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Regional features of the use of amudarya water

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Abstract: The article presents the distribution and flow of the Amu Darya River in the country's agriculture, population needs and industry, in terms of its importance by region. The state of water use of the regions and their share in water distribution are scientifically analyzed. At the end of the article, proposals and recommendations are given for the rational use of the Amu Darya River.

Keywords: Amu Darya, water distribution, Amu - Bukhara Canal, Amu - Karshi Canal, Qoshtepa Canal.

Introduction: The Amu Darya River is one of the largest rivers in Central Asia and is an important source of water supply and agriculture in the region. In recent years, climate change, anthropogenic impacts and the construction of hydraulic structures have had a significant impact on the river's water flow. This study aims to study the variability of the Amu Darya River flow, analyze the distribution and consumers of river water. Its distribution is related to regional, economic and environmental problems.

METHODOLOGY

The Amu Darya has been known by various names throughout history. For example, the Greeks called it Oxus, the Arabs called it Yaksart, and the ancient local people called it Jayhun. It is the second longest river in Central Asia (2,540 km) and the largest river by basin (534.7 thousand km²) [source]. The Amu Darya begins at the confluence of the Panj and Vakhsh rivers in the Pamir Mountains of Tajikistan, passes through the territories of Uzbekistan, Afghanistan and Turkmenistan, and flows into the Aral Sea. The Vohondarya is called Panj after it merges with the Pamir

River, which originates in the Pamirs, Zarko. The Panj is joined by the Gunt, Bartang, Yazgulom, Vanj, and Kyzylsuv tributaries from the right, and finally, after the largest and most freshwater tributary, the Vakhsh River, it takes the name Amu Darya. In this part, it is joined by the Kunduz Darya, which originates from Afghanistan, on the northern slope of the Hindu Kush mountains, at an altitude of 4950 m, from the glacier. Then, from the right, the Kafirnihan from Tajikistan, the Surkhandarya and Sherobodarya from Uzbekistan flow into the Amu Darya, and the water of the Kohitangdarya to the west is also used for irrigation along the way. After that, no other tributary joins it for more than 1200 km until it reaches the Aral Sea. The Zarafshan and Kashkadarya are ancient tributaries of the Amu Darya, and their water is used entirely for irrigation.

Main Part

The main water volume of the Amu Darya is formed in its upper part. Here, the Amu Darya flows through a narrow, sometimes deep bed. The bed decreases on average by 4 meters per km (and in some places by more than 10 meters). Because of this, the river flows very quickly, the speed of the current is 1.5-2.5 m / s. The river valley is also narrow, it goes around the steep rocky mountains that are part of the Pamir mountain system. Having reached the plain, it passes through the Karakum and Kyzylkum deserts, in the middle part the average width of the riverbed is 1500 m. In the part of the river flowing through the plain, the slope is small (0.2-0.3 m per km). Due to the high speed of the river flow (2-3 m / s), it constantly erodes the bed and banks, which is why the bed is constantly changing. In the plain, the width of the Amu Darya valley is 10-15 km, and in some places it reaches 20-25 km. Three terraces have formed where the valley has widened. In places where the river passes between low mountains, the width of the valley does not exceed 350-380 meters. Near Pitnak there is Tuyamoyin, in the middle reaches there are Duldulhatlagan and Elzhik narrow channels. In the plains, there are sand dunes 2-3 km wide on both banks of the river. The lower reaches of the Amu Darya reach the Aral Sea, the length of the lower reaches is 500 km, of which 325 km falls on the area between Nukus and the Aral Sea - the current delta of the river. The river receives water from glaciers and snow, there are about 1,000 glaciers in its basin (including the largest mountain-valley glacier on the planet - Fedchenko). Historically, the river flowed into the Aral Sea, but due to reduced water consumption, it now rarely reaches the sea. Taking into account the water demand of the countries located in the Amu Darya basin, it distributes the available water resources among itself (since different amounts of water resources are formed in the basins every year). The Interstate Commission for Coordination of Water Management of the Central Asian States and Kazakhstan is also involved in the use of the Amu Darya. The Amu Darya basin has enormous hydropower resources. Total hydropower resources amount to 63.2 million kW. By basin, 29.8% of these hydropower resources fall on the Panj, 38% on the Vakhsh, 5.6% on the Kofarnikhan, 3.0% on the Surkhandarya, 1.0% on the Kashkadarya, 5.4% on the Zarafshan, and 17.1% on the Amu Darya basins. To date, only a little more than 2% of the hydropower resources in the Amu Darya basin are actually used. The largest of the commissioned hydropower facilities is the Norak reservoir and hydroelectric power station built in the Pulisangin gorge of the Vakhsh River. Until the 1960s, water transport on the Amu Darya was widely established. However, in recent years, the construction of the Chorjoi-Kungurat railway and the development of road networks, as well as the shallowing of the river, have sharply reduced the share of Amu Darya water transport in total cargo transportation [4].

Irrigated areas of Uzbekistan provide 10-20 percent of the world's cotton harvest. The largest canal in the world, the Karakum, receives about 45 percent of the Amu Darya's water (20-30 km3); The Amu-Bukhara Machine Canal, which irrigates the territory of Uzbekistan, also receives water from the Amu Darya. These canals and along the Amu Darya (in Turkmenistan) extend to vast cotton and wheat fields. In the early 1950s, it was also planned to build the Main Turkmen Canal, which would start in Nukus and use the Uzboy Canal, but this plan was not implemented. Since 2020, the vast Qoshtepa Canal has been under construction on the northern Afghan section of the river; it is estimated to be 285 km long and 100 m wide. Construction of the Qoshtepa Canal is underway. Uzbekistan has expressed concern that the canal will negatively impact agriculture. The canal is also expected to exacerbate the Aral Sea disaster, and in 2023, Uzbek officials held talks with the Taliban on the canal. Images provided by Planet Labs show that more than 100 km of canal was dug between April 2022 and February 2023. Numerous dams have been built on the river and its tributaries (especially in Tajikistan) to generate electricity, which Tajikistan exports. Amu-Bukhara Machine Canal - an irrigation canal in the Bukhara region begins on the right bank of the Amu Darya, 12 km upstream of Charjoi (Turkmenistan). It passes through Kyzylkum and supplies water to the Bukhara oasis. The first stage was built in 1965, the second stage in 1976. The total length is 400 km. The maximum water lifting height is 111 m, the maximum water transfer capacity is 270 m^3/s. After the commissioning of the first stage of

the Amu-Bukhara Machine Canal, it became possible to irrigate 136.5 thousand hectares of land in the Bukhara region, which had been irrigated from other sources, with Amu Darya water, improve the water supply of 377 thousand hectares of land in the Amu Darya basin, and irrigate 23.8 thousand hectares of new land.

To ensure the water level at the upper level of the Kyzyltepa pumping station, a water discharge facility was built into the Tudakol swamp. The commissioning of the 2nd stage of the Amu-Bukhara Machine Canal made it possible to develop 15.5 thousand hectares of new land and improve the water supply of 77 thousand hectares of land in the Bukhara, Samarkand, and Navoi regions irrigated with Amu Darya water. The canal begins near the Pulizindan port of the Amu Darya River in the city of Dostlik, located in the southern region of the Lebap region of Turkmenistan. The canal is built in a northeasterly direction and crosses the border of Turkmenistan and Uzbekistan. The canal ends at the confluence of the Kashkadarya River near the town of Kashkadarya. The mouth is located in the Karshi district of the Kashkadarya region of Uzbekistan (Table 1).

1 - table

Regional characteristics of Amu Darya water use (during the growing season)

Regions (canals)	April		May		June		July		August		September		To-tal
	Amo-unt	Sh-are	Amo-unt	Sh-are	Am-ount	Sh-are	Amo-unt	Sh-are	Amo-unt	Sh-are	Amo-unt	Sh-Are	
Kashka-darya	373,5	16,9	244	11	307	13,9	679,2	30,7	397,8	18	211,2	9,5	2212,7
Amu-Bukhara Machine Canal	210,8	7,9	274,6	10,4	514,3	19,4	842	31,7	573,4	21,6	237,8	9	2652,9
Bukhara	150,9	6,7	210	9,3	444,2	19,7	769,4	34,1	505,8	22,4	174,5	7,7	2254,8
Navoi	59,7	15	64,6	16,2	70,3	17,7	72,5	18,2	67,6	17	63,4	15,9	398,1
Karakalpakstan	387,6	8,4	666,1	14,4	981,4	21,3	1222,9	26,5	487	10,5	872,6	18,9	4617,6
Khorezm	272	9,7	409	14,6	582	20,8	648	23,2	582	20,8	304,6	10,9	2797,6
Total:	1243,9	10	1593,7	12,9	2529,7	20,4	3192,4	25,8	2491,8	20,1	1326	10,7	12378
Amu-Surkhan Canal	160,6	13,3	184,3	15,2	225,6	18,7	289,2	23,9	198	16,4	151,9	12,6	1209,6

Source: Prepared by the author based on data from the Water Management of the Republic of Uzbekistan for 2024.

Note: Absolute figures are given in million m^3, shares are given in percent.

The length of the canal is 290 km. The banks are more than 100 km concreted. The maximum water flow is about 195-220 m³/s, and the water is pumped in 6 stages by powerful pumps to a height of 132 meters. Approximately 80 km from the beginning of the canal is the Tallimarjon reservoir, which receives water from the system. There are six pumping stations designed to overcome the height difference of 132 m before connecting to the reservoir. The system includes 36 pumping units with a total capacity of 450 MW. In addition, the flow along the main canal is carried out by gravity, and the branch to the reservoir is equipped with a seventh pumping station[1].

The construction of the first stage of the canal began in 1965 and was completed in 1973. The purpose of the construction is to provide the arid regions of the Karshi steppe with Amu Darya waters for the development of cotton cultivation. The canal will irrigate more than 218 thousand hectares of land in the Nishon, Karshi, Guzar, Koson and other districts of the Kashkadarya region of Uzbekistan.

There are 276.7 thousand hectares of irrigated land in the Khorezm region, of which 191.3 thousand hectares are irrigated through the Tashsoqa system. This system supplies the Amu Darya water to the region. 120 kilometers of the Tashsoqa, Shovot, Polvan Gazovot and Gazovot main canals have been reconstructed, and 318 new hydraulic structures have been built. As a result, the use of 279 pumping units has been discontinued, saving 31.6 million kilowatt-hours of electricity. Amu Darya water is the main source of drinking and irrigation water in the Khorezm region, and the river flows throughout the entire territory. This reduces salinization of the land and improves soil composition. The Amu Darya River plays a significant role in the economic life of the Khorezm region. The Polvan, Yermish, Shovat and Kilichniyozboy canals distribute the Amu Darya River water throughout the region. At the same time, water-saving technologies are being introduced in the region to improve water supply. For example, it was planned to implement such technologies on an area of 49.5 thousand hectares by 2022. The agriculture of the Khorezm region mainly consists of cotton growing, melon growing, rice growing and meat and dairy farming, which rely on the water of the Amu Darya River. The climate of the Khorezm region is sharply continental, and in the summer months the temperature can rise to +40°C. Despite this, the arable land in the region has high productivity, since the Amu Darya River, the main source of drinking and irrigation water, flows through the entire territory, washing away the salt from the soil and improving its composition.

In 2024, Bukhara region continued to receive Amu Darya water mainly through the Amu-Bukhara machine canal and use it for agricultural and drinking water supply. There are a total of 274.60 thousand hectares of irrigated land in the region, and the main water source for these areas is the Amu Darya.

In 2024, Navoi region mainly used the water of the Zarafshan River, and also partially consumed the water of the Amu Darya. In the Kyzyltepa and Karmana districts of the region, three-quarters of the water supply is obtained from the Amu Darya. The Kushtepa canal under construction in Afghanistan can divert 20 percent of the Amu Darya water, which is likely to reduce the volume of water entering Uzbekistan by 15 percent. As a result, water supply disruptions may occur in regions such as Navoi region.

The districts of Kashkadarya region are mainly irrigated with water from the Amu Darya. Water from the Amu Darya is pumped into the Tallimarjon reservoir through 7 pumping cascades. The area of the reservoir is 77.4 km2. The length of the reservoir is 14 km, width is 5.5 km. The length of the coastline is 36 km. The average depth is 19.8 meters. The total volume of water is 1.53 billion cubic meters, the area of use is 1.4 billion cubic meters. The complex of hydraulic structures includes two earthen dams, a pumping station, a water intake and discharge channel, a drainage system and a pumping station. The reservoir is filled in the fall. Water is raised to a height of 26.6 m using electric pumps. There are two dam structures in the reservoir. During the irrigation season, water from the reservoir is returned to the Karshi main canal through the drainage system. The water flow is 360 m3/s.

In 2024, the Republic of Karakalpakstan continued to use the Amu Darya River mainly for agricultural, drinking water supply and industrial needs. The Amu Darya River is the main water source in this region, and its water is used for irrigation and other purposes. In 2023, Uzbekistan consumed 38.4 % of the Amu Darya River's water (approximately 18.3 cubic kilometers). This amount of water is distributed to various regions of the country, including the Republic of Karakalpakstan. Although exact figures for 2024 have not been announced, it can be assumed that the water

distribution was carried out on the basis of agreements from previous years. In order to effectively use water resources and improve water supply in the Republic of Karakalpakstan, a number of projects were implemented in 2024. For example, new water pipelines were laid and existing networks were reconstructed to eliminate the shortage of drinking water. Attention is also paid to optimizing water consumption by introducing water-saving technologies in agriculture. Due to the threat of depletion of the Amu Darya River, the issues of rational use of water resources and the widespread introduction of water-saving technologies remain relevant in the Republic of Karakalpakstan. These measures will ensure the ecological stability of the region and improve the living standards of the population.

The Amu Darya is one of the largest rivers in Central Asia, and its waters are of great importance for Uzbekistan. The river is formed mainly in the territories of Tajikistan and Afghanistan, and then flows through Uzbekistan and Turkmenistan. Uzbekistan forms about 8.5% of the Amu Darya's water. Afghanistan, in turn, uses about 6% of the river's water. The Amu Darya's water is used mainly for agriculture, drinking water supply, and industrial needs. Although the distribution of water by region is not disclosed with precise figures, Khorezm, Bukhara, Surkhandarya, Navoi regions and the Republic of Karakalpakstan rely on the water of the Amu Darya. It is planned to take an additional 10 cubic km of water from the Amu Darya through the Kushtepa Canal under construction in Afghanistan, which could reduce the volume of water entering Uzbekistan by about 15%. The distribution and use of the Amu Darya water require regional cooperation and agreements. The rational use and protection of water resources is a pressing issue for Uzbekistan and neighboring countries.

Geographical route

Tajikistan is located in the upper reaches of the Amu Darya River. The main water source.

Afghanistan - The river flows along a large part of the border.

Uzbekistan - The Amu Darya supplies water to Karakalpakstan, Khorezm, Bukhara, Surkhandarya and Navoi regions.

Turkmenistan – The river crosses the southwestern part and provides water for the Garagum Canal.

Additional information:

Kazakhstan does not use the Amu Darya water directly, but may be connected via the Syr Darya.

The Republic of Karakalpakstan, although part of Uzbekistan, uses the Amu Darya water separately. Water distribution is carried out on the basis of agreements between the Central Asian countries.

RESULTS AND DISCUSSIONS

The results section describes the regional distribution of Amu Darya water, annual changes, and water consumption indicators. The results obtained are clearly presented using tables and graphs, which strengthens the scientific basis of the study. The scientific and practical significance of the results is discussed in the discussion section. The problems identified in the study, water resources management strategies, and future research directions are analyzed. This section proposes theoretical and practical solutions based on the available tables and graphs.

In 2024, Uzbekistan continued to use the Amu Darya River mainly for agricultural, drinking water supply and industrial needs. The annual water withdrawal limit from the Amu Darya basin is 56 billion cubic meters, of which 40 billion cubic meters falls on the growing season (from April to October). In previous years, 16 billion cubic meters of water were allocated for Uzbekistan during the growing season. In 2024, water-saving technologies were introduced in Uzbekistan on 326 thousand hectares of land in order to effectively use water resources, which allowed saving 2 billion cubic meters of water. At the same time, there is a risk of a decrease in the Amu Darya River, which could negatively affect Uzbekistan's water supply. For example, the Kushtepa Canal under construction in Afghanistan could increase the volume of water withdrawn from the Amu Darya, which would likely reduce the amount of water entering Uzbekistan.

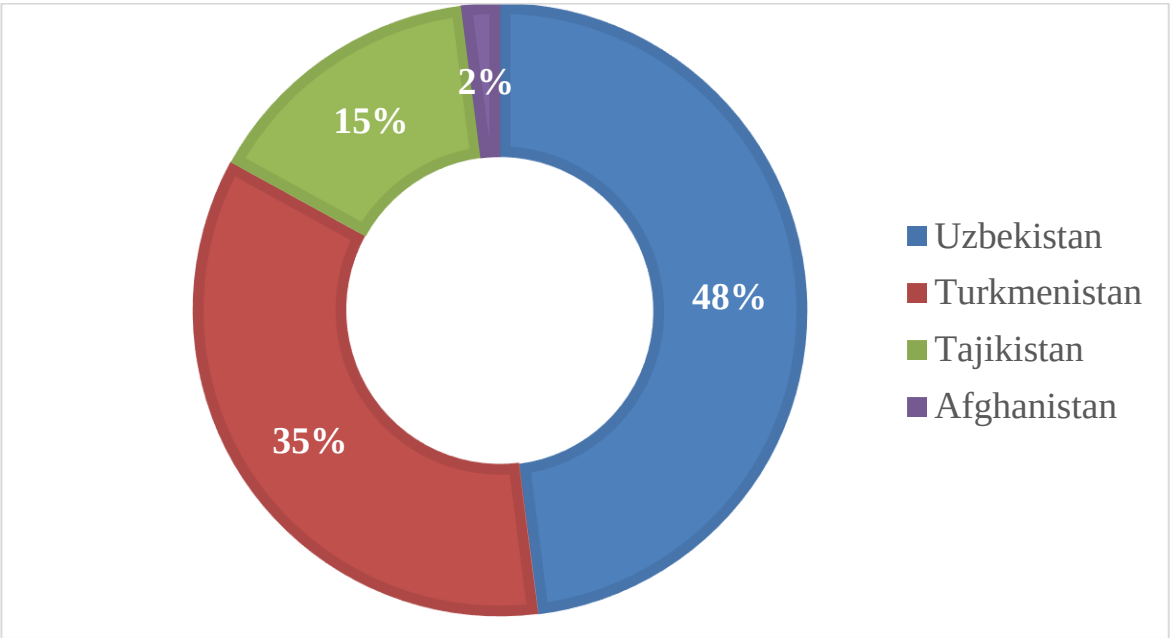

Figure 1. Share of countries in the distribution of Amu Darya waters

Source: *Prepared by the author based on data from the Water Management of the Republic of Uzbekistan for 2024.*

In 2024, Tajikistan continued to use the Amu Darya River mainly for agricultural, drinking water supply and industrial needs. In previous years, Tajikistan was allocated 6.9 billion cubic meters of water during the growing season. In 2023, Tajikistan consumed 15 percent of the Amu Darya River (about 9 cubic kilometers). Although exact figures for 2024 have not been announced, it can be assumed that the water distribution was carried out on the basis of agreements from previous years. Tajikistan is located in the upper reaches of the Amu Darya River and plays an important role in the formation of the river flow (Figure 1). In 2024, Turkmenistan continued to use the Amu Darya River mainly for agricultural, drinking water supply and industrial needs. According to 2023 data, the total water withdrawal from the Amu Darya was 47.58 cubic kilometers, of which Turkmenistan used 35%, or approximately 19.9 cubic kilometers of water. Despite having the smallest population in the region, Turkmenistan is the largest consumer of Amu Darya water. According to official data, the country has a population of over 7 million, while independent estimates put the figure at just over 5 million. Based on the official population, Turkmenistan's water withdrawal from the Amu Darya in 2023 was 6,741.7 cubic meters per capita.

In 2024, Afghanistan continued to use the Amu Darya water mainly for agriculture and drinking water supply. Afghanistan has the right to use the Amu Darya water, and dialogues are underway with neighboring countries in this regard. For example, Uzbekistan and Afghanistan have formed a joint working group on the construction of the Kushtepa Canal. Through this canal, Afghanistan plans to irrigate 300,000 hectares of land, which will require approximately 4-5 billion cubic meters of water.

According to the discussion: Water distribution requires international cooperation. The Kushtepa Canal may affect the water supply of Uzbekistan and Turkmenistan.

Environmental problems of the Amu Darya

Water shortage - Water consumption is increasing due to irrigation works.

The drying up of the Aral Sea - Due to the extensive use of the waters of the Amu Darya and Syr Darya for agriculture, the sea level has dropped sharply.

The Afghan Kushtepa Canal project may reduce the volume of water entering Uzbekistan and Turkmenistan.

The distribution of Amu Darya water is an important issue for all countries in the region, and it is necessary to use water resources rationally and take into account the interests of neighboring countries.

CONCLUSION

The Amu Darya is one of the most important water resources in Central Asia, its water is used mainly for

agriculture, drinking water supply and industrial needs. The river is of strategic importance for Uzbekistan, Tajikistan, Turkmenistan and Afghanistan and plays an important role in regional water distribution. The main area of water use in Uzbekistan is agriculture. The article describes in detail the geographical features, distribution and use of the Amu Darya water. In particular, the volume of water withdrawn from the river, the main channels (Karaqum, Amu-Bukhara, Kushtepa, etc.) and their impact on agriculture are analyzed. In particular, it is noted that the Kushtepa Canal under construction in Afghanistan may cause regional problems due to the possibility of reducing the volume of water entering Uzbekistan and Turkmenistan. The environmental problems of the Amu Darya, including the drying up of the Aral Sea, water shortages and increasing water consumption in agriculture, may further complicate water distribution in the future. Therefore, rational management of river water, widespread implementation of water-saving technologies, and international agreements on water distribution between countries are of great importance. In this regard, the Amu Darya provides important information for studying the water distribution process and regional problems, contributing to the formation of scientific and practical approaches to the effective use of water resources.

REFERENCES

Taliban and Talibanism in Historical Perspective, M Nazif Shahrani, chapter 4 of The Taliban And The Crisis of Afghanistan, 2008 Harvard Univ Press, edited by Robert D Crews and Amin Tarzi

Pavlovskaya, L. P. "Fishery in the Lower Amu Darya Under the Impact of Irrigated Agriculture". Karakalpak Branch. Academy of Sciences of Uzbekistan. Accessed: February 9, 2010.

International Crisis Group. "Water Pressures in Central Asia (archived 2016-05-20 at the Wayback Machine)", CrisisGroup.org. 11 September 2014. Retrieved 6 October 2014.

Self. The first volume. Tashkent, 2000

Beshenaya sushka: talibi dobivayut glavnuyu reku Tsentralnoy Azii. Gigantic arik can provoke a "water war" // Izvestia, March 29, 2023

"Velayats of Turkmenistan/Academy of Sciences of Turkmenistan". science.gov.tm. Archived from the original on June 14, 2022. Retrieved June 18, 2022.

"Uzbekistan pursues dialogue with Afghanistan on fraught canal project". Eurasianet (March 24, 2023).

Safarov I. Can the Taliban be stopped from building a tragic canal for Uzbekistan? — a conversation with experts" (Uzbek). Kun (February 10, 2023). Retrieved March 26, 2023.

Water management data of the Republic of Uzbekistan (www.gov.uz /suvchi), 2024.

Duffy, Seamus "What Afghanistan's Qosh Tepa Canal Means for Central Asia". The Diplomat (April 19, 2023). Retrieved May 18, 2023.

The Taliban are digging an enormous canal. The Economist (February 16, 2023). Retrieved March 26, 2023.