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Flow Distribution in Large Irrigation Channels in Zarafshon Basin (Example of Samarkand Region)

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Abstract: This article deals with using and distributing water in the Zarafshan River to large irrigation channels. The article provides information on the possibilities of effective use of the Dargom, Eski Ankhor and Narpai canals presented on the long-term water consumption observation.

Keywords: river, administrative area, transboundary, vegetation, prognosis, synchrony, efficiency, economy.

Introduction. In light of the ongoing global climate transitions, numerous nations and regions are seeing the emergence of social and economic challenges related to water and water consumption. This phenomenon is particularly noticeable in transboundary rivers, resulting in a significant water shortage in the respective areas. The lack of substantial reservoirs in the upper reaches of the Zarafshan River, together with the absence of dams, can be characterised by a natural course. Within the Transchegaravi rivers of Uzbekistan, the Zarafshan River is ranked second in terms of water volume, after the Amudarya and Syrdarya basins. Zarafshan River flows into Uzbekistan from the eastern region of Samarkand province, which is part of the adjacent territory of Tajikistan. The distribution of water from the Ravotkhoja water dam commences as soon as the river enters the Uzbek boundary. The primary usage of the water from the Zarafshan River is for irrigation purposes in agriculture, along with a partial diversion for the generation of electrical energy. To optimise the utilisation of the river's water resources, a single Ground Effluent System (GES) has been constructed on the PK103 part of the new Dargam canal. Additionally, a seasonal functioning GES has been completed and is already operational in a stream located 3.5 km downstream of the PK103 segment. The river water is conveyed to the various districts using multiple extensive irrigation canals (Table 1.1).

The main emphasis is that the distribution of river flows throughout the year is intricately linked to the sources of saturation. Fundamentally, the primary criterion for detecting the sources of saturation of a river stream is the hydrological indicators that depict the distribution of river flow by seasons throughout the year. These indications help identify the kind of river stream based on its source of saturation.

1.1-jadval Zarafshon havzasidagi yirik kanallar

№	Channels	Administrative areas	Irrigated land area, ga
1	Tuyatortar	Bulungur, Jizzakh city, Jizzakh, Bakhmal, Gallaorol districts	24392
2	Yangi Dargom	Urgut, Taylak, Samarkand, Pastdargom, Nurabad, Kattakurgan and Samarkand City	60272
3	Eski Anhor	Pastdargom, Nurabad, Chirakchi, partially Qamashi and Shahrisabz districts of Kashkadarya region	27530
4	Eski Dargom	Taylak, Samarkand district	67,5
5	Aylanma Dargom	Urgut district, Kashkadarya region	18.396
6	Narpay	Narpay, Pakhtachi, Kattakurgan districts and Navoi city of Navoi region and Karmani district	53934

As previously mentioned, atmospheric precipitation is the primary cause of saturation in all rivers worldwide. Under specific circumstances, precipitation in the form of rain precipitates as a stream on the Earth's surface, therefore directly contributing to river saturation. When precipitation occurs as snow, it gathers on the Earth's surface, melts when the air temperature increases, and the resulting water further contributes to river saturation[1,3,4,5].

Interannual variations in river flow stem from the impact of meteorological variables such as atmospheric precipitation, air temperature, and humidity. The saturation of rivers at the cost of rain and snow water results in an augmentation of the annual precipitation in comparison to the standard. In other words, the flow of the river also contributes to an increase. Furthermore, in rivers that receive water from continuous snow and glacier runoff, the elevated summer air temperature also leads to a rise in river flow. No matter the scenario, other variables influencing river flow are considered secondary [1,3,4,5].

The Zarafshan river is classified as a river types that receive water from ice-snow. Consequently, the quantity of atmospheric precipitation or its reserves plays a crucial role in determining the saturation of the river source.

Undoubtedly, the water consumption of rivers exhibits annual fluctuations. The occurrence of low-water and many-water years in rivers is nearly routine. To optimise the utilisation of river flow and identify suitable crop varieties and their corresponding irrigation zones, it is important to forecast the quantities of runoff produced during the growing season in the river basin. Given the prediction, during periods of low water availability, crop species that have minimal irrigation requirements enable the cultivation and strategic allocation of water to the canals. Viewed in the same sabali below are the synchronised oscillations of water consumption in the Zarafshan River and major canals throughout different years.

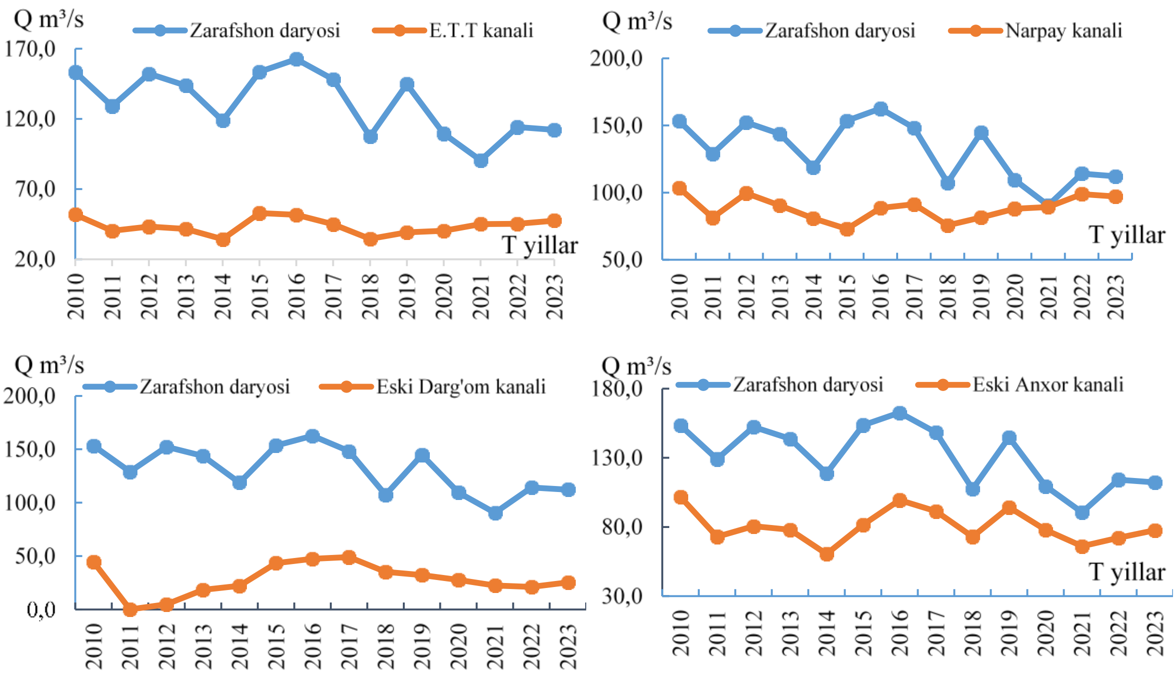

Figure 1.1: Zarafshon River and its primary canals Inter-annual variations in water usage

Figure 1.1 displays the inter-year fluctuations in water consumption for six canals: ancient Anhor, round Dargam, New Dargam, old Dargam, Narpay, and old Tuyatortar. The quantification of water flow into the canals is established by the Basin management of the Zarafshan River based on the level of wateriness during the growing season. This allocation of water is aimed at meeting the whole water needs of the farmers.

Our data reveals a progressive rise in the demand for water in the channels, accompanied by a corresponding reduction in the quantity of water in the river. This process is a highly urgent issue in the current day and necessitates the identification of excellent remedies for the immediately future.

The conclusion might be rephrased as follows: the efficient utilisation of the water from the Zarafshan River, together with the extraction of electric energy from it, simultaneously offers significant prospects for agriculture and all sectors of the economy. Depending on the snow and ice reserves in the upper mountainous section of the river basin, it is essential to determine the crop varieties cultivated in the arable land of the lower plains and consider which crops are water-resistant or low-water-consuming. The growth of the population residing in the higher mountainous section of the Zarafshan River and the lower plains necessitates a logical and ethically sound strategy for water allocation. Systematic concreting of natural grooves requires the employment of water-conserving technological skills.

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