PROBLEMS ARISING FROM THE USE OF TRANS-BOUNDARY RIVER WATERS

(on the example of the Syr Darya and the Amudarya).

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Annotation: Technical development and increasing of population in the world strengthen culmination problem potable water. The rivers are the biggest potable water stock in the land and many of them across the outskirts of the country. Causing of the waters little, there are different degrees' disagreement between situated in some river basin countries.

Keywords: transboundary rivers, hydraulic structures, hydroelectric power station, water volume, irrigation

Introduction. According to information from the UN, a person needs more than 20 liters of water per day for normal life activities, and another 50 liters of water to use sanitation systems. Today, 1.1 billion people in the world use only about 5 liters of water a day. In European countries, the population consumes 200 liters of water per day, while in the United States they consume 400 liters. It is estimated that by 2025, 3 billion people around the world will suffer from water shortages. They have less water than the minimum amount of water a person can use [6]. There are now two or more states in 261 river basins around the world. It covers 80 percent of the world's river basins and 45.3 percent of the world's land area. Forty percent of the world's population lives in these areas. [7].

With the increase in population, the process of desertification in arid climates is intensifying. According to the United Nations, desertification is having a negative impact on the lifestyles of 100-200 million people worldwide, and more than 50 million people will be forced to flee their homes in the next decade. The economic damage from the desertification process is estimated at 42 billion. Global climate change could exacerbate this process.

The lack of fresh water, which is directly related to the desertification process, is exacerbating political disagreements between states. Currently, there are sharp debates at the level of heads of state on water use, water redistribution, proper distribution of water in more than 50 countries in about 20 river basins around the world. Here are a few examples. The economy of the Egyptian state, with a population of over 70 million, is entirely dependent on the Nile. Located in this river delta, 90 percent of its water comes to the country from the upper reaches of the river, Sudan, Ethiopia and Uganda. Under the 1959 agreement, Egypt would receive 55.5 billion m^3 of water a year and Sudan 18.5 billion m^3. Ethiopia is protesting the quota and demanding a review of water distribution.

The Jordan River is located in five states. This small river starts in Turkey, flows through Syria and Lebanon, and flows into the Dead Sea, which borders Jordan and Israel. In 1967, the state of Israel occupied the Golan Heights near the river and controlled the upper reaches of the river through this area. In 2002 year Lebanon began to build a water intake station from the Vazani river, passing through the borders of the state of Israel, which caused the emergence of a military conflict with the state of Israel. This controversial problem was overcome by mutual agreement without war in due time.

The water problem in transboundary rivers has been going on for decades between Turkey, Syria, Iraq and Iran in the Tigris and Euphrates basins. The Brahmaputra River begins in the Himalayas, which belong to the territory of China, and crosses the state of Bangladesh and flows into the ocean in the state of India. The Chinese government is working on a project to dump some of the water from the Brahmaputra River into its territory through a tunnel that pierces the mountain 20 km from the high mountain. Due to water shortages around the world, there are many projects to divert river water in different directions [1].

Among the Central Asian states, there are also major disputes over the use of the Amu Darya, the Syrdarya, the Ili, the Zarafshan rivers, and the Irtysh River, which cross over eastern Russia and flows into the Ob River.

Key results and their discussion. In the 70s and 80s of the last century, the Republic of Uzbekistan received 74.1 km^3 of water annually from the Amudarya and the Syrdarya, including 28.4 km^3 to the Amudarya, 10.9 km^3 to the

Syrdarya, 19.2 km^3 to inland small rivers, 12.6 km^3 to groundwater and collector water. Uzbekistan now receives 55.07 km^3 of water, which is 79% more than in the 1980s. At the end of 1980, the total area of irrigated land in Uzbekistan was 4,220,000 hectares. Due to limited water resources, the area of irrigated lands remains at the same level, 57.0 km^3 of water is used to irrigate these 4 million 220 thousand hectares of land. The use of water by the national economy in the country has the following indicators [6].

During drought years, the volume of water abstraction from the Amudarya and the Syrdarya decreases by 8-10 km^3, and we use up to 49.0 km^3 for irrigation. Due to water shortages, the yields of cotton and other crops have declined significantly during drought years.

The average long-term water resources of inland rivers of Uzbekistan are 11.5 km^3, which is 18% of the total water needs of the republic [6].

The picture above shows that 84% of the total water resources in Uzbekistan are spent on irrigation. Depending on local conditions, an average of 11-15,000 m^3 of water is used to irrigate one hectare of cotton. In order to collect runoff during the growing season and use it during the growing season, 55 reservoirs were built in the Amudarya and the Syrdarya basins, of which 30 are located in the Amudarya and 25 in the Syrdarya basin. Most of these reservoirs were built in the area of Uzbekistan.

Syrdarya is the longest river in the territory of Uzbekistan (2800 km), the basin area is 345 thousand km^2, water resources average 21.6 km^3. 45% of the Syrdarya's water comes from the Naryn River, 16% from the Karadarya River, and 39% from small rivers and streams from the right and left tributaries.

The Tokhtagul Reservoir was built in the Naryn tributary of the Syrdarya River in the area of Kyrgyz Republic. Its total water capacity is 19.5 km^3. It is the second largest reservoir in Central Asia after the Kapchigay Reservoir on the Ili River (Kazakhstan). Built during the former Soviet era, the dam was designed to supply water to irrigated lands in the Fergana Valley, Syrdarya and Jizzakh regions, as well as in Kazakhstan, to keep excess water in reserve and to irrigate it in dry years.

Water use in economic sectors

Sectors

Household and drinking water supply -4,054 км^3

Industry -1,202 км^3

Rural water supply -0,906 км^3

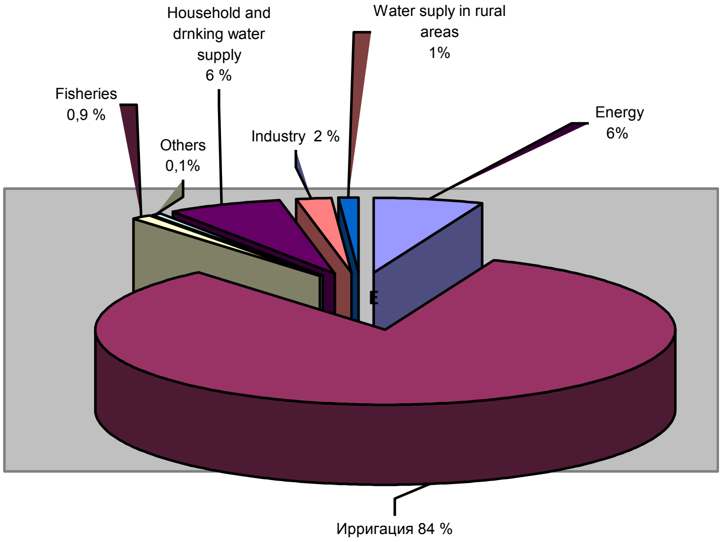
Irrigation - 50,7 км^3

Energy -4,73 км^3

Fisheries -0,368 км^3

Others-0,102 км^3

Total-67,705 км^3



After the collapse of the Soviet Union, the Kyrgyz Republic switched the Tokhtagul Reservoir to the production of energy. Water from the tap water for the production of electric energy is extracted in large quantities even during the non-vegetation period, and in the summer months when the crops are irrigated, the demand for the hook is reduced by the possibility of extracting water. During the summer months, when the water is drained, there is not enough water to fill the reservoir. Operation of the reservoir in the regime of electricity generation (energy) causes water shortages on 1.5 million hectares of irrigated land in the Fergana Valley, Jizzakh and Syrdarya regions. According to the agreed project, the Tokhtagul reservoir will hold 2.8 km^3 of water during the non-vegetation period and 8.5 km^3 during the growing season (table). Until 1991, it worked in this regime. After the transition to energy regime after 1991, it releases up to 8.4 km^3 of water during the non-vegetation period. During the growing season, it produces 5.9 km^3 of water, which is 2.6 km^3 less than the agreed quota.

Changes in the water regime of the Toktogul reservoir

	Flow	Loss	Water transfer		Total	Annual average balance of the reservoir
			Non-vegetation period	Vegetation period		
According to project (1970)	11,83	0,3	2,8	8,5	11,3	0,2
Annual average for 1975-1991 (16 years)	11,3	0,3	2,7	8,1	10,8	+0,2
Average 1991-2001 (10 years)	13,0	0,3	7,2	6,1	13,3	-0,6
In 2000-2001	12,8	0,3	8,4	5,9	14,3	-1,8

Source: "Sirdaryo" HSB, 2002

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Uzbekistan annually receives 2.5 km^3 less water than the quota. The Fergana Valley receives less than 1.5 km^3 of water during the summer months. During the winter months, 3.0 km^3 of water comes from the Syrdarya and joins the Chordara Reservoir in Kazakhstan. However, due to the inability to discharge large amounts of water downstream from the Chordara Reservoir into the Syrdarya River, excess water was discharged into the Aydar-Arnasay Lake System by 2006, creating a huge lake with a volume of 44 km^3 in the Aydar-Arnasay Lake System.

Kazakhstan is on the verge of completing the construction of a 3,0 km^3 Kuksaroy reservoir in the lower reaches of the Chordara Reservoir for the use of large volumes of fresh water in the Syrdarya. In turn, the Republic of Uzbekistan has built dams and reservoirs in three places of the Arnasay basin to prevent the discharge of fresh water from the Chordara reservoir into Lake Aydar and its irrigation. Excess water from the Chordara reservoirs increases and is discharged into the Aydar basin. Since 2006, there has been less water flowing from the Chordara Reservoir into the Arnasay Basin, so there is almost no Syrdarya water flowing into Aydar Lake, as a result of which the water level of Aydar Lake has decreased by 1.5-2.0 meters over the past 6 years.

The Kyrgyz government plans to build 1.2 Kambarata hydroelectric power plants on the Naryn River above the Tokhtagul reservoir. If these hydropower plants are built, the amount of water coming from the Naryn River in the summer will decrease again and the amount of water coming in the winter will increase. This will exacerbate the problem of water shortage in the Republic of Uzbekistan.

The Amudarya is the waterful river in Central Asia, with a length of 2,540 km and an area of 309,000 km^2. 74% of its water is formed in Tajikistan, 13.9% in Afghanistan and Iran, and 8.5% in Uzbekistan [3].

At present, there is the Norak HPP and a reservoir in the Vakhsh basin of the Amudarya. The water capacity of the Norak Reservoir is 10.5 km^3, second only to the Tokhtagul Reservoir [4]. The transition of the Norak reservoir to energy mode is affecting water supply in Uzbekistan. In dry years, when water is scarce, water from the Amudarya decreases by 5.0-6.0 km^3. This large amount of water causes a shortage of water on several million hectares of irrigated land in the Republics of Uzbekistan and Turkmenistan. If the Rogun Reservoir is built, its capacity will be 12.4 km^3 larger than the Norak Reservoir [4]. Due to these reservoirs, the reduction of water during the growing season reaches 22.2%, and in dry years - 30-40%. In addition to the Norak and Rogun HPPs on the Vakhsh River, there are plans to build 1-2 HPPs in Sangto and to increase the water capacity of the Naryn River reservoirs to 25 km^3. At the same time, there are projects to build 39.0 km^3 of water and generate electricity from the Panj River, the largest tributary of the Amu Darya, by building Rushan, Dashtijum, Upper Amudarya and other hydropower plants and reservoirs. If 50 percent of these projects are implemented and the reservoirs operate in energy mode, Uzbekistan and Turkmenistan will not be able to get even half of the water they currently receive, large areas of irrigated agriculture will fail, desertification will intensify and the ecological situation will deteriorate sharply.

Maximum use of Amudarya water is also in the state plan of neighboring Afghanistan. A few hundred kilometers along the left bank of the Amu Darya, the Kunduz River and several small rivers flow into the Amu Darya from neighboring Afghanistan. The water of the Kunduz River makes up 8% of the annual water volume of the Amudarya. According to an agreement signed in 1958 during the former Soviet Union, Avghanistan has access to up to 9 km^3 of water annually from the Panj and Kunduz rivers and some other tributaries. 9 km^3 of water makes up 10% of the annual water flow of the Amudarya. At present, the Afghan government uses a total of 2 km^3 of water from the Amu Darya annually.

From the above facts, it is clear that the water problem in Uzbekistan is growing from year to year. Even when we receive the quota of water agreed with Kyrgyzstan and Tajikistan, we will not be able to develop new lands for irrigation, as they will be used to irrigate 4,220,000 hectares of irrigated land and provide other sectors of the economy.

In the future, the improvement of water supply in the Republic, the rational and economical use of existing water resources should be organized on the basis of new science-based technologies. First of all, it is necessary to modernize the existing irrigation system and implement ways to dramatically reduce water loss. According to experts, 25 to 40 percent of water is lost from water sources to irrigation fields through canals and ditches [2].

This loss occurs through infiltration (filtration), evaporation, leakage and other means into the canal, ditches. Large amounts of water are discharged from irrigated fields through ditches and collectors. Their volume is 28.0-33.0 km^3 per year [6]. This is more than half of the water used in irrigation. Hundreds of large and small ashes have formed around river deltas due to sewage discharged through these collectors. The salinity of the water discharged through these collectors ranges from 4 g /l to 12 g/l, making them unsuitable for irrigation. However, the reduction of salts in these large amounts of water, i.e. the development of desalination technology, is the biggest issue. If the technology of desalination of salt water is introduced or developed, another 2 mln. hectares of land will open up prospects for development.

Drip irrigation from advanced technologies is widely used in all regions. This technology saves 6-7 times more water than ditches or flood irrigation equipment [2]. Drip irrigation opens up opportunities for the development of mountainous, pre-mountainous plains with different substrates, large slopes. Drip irrigation can use river streams, spring water, groundwater in the foothills.

There is a lot of predictive data that the current global climate change will lead to more melting of glaciers, resulting in a significant reduction in river water levels in the future, starting with permanent snow from glaciers. We need to look at ways to adapt to climate change by taking this process into account when using water.

The main solutions for the use of transboundary rivers - compliance with international law, should be based on mutual agreements, taking into account the interests of the states.

Conclusion. The growing population of the world is increasing the demand for water for economic development from year to year, which in turn leads to disagreements and disputes over water use between countries in the same river basin. This problem is exacerbated in countries with arid climate irrigated agriculture.

The Amudarya and the Syrdarya basins, the largest rivers in Central Asia, also have disagreements over water use. Energy-intensive operation of the Toktagul Reservoir on the Naryn River and the Norak Reservoir on the Vakhsh River, which are the largest reservoirs in Kyrgyzstan and Tajikistan, is causing water shortages in the lower reaches of the rivers Uzbekistan, Turkmenistan and Kazakhstan and causing significant damage to the economies.

In the future, in solving the problem of water supply in the Republic of Uzbekistan, it is necessary to use these waters and inland water resources of the country sparingly, while receiving the amount of water from the states on the basis of mutual agreement. With the use of advanced irrigation technologies and the widespread use of scientific advances, more than 2.0 million hectares of land can be developed for irrigated agriculture on the basis of available water resources.

If advanced technologies are used from irrigation and scientific achievements are widely used, more than 2.0 million hectares of land can be mastered for irrigated agriculture on the basis of avaqilable water resources.

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