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## SOLVING WATER RESOURCES PROBLEMS - WATER SAVING IN THE REPUBLIC OF UZBEKISTAN

Rustam Muxammatdjanovich Raximov

*Tashkent state technical university named after Islam Karimov, Tashkent city, Republic of Uzbekistan, Doctoral student (PhD), rahimov8003738@gmail.com, <https://orcid.org/0000-0001-9733-467X>, sharopovhusanjon@gmail.com*

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## SOLVING WATER RESOURCES PROBLEMS - WATER SAVING IN THE REPUBLIC OF UZBEKISTAN

R.M.RAKHIMOV (Tashkent state technical university named after Islam Karimov, Tashkent city, Republic of Uzbekistan)\*

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**Abstract.** In this article we will talk about the problems of water resources in the Republic of Uzbekistan. The problem of drinking water supply, solutions to provide drinking water to the population of Uzbekistan. The largest consumers of fresh water in Uzbekistan are farmers. Due to outdated infrastructure, 40% of water is wasted. Rising food prices and the risk of spreading disease are the first signs of water shortages that we may experience in the coming years. Uzbekcosmos told how to solve the problem. Water is an invaluable resource used not only in the home, but also in the production and processing of food products. But the intensity of its exploitation is growing every day. Studying with close attention the ideas reflected in the report, one can be personally convinced of the extremely simple and understandable way of reflecting large-scale and complex problems in the form of theses, deep elaboration and study of the material, purely pragmatic specificity of the given proposals, easy to remember and ready for perception in international politics.

**Keywords.** air temperature, water resources, consumption, water supply, drinking, problem, groundwater, agriculture, hydropower.

**Annotatsiya.** Ushbu maqolada O'zbekiston Respublikasida suv resurslari muammolari haqida so'z yuritiladi. O'zbekiston aholisini ichimlik suvi bilan ta'minlash muammosi, yechimlari. O'zbekistonda chuchuk suvning eng yirik iste'molchilari fermerlardir. Eski qanot infratuzilma tufayli suvning 40 foizi isrof bo'lmoqda. Oziq-ovqat mahsulotlari narxining ko'tarilishi va kasalliklarning tarqalish xavfi yaqin yillarda yuz berishi mumkin bo'lgan suv tanqisligining dastlabki belgilaridir. "O'zbekcosmos" bu muammoni qanday hal qilish mumkinligini tushuntirdi. Suv nafaqat kundalik hayotda, balki hayotda ham foydalaniladigan bebaho resursdir. oziq-ovqat mahsulotlarini ishlab chiqarish va qayta ishlash. Ammo uni ekspluatatsiya qilish intensivligi kundan-kunga ortib bormoqda. Ma'ruzada aks ettirilgan g'oyalarni sinchiklab o'rganib, siz keng ko'lamli va murakkab muammolarni tezislar shaklida aks ettirishning nihoyatda sodda va tushunarli usulini shaxsan tekshirishingiz mumkin, materialni chuqur o'rganish va o'rganish, bu takliflarning sof pragmatik o'ziga xosligi, eslash oson va xalqaro siyosatda idrok etishga tayyor.

**Tayanch so'zlar:** havo harorati, suv resurslari, iste'mol, suv ta'minoti, ichimlik, muammo, yer osti suvlari, qishloq xo'jaligi, gidroyenergetika.

**Аннотация.** В этой статье мы поговорим о проблемах водных ресурсов в Республике Узбекистан. Проблема обеспечения питьевой водой, решения по обеспечению питьевой водой населения Узбекистана. Крупнейшими потребителями пресной воды в Узбекистане являются фермеры. Из-за устаревшей инфраструктуры 40% воды расходуется впустую. Рост цен на продукты питания и риск распространения болезней - первые признаки нехватки воды, с которой мы можем столкнуться в ближайшие годы". Узбеккосмос рассказал, как решить эту проблему. Вода - бесценный ресурс, используемый не только в быту, но и в производстве и переработке продуктов питания. Но интенсивность ее эксплуатации растет с каждым днем. Внимательно изучая идеи, отраженные в докладе, можно лично убедиться в предельно простом и понятном способе отражения масштабных и сложных проблем в виде тезисов, глубокой проработке и изучении материала, сугубо прагматичной конкретности данных предложений, легко запоминающихся и готовых к восприятию в международной политике.

**Ключевые слова:** температура воздуха, водные ресурсы, потребление, водоснабжение, питьевая, проблема, подземные воды, сельское хозяйство, гидроэнергетика.

### Introduction

The atmospheric air temperature is increasing worldwide due to climate change. Increase in air temperature automatically increases the demand for water. Global population growth, decreasing fresh

water resources, increasing demand for drinking water, conservation of drinking water resources and need for water conservation.

Many water and water-related problems are the result of slow-moving environmental changes. They

\*Raximov Rustam Muxammadjanovich – Doctoral student (PhD), [rahimov8003738@gmail.com](mailto:rahimov8003738@gmail.com), <https://orcid.org/0000-0001-9733-467X>

appear most often at sub-national and regional levels. It is difficult for society to recognise and counteract gradually increasing, accumulating changes in the environment, and there is a tendency to deal with these changes later. In other words, there is a lack of responsibility of mankind and society towards nature.

Research in the field of hydrogeology is very important for mankind. According to scientific studies, 74% of the globe is covered with water. However, there is a worldwide shortage of water, especially drinking water.

**Materials and Methods**

According to the UN, almost half of the world's population suffers from water scarcity. Experts estimate that more than 780 million people around the world do not have access to clean drinking water. And 1.7 billion people are in need of fresh water. Thousands of people die every year due to lack of clean water and unsanitary conditions around the world. Most of them are children.

Water quality is also an example of a slowly evolving environmental problem. Today's water quality in a particular place is not much different from yesterday's, and tomorrow's is not likely to be much different from today. Such a thought is repeated every day, and there is a sense that action is not necessary. However, after a few years, the deterioration of water quality becomes noticeable, significant, dangerous, and the problem may have entered a crisis stage requiring more serious costs. It would probably be easier and cheaper to address the water quality problem as well as other water problems at an earlier stage [1-2].

In the last fifty years, we have witnessed that seemingly insignificant problems in the water sector

that arise from year to year lead to an ecological crisis in a few years or decades. This is due to the fact that most environment-related problems that affect human beings manifest themselves imperceptibly because they are initially weakly expressed, build up gradually and accumulate over a long period of time. One vivid example is the Aral Sea crisis.

It should be noted that water is a substance with extremely simple chemical formula, it does not have its own colour and taste, but at the same time, it is an irreplaceable and unparalleled invaluable natural resource that serves as a fundamental basis for the development of society, economy and ensuring a decent quality of life for people, development and the very existence of human society on Earth in general. According to scientists' estimates, the world's water reserves are about 1.5 billion km<sup>3</sup> of which only 2 per cent is fresh water. Available fresh water resources suitable for use for human needs are estimated at about 41,000 km<sup>3</sup>. At the same time, the existing limited fresh water resources are characterised by their increasing scarcity and progressive deterioration of their quality. Under current conditions, the deficit of fresh water resources have already taken on the scale of a worldwide global problem. As a result, it leads to negative consequences, such as deterioration of ecosystems, reduction of resources necessary for life support of people and nature, growth of various diseases among the population, etc. To date, the shortage of water, which is the main consumer product, has led to the deterioration of water availability in more than 40 countries and worsened the lives of more than 2 billion people living there [3-4].

Table 1

**Household water security indices in Central Asian countries (KD-1) ("Asian Water Development Outlook" (AWDO), 2013 and 2016)**

Water consumers (by priority)	Total volume of water required	Including by source		
		Surface water resources	Groundwater resources	Return waters
<b>2018 year</b>				
Utilities	5320	2200	3120	0
Industry	1885	855	1030	0
Agricultural water supply	485	415	70	0
Fisheries	640	460	0	180
Energy	770	770	0	0
Irrigated agriculture	55100	50000	1100	4000
<b>Total</b>	<b>64200</b>	<b>54700</b>	<b>5320</b>	<b>4180</b>
<b>2030 year</b>				
Utilities	6200	2450	3750	0
Industry	3500	1580	1920	0
Agricultural water supply	950	810	140	0
Fisheries	640	460	0	180
Energy	780	780	0	0
Irrigated agriculture	48000	46800	700	500
<b>Total</b>	<b>60070</b>	<b>52880</b>	<b>6510</b>	<b>680</b>

With these important tasks in mind, the Presidential Decree of 20 April 2017 “On the Programme of Comprehensive Development and Modernisation of Drinking Water Supply and Sewerage Systems for 2017-2021” was adopted (PP-2910). In particular, it is aimed at creating more comfortable and decent social and living conditions for the rural population, improving the efficiency of drinking water supply and sewerage services in the country in 2017-2021, ensuring consumer access to quality drinking water throughout the region [4-5].

Water for Uzbekistan, due to its hot and arid climate, occupies a significant place not only in agriculture (23.3% of GDP for 2022) and industry (33.5% of GDP for 2022)<sup>2</sup>, but also in human life support in general. The Republic of Uzbekistan is the most populous country in Central Asia. The country's resident population as of December 2023 was 35,400 thousand people [Demography of Uzbekistan]. About 49% of the population live in rural areas, and their livelihoods depend entirely on agriculture and related industries [5].

President of Uzbekistan Shavkat Mirziyoyev, delivering his report from the high rostrum of the 72nd session of the UN General Assembly, along with the most important world problems, emphasised the global significance and crucial role of sustainable joint management of the region's limited water resources and finding solutions for their reasonable and rational use. in achieving the goals of ensuring peace and stability in Central Asia.

Studying with close attention the ideas reflected in the report, one can be personally convinced of the extremely simple and understandable way of reflecting large-scale and complex problems in the form of theses, deep elaboration and study of the material, purely pragmatic specificity of the given proposals, easy to remember and ready for perception in international politics [6].

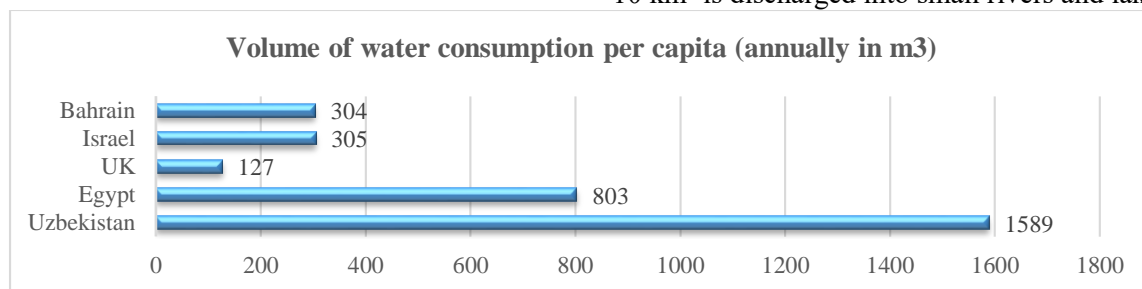
By analysing the essence and relevance of existing water-related problems, it is possible to understand the reasons for their special attention at

different levels. It becomes clear why they have turned into problems of state policy level in the countries. Today, the ever-increasing importance of limited water resources in ensuring the vital activity of mankind, preservation of life itself, stability of equilibrium between society and nature, search for and provision of sustainable solutions to water-related problems in the region are in the centre of attention not only of narrow specialists and scientists, but also of leaders of the highest governmental levels, are considered by heads of state and are exalted in the rank of geopolitical interests of the countries in the region.

**Results and Discussion**

Over the years of independence, Uzbekistan has carried out large-scale work to improve the provision of quality drinking water to the population. Consistent implementation of the most important priorities, program and projects for the development of the drinking water supply and sewerage systems of the Republic has made it possible to significantly improve the state of centralized water supply and sewerage services in cities and districts, including in rural areas.

According to data, the average person in the world uses 100 litres of water for daily needs. This figure is 140 litres in urban areas and 80 litres in rural areas. The average total volume of water resources in Uzbekistan is 81.7 km<sup>3</sup>, of which 71.7 km<sup>3</sup> is accounted for by the Amu Darya and Syr Darya rivers. The remaining 10 km<sup>3</sup> of water is close to being accounted for by groundwater and other rivers. Annual water consumption in our country is 62-65 km<sup>3</sup>. And about 25 km<sup>3</sup> of this water from the Amu Darya River, 11 km<sup>3</sup> from the Syr Darya River, 19 km<sup>3</sup> from other rivers and 9-10 km<sup>3</sup> from the rest of the cube is taken from the ground. 85 per cent (53-55 km<sup>3</sup>) of this water is used for irrigated agriculture, 12 per cent (6 km<sup>3</sup>) for industrial needs and 3 per cent (1.7 km<sup>3</sup>) for municipal needs. About half of the water used (23-25 km<sup>3</sup>) is discharged through ditches and into open water bodies, the remaining 8-10 km<sup>3</sup> is discharged into small rivers and lakes.



**Fig.1. This is proving that water consumption in our country is several times larger.**

Annual groundwater reserves in Uzbekistan, 19 km<sup>3</sup>, of which an average of 9.5 km<sup>3</sup> is used per year. Mineralisation of the bulk of the water used is

3 mg/l. This indicator indicates good water quality, so one third (3.43 km<sup>3</sup>) is used for drinking water and the rest for technical purposes. Water resources



are not only a source of water for population, industry and irrigated agriculture, but also a major factor in maintaining socio-economic development and ecological balance [6-7].

Fresh groundwater resources in Uzbekistan are mainly concentrated in the Fergana Valley (34.5 per cent), Tashkent (25.7 per cent), Samarkand (18 per cent), Surkhandarya (9 per cent) and Kashkadarya provinces (5.5 per cent). Other oblasts account for 7 per cent of total freshwater resources. [3].

Development of the drinking water supply system in Uzbekistan and provision of the population with quality drinking water is one of the priorities of social policy. It should be noted that providing consumers with clean drinking water is one of the vital services provided to the population. Taking this into account, consistent implementation of the most important programmes and projects on the development of drinking water supply systems in recent years has significantly improved the situation with water supply in cities and districts, including rural areas [7-8].

Water is an invaluable resource used not only in the home, but also in the production and processing of food products. But the intensity of its exploitation is growing every day.

As we know, no living being, no organ or even cell of the body can exist without water. Water makes up about 60-65% of the body of an adult human being. If a person can live without food for about a month, without water he will die in a few days. There is no real substitute for water, but in the process of searching for ways to eliminate water shortage, the topic of its primary and secondary use is increasingly being discussed.

Using the water meter, we decided to check how much water is wasted in one minute from the tap. First we opened the tap so that the water flowed in a thin stream. Using an hourglass and a water meter, we determined the water flow rate in 1 minute, which was 1 litre. The tap was then opened to almost full capacity and the sink quickly filled with water. At this pressure, as much as 8 litres of water was used in one minute!

A water meter and a stopwatch were then used to measure the amount of water spent on daily procedures. We obtained the following results:

- we spend 7 litres on hand washing;
- for brushing teeth - 6 litres;
- for washing - 10 litres;
- to fill the bathtub - 120 litres;
- for showering - 50 litres.

The resulting numbers are very large [12].

The main challenge to date in water flow measurement is the accuracy of the measurement over all flow ranges.

Water consumption metering devices are

important elements of energy consumption metering and process control systems in various industries and housing and communal services [11].

Taking into account the current trends towards the interconnection of metering devices in the network of data exchange on energy and water consumption, it is necessary to focus on the mass application of metering devices. At the same time, metering devices as a product should remain attractive for consumers not only because of low cost, but also because of the projected savings in water bills and additional functions [9-10].

A significant challenge remains the balance between cost (depending on the type of metering device) and measurement accuracy at the marginal maximum and minimum flow rates. Minimum and maximum flow rates are measured in closed channels.

### Conclusion

Year after year, Uzbekistan is experiencing a shortage of drinking water, especially in summer. In addition, the country's population is growing rapidly. It is expected that in the next 1-2 years their number will reach 36 million. This situation indicates that water demand will increase and water quantity will decrease. In a word, realisation of these important vital tasks will contribute to social and economic development of our country, further prosperity of our cities and villages, improvement of living standards and quality of life of our people. Today, as a result of propaganda and outreach work in our country to raise environmental awareness and rational use of water, the sense of responsibility for fresh water is growing. After all, preservation of drinking water is a civic and human duty of each of us.

Innovation is the basis for the development of modern society. Water conservation, optimisation of water use will require more in-depth scientific research in the future.

Water metering devices are important elements of energy consumption metering and process control systems in various industries and housing and communal services to solve existing problems. The introduction of "new innovative types of meters" into everyday life will make it possible to control water calculation.

Many people think that as long as water is plentiful, they can use as much of it as they want. In fact, water supplies are limited and it takes a lot of money to make it drinkable. Every time we open the water tap, we don't even think about how many people have worked hard to make sure that we have water at home all the time. It is a pity that water, in which so much effort has been invested, often simply leaks into the sewerage system.

### References

1. Decree of the President of the Republic of

- Uzbekistan No. PP-2954 “On measures to streamline control and accounting of rational use of sub-terrestrial water reserves for 2017-2021”, 2017. Collection of Legislation of the Republic of Uzbekistan, No. 19. Art. 336, P. 171-199.
2. Statistical Agency under the President of the Republic of Uzbekistan <https://stat.uz/ru/ofitsialnaya-statistika/national-accounts> Volume of gross domestic product by economic activity.
3. Physical Geography of Uzbekistan. - Baratov P.B. Tashkent. "Uchitel" 1996.
4. “There is more water and less potable water in the world”. // Portal of the State Committee on Ecology and Environmental Protection of Uzbekistan. source: uznature.uz 01.05.2014.
5. Ozerov, A. D. Water saving in home conditions / A. D. Ozerov, L. I. Nikolaeva. - Text: direct // Young scientist. - 2022. - № 6.1 (58.1). - C. 15-17. - URL: <https://moluch.ru/young/archive/58/3124/> (date of reference: 17.12.2023).
6. Devin M. Stoker, Steven L. Barfuss and Michael C. Johnson Flow measurement accuracies of in-service residential water meters. American Water Works Association. 2012, pp. E637-E642.
7. Semenistaya E.S., Linnik N.S., Gorbunov A.A. Review of the existing schemes of division of energy and water consumption metering systems and development of a new type of division scheme // Engineering bulletin of Don, 2016. No.4.
8. International Climate Conference: Central Asian countries will present a single regional pavilion. 30.07.2021. <https://livingasia.online/2021/07/30/mezhdunarodnaya-konferenciya/> (date of access: 03.11.2021)
9. Forecasting for Resilience: Central Asia Strengthens Climate and Weather Services. World Bank. March 23, 2018. [Electronic resource] URL: <https://www.worldbank.org/en/news/feature/2018/03/23/forecasting-for-resiliencecentral-asia-strengthens-climate-and-weather-services> (accessed 05.10.2021);
10. Kuzmina E., 2018. Impact of Water and Energy Problems on the Economic Development of Uzbekistan. The Handbook of Environmental Chemistry. Springer. T. 85. P. 201-214. // [http://doi-org-443.webvpn.fjmu.edu.cn/10.1007/698\\_2017\\_221](http://doi-org-443.webvpn.fjmu.edu.cn/10.1007/698_2017_221) (In Eng.)
11. Mironenkov A., Sarsembekov T., 2005. Development of hydroelectric resources in Central Asia- Industrial weekly. № 18. P. 12. (In Russ.)
12. Bukhari-zade N., 2015. Water resources in Central Asia: dependent independence // <http://www.fergananews.com/articles/8589>, accessed 12.10.2020. (In Russ.)
13. Kattakhodjaev Sh., Osmanova D., Sulaymanova S., Tulyakova R., 2017. Introduction of small hydropower in Uzbekistan. Present state and future prospects. // <https://anhor.uz/ekologiya/vnedrenie-maloy-gidroenergetiki-v-uzbekistane.-sovremennosti-perspektivi>, accessed 15.10.2020. (In Russ.)
14. Uzbekistan allocates 4.3 billion doll. for hydropower // <http://www.stanradar.com/news/full/25447-uzbekistan-vydeljaet-43-mlrd-na-gidroenergetiku.html>, accessed 15.10.2020.
15. Novikov V., 2020. Kadyrinskaya HPP, the oldest in Uzbekistan, has been restarted again // <https://nuz.uz/sobytiya/1161736-vnov-perezapushhena-starejshaya-vuzbekistane-kadyrinskaya-ges.html>, accessed 16.10.2020.
16. International Water Management Institut 2003 международного института управления водными ресурсами 2003-20 авочный материя е Progress Report - 2004, IWMI (Отчет о работе 04).
17. Law of the Republic of Uzbekistan «On water and water use», 1993 // <https://lex.uz/docs/93202>, accessed 24.10.2020.
18. Central Asia: Water and Conflict, 2002, ICG (International Crisis Group) (Центральная Азия: вода и конфликт, 2002, ICG (Международная кризисная группа)).
19. Sector Study for Power Sector in Uzbekistan, 2004, JBIC (Изучение энергетического сектора в Узбекистане, 2004, ЯБМС (JBIC)).
20. Kuzmina E., 2018. Impact of Water and Energy Problems on the Economic Development of Uzbekistan. The Handbook of Environmental Chemistry. Springer. T. 85. P. 201-214. // [http://doi-org-443.webvpn.fjmu.edu.cn/10.1007/698\\_2017\\_221](http://doi-org-443.webvpn.fjmu.edu.cn/10.1007/698_2017_221)

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## THEORY OF DEVELOPMENT AND IMPROVEMENT OF THE MATHEMATICAL MODEL OF THE METHODOLOGY OF PUBLIC CONTROL IN THE MANAGEMENT OF OCCUPATIONAL SAFETY AND INDUSTRIAL RISKS

A.X.RASULEV<sup>1</sup>, S.S.SULAYMANOV<sup>2</sup>, N.B.GAIBNAZAROVA<sup>2</sup> (1 – Tashkent State Technical University; 2 – Tashkent State Transport University, Tashkent city, Republic of Uzbekistan)\*

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\*Suleymanov Sunnatilla Suleymanovich – Doctor of Technical Sciences, [sulayman@mail.ru](mailto:sulayman@mail.ru), <https://orcid.org/0000-0002-5045-7143>;  
 Rasulev Aliakbar Khamidullaevich – PhD, Associate Professor, [akb-81@mail.ru](mailto:akb-81@mail.ru), <https://orcid.org/0000-0003-4518-4774>;  
 Gaibnazarova Nodira Bakhadirzhanovna – Doctoral student (PhD), <https://orcid.org/0000-0002-5337-9435>.