

The Water Crisis in Uzbekistan: International and National Aspects of the Problem and Ways to Solve Them

Toshboeva Robiya Sobirovna

Doctor of Sciences in Law, Tashkent State University of Law, Uzbekistan

Received October 16, 2024; Revised February 5, 2025; Accepted February 19, 2025

Cite This Paper in the Following Citation Styles

(a): [1] Toshboeva Robiya Sobirovna , "The Water Crisis in Uzbekistan: International and National Aspects of the Problem and Ways to Solve Them," *Environment and Ecology Research*, Vol. 13, No. 1, pp. 110 - 119, 2025. DOI: 10.13189/eer.2025.130110.

(b): Toshboeva Robiya Sobirovna (2025). *The Water Crisis in Uzbekistan: International and National Aspects of the Problem and Ways to Solve Them*. *Environment and Ecology Research*, 13(1), 110 - 119. DOI: 10.13189/eer.2025.130110.

Copyright©2025 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract The article aims to analyze the state and solution of the water crisis in Uzbekistan through the prism of modern international and national trends. New political realities create the need to recognize Afghanistan as an equal user of cross-border waters in Central Asia, especially in light of the growing water crisis in Central Asia. The peak nature of the water crisis is indicated by the introduction of an emergency water saving regime in Uzbekistan. The author contemplates the potential for Central Asia and Afghanistan to share cross-border waters, taking into account the operation of the Koshtepa Canal, and also the process of turning cross-border waters into a commodity and charging for them. The Uzbek approach to addressing the national water crisis through internal resources is reviewed, emphasizing the importance of using water-saving technologies extensively in agriculture and industry, while also seeking external water sources. In order to address the water crisis, it is proposed to utilize the Amudarya waters through bilateral and multilateral relations between countries of the region. The article also refers to the need to enshrine certain concepts regarding water resources management in legislation, define their implementation mechanisms, revise the concept of a state water inventory, and improve water management through government support for research.

Keywords Climate Change, Water Crisis, State Water Policy, Water Cadastre, Water Tax, Water-Saving Technologies, Water Use Culture, Koshtepa Canal, Sarez

Lake, Central Asia, Uzbekistan

1. Introduction

Water is the main source for supporting life on Earth. It plays a major role in ensuring the food security of the population and increasing the quality of life all around the world. Due to climate change, many countries of the world are experiencing an acute water crisis. The water crisis in Uzbekistan, which accounts for fourth place in global water consumption [1], is a direct consequence of the regional water crisis in Central Asia, which is still getting worse. Due to climate change, the amount of water resources in Uzbekistan has decreased by 20% over the last three years [2]. According to forecasts, the water shortage in Uzbekistan is expected to exceed 15 billion cubic meters by 2030, according to projections [3].

Uzbekistan's water crisis is mainly due to its unfavourable geographical location and lack of direct access to any sea and ocean, making it dependent on cross-border water bodies.

Uzbekistan has to be content with access to the Amudarya, Syrdarya, Zarafshan rivers, which also meet the needs of Tajikistan, Kyrgyzstan, Turkmenistan and Kazakhstan. Furthermore, it is situated in the higher parts of the Amudarya, which drastically decreases its capacity

to provide sufficient water.

According to the Ministry of Water Resources of the Republic of Uzbekistan, 80% of Uzbekistan's water resources are from outside sources, and the remaining 20% is formed from internal sources [4]. In addition, water in the Amudarya and Syrdarya rivers is expected to decrease by 15% in the next two decades [5], which will further deepen the problem.

The construction of the Koshtepa Canal on the Amudarya River by Afghanistan, which started in 2022 and had the goal of irrigating infertile lands, is making the situation worse. As information shows, the first stage of the canal construction has already been completed and this has led to an almost halving of the amount of water intake from the Amudarya in the southern regions of Uzbekistan. The full-fledged operation of the canal, which is planned for 2028, will further worsen the water crisis in Uzbekistan, as we can see from current situation.

1.1. The Goals and Objectives of the Study

The recognition of Afghanistan as an equal water user in Central Asian region within the framework of the Koshtepa Canal under construction leads us to write this paper. The article's purpose is to identify the causes and methods of resolving the water crisis in Uzbekistan, taking into account new developments in the global arena, as well as improving water legislation of the country to new water realities in Central Asia.

Quite naturally, the construction of the Koshtepa Canal will radically change relations between the Central Asian countries. In such scenarios, Uzbekistan should take a number of actions, in particular considering the legal consequences of the cross-border use of the Amudarya river waters, beginning to think about transformation of cross-border waters into an economic asset, searching for new external sources to fill the water deficit within the country, changing the culture of society to water consumption, formation of a reliable information basis for solving the water crisis, adaptation of national legislation to international standards, and implementing new water technologies in the country.

Comparative analysis of foreign and national experience in solving the water crisis is the **method** that takes up the central position, and it is used to identify common and distinctive points. In addition, a statistical method that allows analyzing data in the field of water use and interpreting information about water resources to identify the causes of the water crisis and ways to solve it, is widely used.

By using the synthesis method, it was possible to blend diverse elements, concepts, and data in the field of legal regulation of national and cross-border water use to develop new solutions to the water crisis based on different approaches in the scientific literature. The method of legal futurology has made it possible to predict what changes

may occur in legislation, which allows us to prepare for these changes in advance, to identify possible legal risks associated with the development of new trends and technologies and to suggest ways to minimize them.

Foreign experience of cross-border water use and solving the water crisis. The use of cross-border waters on a contractual basis is known in world practice. In particular, the Danube River is the border of 9 countries and passes through 4 European capitals. The Rhine River flows through Switzerland, Liechtenstein, Austria, Germany, France and the Netherlands. These examples indicate the possibility of using the available resources, taking into account the interests of each coastal State.

In Spain, Israel, and the United Arab Emirates, desalination plants are proposed to be used to combat the water crisis, which allows obtaining fresh water. Also in Africa, desalination and reuse of water are innovative solutions to replenish water scarcity. Effective water management methods like rainwater harvesting and watershed management are being proposed in India to help replenish water resources. Gray water reuse and rainwater harvesting are proposed in Bangalore. In the EU countries, the practice of building reservoirs to prevent a water crisis is widespread.

The practice of building reservoirs to prevent a water crisis is also widespread in the world.

History also knows sad stories related to the division of cross-border waters. In fact, access to water has been one of the main causes of the conflict in the northwestern region of Sudan, Darfur, which broke out in 2003 and claimed the lives of about 200,000 people.

2. Literature Review

The problem of the use of cross-border waters of the Amudarya in Central Asia has long been the object of research by scientists in Uzbekistan.

In particular, G.C. Donbaeva [6] considering the problems of water resource use in Central Asia, substantiates the possibility of using integrated water resource management. N.K. Skripnikov [7] studied the problems of water use from cross-border water resources in the context of global environmental problems; Khudali Mukti and Sobirov B. [8] analyze the issue of the national water crisis within the framework of environmental justice, they talked about the need to introduce a fair distribution of water resources in Uzbekistan; A.D. Bogaturov [9] comes to the conclusion that water is a hydropolitical weapon in relations between the countries of the region, which is confirmed by the conflict between Kyrgyzstan and Tajikistan that occurred in April 2021 at the site of the water distribution point. B. Alimdjanov [10], taking into account the interests of all Central Asian region countries, proposed to adopt a unified water code of Central Asia to resolve the water issue.

Along with these scientists, we studied the significance of reliable environmental information in solving environmental problems [11].

The problem of using the waters of the Amudarya by Afghanistan and other countries has also been studied by a number of foreign scientists.

Eric Sievers believes that not only the Central Asian states, but also Russia, China, Iran, Afghanistan, Azerbaijan and others can be involved in water conflicts [12].

In particular, Horsman S. [13] advocates the inclusion of Afghanistan in regional water structures, starting from the technical level, which, first of all, will correct the hydrological position of the country and ensure the confidence of coastal states in it. Zonn I. [14] states that Afghanistan needs to pay attention to the restoration and reconstruction of existing water intake facilities and irrigation systems, identify priority actions regarding the use of water resources to attract financial support from international organizations and donor countries, as well as guarantee conflict-free management of cross-border waters. According to Kharoon A. H. and Atiqullah S. [15], the main reason for preventing the adoption of a cross-border water policy and attracting foreign projects is considered to be the lack of human and technical potential and due to the lack of reliable and accessible information on the fields of irrigated land. Habib H. [16] focuses on the environmental component of Afghanistan's water use, talking about excessive extraction of water for agricultural needs combined with prolonged drought, which led to a sharp reduction in water resources and enormous pressure on the environment. Mohammad O. and Rahimi A. [17] argue that Afghanistan's neighbors have not yet made any serious efforts to include this country in existing regional mechanisms for cross-border cooperation in the field of water resources. Matthew King and Benjamin Sturtewagen [18], emphasizing the lack of participation of Afghanistan in any cross-border agreement due to the neglect of water management due to the military situation in the country, propose to solve the problem through the efforts of neighboring states and the international community.

3. The Main Problem

Problem of Uzbekistan in water resource use is the systematic decrease of its water reserves, which has already led to a water crisis in some regions of the country. The drying up of the Aral Sea has a very negative impact on people, economy, and food safety not only in Uzbekistan, but also in the entire Central Asian region as a whole. The internal socio-economic situation becomes more complicated and relations with neighbors become more challenging due to the further decline of inland water resources and violation of the order of distribution of cross-border waters. We consider it appropriate here to identify two factors of this problem: external and internal.

3.1. External Factors

The current water crisis in Uzbekistan is an integral part of the regional water crisis in Central Asia, which is exacerbated by the onset of global climate change. The construction by Afghanistan of the Koshtepa Canal, which is unauthorized by international standards, will significantly reduce the share of Uzbekistan's water intake from the Amudarya. According to various estimates, in 5-6 years, when this channel is activated, the security of Uzbekistan's water intake will be reduced from 80% to 65% [19].

It should be noted that Afghanistan has always used the Amudarya water due to its geographical location, as evidenced by the existence of international treaties. Although there are five main river basins in Afghanistan, almost 60 percent of the water resources come from the Amudarya in the north.

Two points related to the construction of the Koshtepa Canal cause serious concerns for Uzbekistan:

First, ignoring the interests of the coastal countries of Central Asia during the construction of the canal, which is a gross violation of international law, will change the water security of the region;

Second, Afghanistan's failure to comply with the requirements for the construction of the channel, as well as the use of unskilled labor, can lead to terrible environmental disasters, which will primarily affect Uzbekistan.

In addition, there is another factor that directly impacts the solution of the water crisis in the country. There has long been a debate in international water law about the possibility of charging for water from cross-border water bodies by recognizing water as a commodity. In the context of the growing global water crisis, some forces in Kyrgyzstan, located in the upper reaches of the Amudarya and acting as a water tower for Uzbekistan and Kazakhstan, have long raised this issue. To date, a certain compensation mechanism exists.

In particular, Uzbekistan transfers funds for water to Kyrgyzstan, and Kazakhstan repairs facilities for the joint use of cross-border waters on the territory of Kyrgyzstan. This concept is becoming more and more realistic, since the concept of non-waste use of the waters of cross-border rivers was formed under the socialist economic system. Despite the fact that after the collapse of the USSR, this concept remained a priority, and the drying up of the Aral Sea and some unilateral actions by individual states in the region (the construction of the Rogun hydroelectric power station in Tajikistan, the Koshtepa Canal in Afghanistan, etc.) forces Uzbekistan to be prepared for such an outcome.

3.2. Internal Factors

They are caused by the following points:

- 1) decline of water resources due to the increasing melting of glaciers in Uzbekistan and snow cover in

the mountains due to climate change. On the territory of Uzbekistan, in the upper reaches of Surkhandarya, and Kashkadarya regions, there are mountain glaciers in the number of 525 units, with a total glaciation area of 154.2 sq. km², that is, glaciers of mostly small shapes; the average area of one glacier is only 0.293 km [20]. According to statistics, as a result of global climate change over the past 50-60 years, the area of glaciers in Central Asia has decreased by 30% [21]. According to forecasts, with an increase in temperature by 2 ° C, the volume of glaciers will decrease by 50%, by 4 ° C - by 78% [22]. According to calculations, water resources in the Syrdarya basin are expected to decrease by 5% by 2050, and up to 15% in the Amudarya basin. In the period up to 2015, the total water deficit in Uzbekistan was more than 3 billion cubic meters, then by 2030 it could reach 7 billion cubic meters, and by 2050 – 15 billion cubic meters [23];

- 2) an increase in demand for water due to the growth of the population and the economy against the background of its shortage. So, today the country's population is more than 37.1 million people and the country's gross domestic product has exceeded \$90.9 billion [24]. This leads to an increasing demand for water resources, which in turn leads to an increase in water tariffs;
- 3) further degradation of water quality. This is primarily due to industrial pollution of water bodies in the country, the level of which is also increasing from year to year. In particular, Uzbekistan is one of the world's largest producers of gold and uranium, which, in turn, creates a risk of water pollution due to an increase in the number of tailings dumps containing by-products of metal mining;
- 4) the increased load on groundwater, the use of which is enhanced by the lack of surface water, which in turn leads to a violation of their condition. For example, allowing the use of artesian wells by farms has led to soil salinization and dehydration, which negatively affects agriculture.

4. Problem Solution

4.1. International Practice of Solving Water Issues

The UN recognizes the right to safe and clean drinking water and sanitation as a human right essential for the full enjoyment of life and all human rights, which was enshrined in 2010 resolution 64/292 UNDP, Human Development Report 2006, Beyond Scarcity: Power, Poverty and the Global Water Crisis, Eliminating Discrimination, Inequality in Access to Water and Sanitation (2015), the World Water Resources Development Report 2019, the World Water Resources Development Report 2023 and other acts are the bases for

the realization of this right.

The United Nations Climate Change Conference (COP29), held in November 2024, highlighted the need for unified approaches to prevent cross-border water pollution and maintain sustainable biodiversity. Uzbekistan is working closely with the United Nations to resolve the water crisis. The visit of UN Secretary General Antonio Guterres to the Aral Sea region on June 13, 2017 was of great practical importance, when it was noted that international donors would be involved as soon as possible to solve the water crisis in Central Asia caused by the uneven distribution of water resources. In 2024, the UN launched two projects in Karakalpakstan, which is suffering the most from the water crisis.

The first UNICEF project is aimed at providing access to safe drinking water, sanitation, hygiene and health services for the most affected communities in four districts of the Republic of Karakalpakstan, and the second joint project of UNDP and FAO provides the formation of an educational base in the Aral Sea region in solving environmental problems through improved approaches to air quality management, land and water resources.

4.2. Uzbek Practice of Solving the Water Crisis

The Government of the Uzbekistan is taking a number of specific measures aimed at correcting the situation with water resources.

In particular, the water sector is included in the subsidized list and is allocated as the fourth largest budget in the country. The government spends more than \$1 billion share annually on the costs of water management, which indicates the strategic nature of this field. In Uzbekistan, over the past two years, 22 trillion soums (about \$1.8 billion) have been allocated from the budget for water management [25]. Global international projects aimed at improving water resource management are being implemented in the country.

Disadvantages of the field. Water corruption is an issue that requires acknowledgment in both Uzbekistan [26] and Central Asia [27].

In addition, the “water mafia” is successfully operating in the country in the field of water resource management and irrigation. They manifest themselves in direct interference in the activities of water bodies of local executive authorities in order to prioritize the water interests of large agricultural clusters in relation to the interests of farmers, individuals engaged in agricultural activities and owners of household plots.

Secondly, water-saving technologies in the form of drip and sprinkler irrigation are being actively introduced in the country. The method of irrigation known as drip irrigation involves supplying water to the root zone of plants through a system of polyethylene pipelines and micro-outlets (emitters). The main feature of drip irrigation is the supply of water directly to each plant, in accordance with its need for water. With a sprinkler system, irrigation water is

supplied as natural rain by distributing water through a pipe system by pumping, followed by spraying in the air through sprinklers.

These methods allow saving up to 60-70% of water in agriculture, whereas with the old irrigation methods, 5-6 billion cubic meters of water were lost. 1 trillion subsidies (\$81 million) were spent on water-saving technologies in 2022-2023. Today, water-saving technologies are used in Uzbekistan on a land of 1.2 million hectares, and it is planned to increase to 2 million hectares by 2030 [28].

Disadvantages of the field: there are still many disadvantages that prevent the universal coverage of all agricultural activities with these technologies, specifically, the high expenses associated with system construction, the persistent accumulation of deposits and undissolved carbonates leading to pipe and dropper contamination, the potential risk of clogging, the necessity of installing additional specialized filters for water purification, frequent pipe damage caused by rodents, and the incompatibility with traditional agricultural crops that require substantial water consumption [29].

To date, the total size of the republic consists of 44.9 million hectares of land, of which agricultural land occupies 23.9 million hectares [30]. The coverage of only 4 million hectares of land by water-saving technologies is scanty and will not have a significant impact on the state of water resources.

Thirdly, the current year for Uzbekistan was marked by the transition to an emergency mode of operation to save water. The reason for this was the irrational use of water resources and the inconsistency of modern water management methods with the economic needs of the country.

Disadvantages of the field: there is no legal act containing the mechanism, procedure, subject composition, timing of transition to an emergency regime for saving water, the dynamics of the legal status of water use entities, as well as the responsibility of special bodies during the emergency regime. Furthermore, the regime does not align with the Concept of Water Management Development of the Republic of Uzbekistan for 2020-2030, which is the current fundamental document for water resource management in Uzbekistan.

Fourthly, the three-year program has initiated the process of concreting canals and ditches with natural coating, aimed at avoiding the loss of 36% of water without any economic benefit.

The current irrigation system, inherited from the socialist economic system, is based on natural cover. Therefore, it is estimated that in irrigation systems with natural cover, an average of 14 billion cubic meters or 36% of water is lost per year without any economic benefit. This creates huge problems with the water supply of agribusiness entities. According to calculations by international experts, concreting 447 of the most important channels can reduce losses by 30%, or by 4 billion cubic meters [31]. To do this, an algorithm is being created to

reduce costs and improve the quality of canal concreting programs in each region and district. The financing of this process is planned to be carried out both from the national budget and from the funds of international financial institutions.

Disadvantages of the field: The disadvantage of concreting canals and ditches is the duration of the repair of concrete coatings, low quality indicators and the inability to repair concrete linings of irrigation canals. In addition, the building material introduced into the defective place will be destroyed by the subsidence of the base and exposure to water. This is an expensive procedure that requires a lot of money.

Fifthly, public-private partnership (PPP) in the field of water management is actively developing, which implies long-term interaction between the state and business, in which the private party participates in the design, financing, construction or reconstruction of water bodies, as well as in its subsequent operation and (or) maintenance on the basis of direct negotiations. Such a partnership is carried out in the form of transferring pumping stations to private partners for management in order to replace old equipment with new ones. Furthermore, the Ministry of Water Management of Uzbekistan is in charge of managing water facilities on clusters' land that have been added to their balance sheet. This process was started back in 2020 on the basis of the Water Management Development Concept. Today there are about 300 public-private partnership projects for the operation of pumping stations [32].

Disadvantages of the field: As practice shows, PPP is not always an effective means of solving a problem. Among the negative consequences of the use of PPP in the field of water usage, it is possible to highlight the predominance of economic goals of project implementation over socially significant ones, a relatively greater increase in direct budget expenditures, a high costs of developing and conducting competitive procedures, the growth of "water corruption" and the strengthening of the "water mafia".

Sixthly, in order to ensure additional water supplies, Uzbekistan is actively promoting the issue of joint use of Lake Sarez, located in the Gorno-Badakhshan Autonomous Region of Tajikistan. The issue of using the fresh water of Lake Sarez for drinking needs of the two countries was discussed during the state visit of the head of Tajikistan to Uzbekistan back in 2018. Thus, it is planned to annually withdraw up to 1.5 cubic kilometers of water from the lake. This volume is expected to improve the living conditions of about 5 million residents of Uzbekistan and Tajikistan, as well as to provide irrigation for about 3 million hectares of agricultural land [33].

In the next five years, it is planned to invest \$500 million in joint innovative cross-border projects in this field. Such a solution to the problem will be mutually beneficial for both countries, since according to the UN, Lake Sarez can burst at any time. In such conditions, the release of excess cubic meters of water into Uzbekistan will help to unload the lake and thus prevent a possible disaster.

Disadvantages of the field: The efforts of the two countries are insufficient; the project requires large investments, which requires the support of the entire world community and major international organizations. However, other countries and donor organizations have not yet shown their interest in this project. For Central Asia, Lake Sarez is like a time bomb. There are reports that the level of Sarez has risen by 5-6 m in recent years, i.e. almost 10 times higher than the calculated one, which has already led to the merger of Sarez and Shadaukul [34].

4.3. What is Being Offered to Uzbekistan?

International experts propose three types of comprehensive measures to solve the water crisis:

1. Widespread attraction of investments in water infrastructure. According to EDB estimations, Central Asia needs over 12 billion US dollars of investments in the period 2025-2030 for the modernization of water infrastructure [35];
2. Improvement of legislation: creation of an effective regulatory framework for regulating water use;
3. Raising public awareness: conducting information campaigns aimed at fostering respect for water resources.

As a long-term perspective for solving the water crisis, it is proposed to implement a long-proposed project to transfer the waters of the Russian rivers Irtysh, Ob and Yenisei to the Aral Sea [36].

5. The Results of the Study

First, the main consumer of water in Uzbekistan is the agricultural sector, which uses 1/9 of the water resources (46 billion cubic meters). Despite a significant decrease in the share of agriculture in the country's GDP (from 27% in 2017 to 18% in 2023), it plays a major role in ensuring the country's food security through the development of increased exports of fruits and vegetables. According to statistics, 10-11 thousand cubic meters of water are spent on irrigation of 1 hectare of a cotton field per year, whereas in countries with similar climates and soils, as well as a large volume of water; 2-3 times less water is spent, while almost half of the water used goes down the drain.

The lifting of the embargo on Uzbek cotton in 2019 has re-actualized cotton growing in the country. According to the legislation, water intake limits for farmers and dehqan farms and other water consumers are set by the associations of water consumers serving them, which is a non-governmental non-profit organization. The limits of water intake for farms and dehqan farms, except in cases of a decrease in the water content of sources, cannot be changed without their consent;

Second, there is an insufficient level of water use culture. The Head of State, Sh.M.Mirziyoyev, stressed back in

2023 that "the main task should be to deeply introduce to the population that the idea that water is not free, to turn it into a rule of daily life together with mahalla activists, intellectuals, elders and the general public"[37].

Misunderstanding or miscalculation of the results of actions not of individual persons, but of the whole society, which under the Soviet regime led to the disaster of the Aral Sea in the region, unfortunately, is still actively manifested in society nowadays. In the context of active business development, the existing meager level of legal knowledge about water resources and the absolute lack of water culture among the population is increasingly exacerbating the water crisis. The Center for Media Research and Educational Development (MediadataLab) of Uzbekistan, in a survey of 1,583 respondents aged 15-25, concluded that young people have not yet formed a conscious, careful attitude to water and water resources, while 88% of respondents consider the problem of water scarcity to be a real threat [38].

Third, is water a commodity? In Uzbekistan, the task of turning land resources into an asset has been set, but water resources are not yet being talked about, although the value of land resources is directly assessed their level of water availability. Internationally, water is treated as a commodity in some countries. To date, Uzbekistan has not yet considered this issue at the legislative level and has not applied market mechanisms for water quality assessment.

This is a highly controversial issue and requires comprehensive research and assessment by professionals in different fields. We came to this conclusion after studying the opinion of UN human rights expert Pedro Arrojo Agudo, who noted "water is not a commodity and financial asset to be exploited. He also calls on States to re-think the usefulness of water trading as a tool for managing scarcity, and to consult the public to determine whether water trading markets should be abolished or more strictly regulated" [39].

In Uzbekistan, fees are charged for water delivery and other water management services.

In addition, the Tax Code of the Republic of Uzbekistan introduced a water tax for the use of surface and groundwater [40]. Uzbekistan still uses the procedure for assessing water resources, which involves taking into account the indicators of quantity and quality in different time limits by identifying typical devices, examining the correctness of the results obtained, processing them using established methods and synthesizing them into different groups. This procedure was inherited from the Soviet water management mechanism and does not correspond to the current economic reforms.

Fourth, outdated legislation. The base of the national water legislation is sufficiently formed and is constantly being improved [41, 42, 43]. The current concept of the water cadastre, which contains all information about the country's waters and is the information basis for solving the water crisis, is morally outdated and does not correspond to current trends in the development of national legislation

and international water realities.

National legislation defines the state water cadastre as a systematized, constantly updated and, if necessary, updated set of information on water bodies that make up the unified state water fund, water resources, regime, quality and use of waters, as well as on water users, water consumers and water management facilities, water protection zones, coastal strip and sanitary protection zone, drinking and wastewater.

From a technological point of view, according to the legislation, the water cadastre is an automated system, which means a software and hardware complex for authorizing the activities of an organization that provides storage, transmission and processing of information. At the same time, such important components of the procedure for the formation of cadastral information as collection, updating, search and provision of information are not covered by automated systems.

We can refer to the water cadastre as information resources according to [44], since water cadastral information is documented and this refers to the main feature of information resources. In addition, since 2020, the cadastral system of Uzbekistan has begun to function in the National Geographic Information System [45].

Since 2021, cadastral data has become part of the National Spatial Data Infrastructure [46], the main purpose of which is to provide access to metadata about geographic information resources using the worldwide Internet information network. These major technological developments are still not reflected in the concept and essence of the water cadastre, which indicates the backwardness of legislation.

Fifth, in the country the main focus is on the training of irrigation reclamation specialists, that is, a network of specialists in the field of water use, while special “water law lawyers” are not trained. This has led to insufficient scientific substantiation of the problems of legal regulation of water use. The scientific works of national scientists contain only references to the function of accounting for

water bodies and their condition in the framework of research on the protection of waters and water bodies, as well as control and supervision of the activities of citizens and legal entities in the process of water use. The most developed issue is the study of cross-border waters, while the legal problems of maintaining a water cadastre still remain unexplored, which in turn weakens the position of the information basis for solving the water crisis.

Sixth, the disproportion between water payments and costs.

In Uzbekistan, the concepts of “water use” (the use of water without removing it from localization sites) and “water consumption” (the use of water associated with its removal from localization sites with subsequent relocation) are distinguished. At the same time, both of these procedures are paid.

In the Tax Code of the Republic of Uzbekistan, taxpayers for the use of water resources are recognized as:

- i) legal entities of the Republic of Uzbekistan;
- ii) non-resident legal entities of the Republic of Uzbekistan operating in the Republic of Uzbekistan through permanent establishments;
- iii) individual entrepreneurs who use water for entrepreneurial activities, as well as individuals who have non-residential real estate objects intended for entrepreneurial activity and (or) income generation;
- iv) dehqan farms (farmers), as well as individuals who have agricultural land, are the following persons engaged in primary water use or water consumption on the territory of the Republic of Uzbekistan.
- v) water suppliers - legal entities pay tax only for water used for their own needs.

The figure 1 sets out the elements of water use charges in Uzbekistan.

The use of water by individuals is allowed both with a water consumption meter and without a meter (based on the summation of the net cost of water, sewerage for cold and hot water, as well as value added tax).

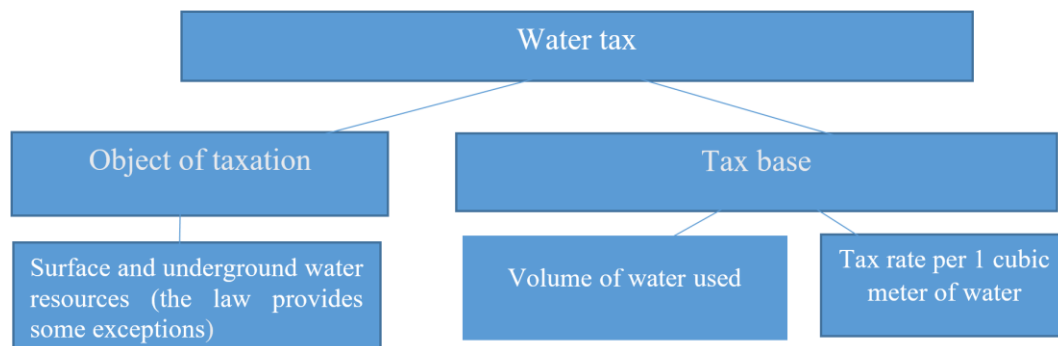


Figure 1. Water board elements

This year, with a water consumption meter, one cubic meter of water for the population costs 2,000 soums (about 0,15 cents), for budget organizations 1 cubic meter – 9,000 soums (about \$0,70 cents), for wholesale consumers 1 cubic meter – 9,000 soums. With the abolition of the value added tax, the cost of water in Uzbekistan has increased by 12%. The price of water for April 1, 2024 per person (without a meter) in apartments with a centralized hot water supply system is almost 50 thousand soums (3.92 dollars), and with a meter 3808 soums (30 cents) [47].

Such a huge gap in the cost of water (\$3.62) is due to the presence (absence) of a device with a conditional passage of 15 or 20 mm, fixing the number of revolutions and determining the actual volume of water consumed. Water prices (tariffs) are approved by a decision of the local representative body and are systematically changed.

By international standards, in 2024, Uzbekistan entered the top ten countries with the cheapest water. The table below shows the cost of a liter of water in different countries*.

Table 1. Cost of 1 liter water in different countries

№	Country name	The cost of 1 cubic meter
1.	Indonesia (Jakarta)	0,03 USD
2.	Pakistan (Karachi)	0.04 USD
3.	Cuba (Havana)	0.04 USD
4.	Egypt (Cairo)	0.05 USD
5.	Uzbekistan	0.11 USD
6.	Georgia	0,12 USD
7.	Tadjikistan	0,12 USD
8.	Kirgizstan	0,13 USD
9.	Turkmenistan	0.14 USD (at the expense of the limit)
10.	Kazakhstan	0.18 USD

It is indisputable that water should have its own value, just like oil, gas, land, and water pricing in Uzbekistan should be based exclusively on market mechanisms, and not on administrative ones. Only in this case can we talk about the proportionality of water tariffs and costs.

6. Conclusions

The deepening water crisis in Uzbekistan requires the adoption of a set of legal, economic and social measures, including both international and national measures. The connection of the national water crisis with the state of cross-border waters causes Uzbekistan’s direct dependence on them. Therefore, international factors are the determining factors in solving the national water crisis. To retain and implement the achievements of international best practices is already the task of legislator in Uzbekistan. Therefore, even such moral factors as the culture of water

use should have its own source of legal regulation.

To solve the water crisis in Uzbekistan, we highlight the followings:

First, it is necessary to reconsider the issue of further use of the waters of the Amudarya with the participation of the countries of Central Asia and Afghanistan before the commissioning of the Koshtepa Canal within the framework of the Convention on Cross-border Waters as well as the regional agreement of February 18, 1992 concluded in Afghanistan.

Uzbekistan’s efforts alone are not enough; all Central Asian countries should be interested in resolving this issue, including the upstream countries, on the basis of generally accepted norms of international water law.

It is proposed to regulate relations both on the basis of bilateral (between Uzbekistan and Afghanistan, since 8.5% of the drainage of the Koshtepa Canal is formed on the territory of Uzbekistan) [48] and of multilateral relations between the Central Asian countries and Afghanistan (as an additional protocol to the Almaty Agreement of 1992).

In addition, within the framework of the Universal Environmental Charter, initiated by Uzbekistan, it is proposed to consolidate the principle of verifying data on the state of cross-border waters by independent international organizations;

Secondly, to solve the imperfections of legislation by:

- a) consolidating in the Strategy for the development of agriculture of the Republic of Uzbekistan for 2020 - 2030 the emergency mode of work on saving water in agriculture and developing appropriate measures for its implementation;
- b) revision of the definition of the state water cadastre contained in national legislation in accordance with the requirements of the digital economy. It is proposed to define the state water cadastre as a public geographic information resource based on GIS technologies, containing information on all the quantity and quality of waters of both internal and cross-border origin, directly used by Uzbekistan, on economic assessment and water users;
- c) fixing the economic assessment of water resources as a criterion of the water cadastre. As a basis for such an assessment, we propose to introduce water rental relations. Unlike fees for the provision of water use services (water consumption), rent payments will be made only by those water users who profit from the use of water and will be charged for the amount of withdrawal and conditions of use of water resources.

In particular, it is

- i) an individual who lease agricultural land, farms and dehqan farms, clusters that profit from the production of agricultural products;
- ii) hydropower facilities that receive income from water bodies as an energy source;
- iii) health and wellness institutions that use mineral springs in the treatment of certain types of diseases;

Thirdly, we propose to implement the Concept for the development of environmental education in Uzbekistan's education system that should include a separate section that deals with the formation of a water-using culture in Uzbekistan.

Along with this, we believe it is a good idea to increase the scientific justification for the issues with legal water regulation in the country by opening a master's degree program at Tashkent State University of Law.

REFERENCES

- [1] "Water", Worldometer. Population info, https://www.worldometers.info/#google_vignette (last viewed date: Sept. 1, 2024)
- [2] Sh. Hamraev, "The President declared 2024 year as a period of transition to an emergency mode of work to save water in Uzbekistan", *Gazeta.uz*, <https://www.gazeta.uz/ru/2023/11/30/water/#> (last viewed date: Oct. 1, 2024)
- [3] Sh. Hamraev, "By 2030, water shortages in Uzbekistan could reach 15 billion cubic meters", *Podrobno.uz*, <https://podrobno.uz/cat/obchestvo/k-2030-godu-v-uzbekistane-nehvatka-vody-mozhet-dostich-15-milliardov-kubometrov> (last viewed date: Oct. 1, 2024)
- [4] R. Karshiev, "Due to the comprehensive measures taken, Uzbekistan annually saves about 7 billion cubic meters of water", *Uzbekistan.org*, <https://uzbekistan.org/ru/> (last viewed date: Sept. 1, 2024)
- [5] Sh. Mirziyoyev, "The idea that water is not free should be introduced", *Daryo.uz*, <https://daryo.uz/ru/2023/11/17/sleduet-vnedrit-ideyu-o-tom-cto-voda-ne-besplatna-prezident-savkat-mirziyev> (last viewed date: Sept. 5, 2024)
- [6] Ch. Donbaeva, "Problems of water resources in Central Asia", *RUDN Bulletin, Engineering Research Series*, vol. 2, pp. 62-67, 2016.
- [7] N. Skripnikov, "Legal regime for the use of cross-border waters", *Bulletin of the Supreme Court*, vol. 3, pp. 57-41, 2011.
- [8] H. Mukti, B. Sobirov, "Environmental Justice at the Environmental Regulation in Indonesia and Uzbekistan", *Journal of Human Rights, Culture and Legal System*, vol. 3, pp. 476-512, 2023. <https://doi.org/10.53955/jhcls.v3i3.171> (last viewed date: Oct. 1, 2024)
- [9] A. Bogaturov, A. Dundich, E. Troitsky, "Problems of transboundary water regulation in Central Asia" In *Central Asia: "deferred neutrality" and international relations in the 2000 s.*, Scientific and educational forum on international relations, 2010, pp. 20-30.
- [10] B. Alimdjanov, "Water problems of Uzbekistan: environmental and management issues", *Cabar.asia*, <https://cabar.asia/ru/vodnye-problemy-uzbekistana-voprosy-ekologii-i-menedzhmenta> (last viewed date: Oct. 1, 2024)
- [11] R. Toshboeva, "Environmental Information and Management of Ensuring Access to it (On the Example of Uzbekistan)", *Environment and Ecology Research*, vol. 10, pp. 238-247, 2022. DOI: 10.13189/eer.2022.100213. (last viewed date: Oct. 1, 2024)
- [12] E. Sievers, "Water, conflict, and regional security in Central Asia", *Dergipark.org*, <https://dergipark.org.tr/en/download/article-file/575632> (last viewed date: Jan. 4, 2025)
- [13] S. Horsman, "Afghanistan and Cross-border Water Management on the Amy Darya: A Political History", *Central Asian Journal of Water Research (CAJWR)*, vol. 4, pp. 63-74, 2008.
- [14] I. Zonn, "Water policy of Afghanistan in Central Asia", *Bulletin of the Moscow University named S U Vitte Series 1 Economics and management*. DOI: 10.21777/2587-554X-2018-3-54-66.
- [15] A. Haroon, A. Sediqi, "Impacts of Water Development Plans on Regional Water Cooperation-A Case Study of Amu River Basin", *Journal of Water Resource and Protection*, vol. 10, pp. 134-137, 2018. DOI: 10.4236/jwarp.2018.1010059. (last viewed date: Jan. 6, 2025)
- [16] H. Habib, "Water Related Problems in Afghanistan", *International Journal of Educational Studies*, vol. 1, pp. 137-144, 2014.
- [17] M. Osman, A. Rahimi, "Water politics and its impact on Afghanistan's relations with neighbor states", *Cyberleninka*, <https://cyberleninka.ru/article/n/vodnaya-politika-i-ego-vliyaniye-na-otnosheniya-afganistana-s-sosednimi-gosudarstvami> (last viewed date: Jan. 1, 2025)
- [18] M. King, B. Sturtewagen, "Efficient use of Afghanistan's water resources: New opportunities for regional cooperation", *Cabar.asia*, <https://cabar.asia/ru/vodnye-problemy-uzbekistana-voprosy-ekologii-i-menedzhmenta> (last viewed date: Jan. 1, 2025)
- [19] United Nations, *Uzbekistan Environmental Performance Reviews*, No.52, 2020, <https://doi.org/10.18356/1a964ffd-en> (last viewed date: Sept. 15, 2024)
- [20] "Uzbekistan is taking systematic measures to adapt and mitigate the effects of climate change", *Isrs.iz.ru*, <https://isrs.iz.ru/makular/Uzbekistan-is-taking-systemic-measures-to-adapt-and-mitigate-the-consequences-of-climate-change> (last viewed date: Sept. 15, 2024)
- [21] Sh. Hamraev, "Almost \$2 billion allocated for water management in Uzbekistan over two years, but water losses and pump conditions have only worsened", *Gazeta.uz*, <https://www.gazeta.uz/ru/2023/10/23/water> (last viewed date: Sept. 11, 2024)
- [22] M. Aitov, "Uzbekistan takes systemic measures to mitigate effects of climate change", *Uzdaily.uz*, <https://www.uzdaily.uz/en/uzbekistan-takes-systemic-measures-to-adapt-and-mitigate-the-effects-of-climate-change> (last viewed date: Sept. 15, 2024)
- [23] Sh. Mirziyoyev, "There will be a transition to an emergency mode of operation to save water", *President.uz*, <https://president.uz/ru/lists/view/6894> (last viewed date: Sept. 11, 2024)
- [24] Statistical agency under the President of the Republic of Uzbekistan <https://www.stat.uz/ru/> (last viewed date: Dec. 15, 2024)
- [25] Sh. Hamraev, "Nearly \$2 billion has been allocated to

Uzbekistan's water sector in two years, but water losses and the condition of pumps have only worsened”, *Gazeta.uz*, <https://www.gazeta.uz/ru/2023/10/23/water/> (last viewed date: Aug. 20, 2024)

- [26] Sh. Hamraev, “Over the past two years, Uzbekistan has allocated almost \$2 billion to water management”, *Kun.uz*, <https://kun.uz/en/news/2023/10/23/uzbekistan-allocated-almost-2-billion-to-water-industry-in-past-two-years> (last viewed date: Aug. 20, 2024)
- [27] A. Mukhtarova, “Water Corruption in Central Asia: A Brief Review of the Central Asian”, *Journal of Water Resources Research*, vol. 9, no. 2, pp. 121-146, 2023. DOI: 10.29258/CAJWR/2023-R1.v9-2/121-146.rus.2023
- [28] Sh. Hamraev, “Almost \$2 billion allocated for water management in Uzbekistan over two years, but water losses and pump conditions have only worsened”, *Gazeta.uz*, <https://www.gazeta.uz/ru/2023/10/23/water>
- [29] A. Sherov, B. Amanov, “Resource-saving innovative irrigation technologies”. Textbook, Tashkent, 2023, pp. 50-54.
- [30] Sh. Mirziyoev, “Water shortage in Uzbekistan may reach 15 billion cubic meters by 2030”, *News.mail*, <https://news.mail.ru/economics/58819603/> (last viewed date: Sept. 11, 2024)
- [31] Sh. Mirziyoev, “Uzbekistan switches to emergency mode of operation on water saving”, *Kun.uz*, <https://kun.uz/ru/news/2023/11/30/uzbekistan-perexodit-na-chrezvychayny-rejim-raboty-po-ekonomii-vody> (last viewed date: Sept. 11, 2024)
- [32] “Register of public-private partnership projects”, *Pppda.uz*, <https://www.pppda.uz> (last viewed date: Aug. 20, 2024)
- [33] Sh. Hamraev, D. Djuma, “Tajikistan is ready to share the water of Lake Sarez with Uzbekistan”, *Daryo.uz*, <https://daryo.uz/ru/2024/08/07/sarez-lake-to-provide-up-to-15-cubic-kilometers-of-water-annually-for-uzbekistan-and-tajikistan> (last viewed date: Sept. 15, 2024)
- [34] Yablokov A., “Possible changes of Tajikistan’s hydrology», *Scientific-practical conference*”, Dushanbe, Tadjikistan, September, 2001, pp. 4-12.
- [35] EDB Media Center, “Central Asia will need to attract an additional 12 billion dollars of investment to provide clean drinking water to its entire population by 2030”, *Eabr.org*, <https://eabr.org/en/press/news/central-asia-will-need-to-raise-an-additional-12-billion-in-investment-to-provide-clean-drinking-wat/> (last viewed date: Sept. 15, 2024)
- [36] D.Mirzakhmedov, “What do the youth of Uzbekistan know about the problems of water shortage?” *Cabar.asia*, <https://cabar.asia/ru/chto-molodezh-uzbekistana-znaet-o-problemah-nehvatki-vody> (last viewed date: Jan. 2, 2025)
- [37] Sh. Mirziyoev, “We need to introduce the idea that water is not free”, *Gazeta.uz*, <https://www.gazeta.uz/ru/2023/11/30/water/> (last viewed date: Sept. 15, 2024)
- [38] D.Mirzakhmedov, “What do the youth of Uzbekistan know about the problems of water shortage?”, *Cabar.asia*, <https://cabar.asia/ru/chto-molodezh-uzbekistana-znaet-o-problemah-nehvatki-vody> (last viewed date: Jan. 2, 2025)
- [39] A. Pedro, “Water is neither a commodity nor a financial asset that can be exploited, says UN human rights expert”, *Ohchr.org*, <https://www.ohchr.org/en/press-releases/2021/10/water-not-commodity-and-financial-asset-be-exploited-says-un-human-rights> (last viewed date: Sept. 10, 2024)
- [40] Tax code of the Republic of Uzbekistan, *Lex.uz*, <https://lex.uz/docs/4674902#> (last viewed date: Sept. 15, 2024)
- [41] Law of The Republic of Uzbekistan “On water and water use”, *Lex.uz*, <https://lex.uz/docs/93202#h> (last viewed date: Sept. 15, 2024)
- [42] Decree of the President of the Republic of Uzbekistan “On the Development Strategy of the New Uzbekistan for 2022-2026”, *Lex.uz*, <https://lex.uz/ru/docs/6968143> (last viewed date: Oct. 5, 2024)
- [43] Decree of the President of the Republic of Uzbekistan “On approval of the concept of development of the water sector of the Republic of Uzbekistan for 2020 -2030”, *Lex.uz*, <https://lex.uz/ru/docs/6973364> (last viewed date: Aug. 20, 2024)
- [44] Law of the Republic of Uzbekistan “On Informatization”, *Lex.uz*, <https://lex.uz/en/docs/6808124> (last viewed date: Aug. 20, 2024)
- [45] Decree President of the Republic of Uzbekistan “On measures to fundamentally improve the system of land accounting and state cadastres”, *Lex.uz*, <https://lex.uz/docs/4985026> (last viewed date: Sept. 15, 2024)
- [46] Law of the Republic of Uzbekistan “About spatial data”, *Lex.uz*, <https://lex.uz/docs/6115259> (last viewed date: Aug. 20, 2024)
- [47] “Official statement on the new tariff approved for drinking water supply and sanitation services in the city of Tashkent”, *Uzsuv.uz*, <https://uzsuv.uz/ru/posts/1050> (last viewed date: Sept. 15, 2024)
- [48] C. Bush. “The Kush-Tepa Canal will have a significant impact on agriculture in Uzbekistan”, *German-economic-team*, <https://www.german-economic-team.com/en/newsletter/qush-tepa-canal-to-significantly-im-pact-uzbekistans-agriculture/> (last viewed date: Yan. 20, 2025)