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Irrigation Networks Of Surkhandarya Region And Their Role In Economic Development

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Abstract: The main rivers of the Surkhandarya natural geographical region are the Surkhandarya and Sherabaddarya, along with their tributaries such as Karatog, Tupalang, Khonjiza, Sangardak, Kizilsuv, Khojaipok, Bandikhonsoy, Machaysoy, Sho'robsoy, and Panjabsoy.

Due to increasing demand for water, major reservoirs were constructed in the second half of the last century, including Uchkyzyl (165 million m3), Southern Surkhan (800 million m3), and Degrez (12 million m3), followed later by Oqtepa (500 million m3), Topalan (500 million m3), and Hangaronsoy reservoirs. Additionally, major machine-irrigation canals were built, such as Zang, Sherobod, Khazarbog‘-Oqqopchig‘oy, Qumqo‘rg‘on, Chilmirob, Bobotog‘, Bandixon, Khayrobod, Amu-Iskra, and Amu-Zang. Today, the Tupolan Hydroelectric Power Plant (HPP) and its subsequent numerous micro-HPPs contribute significantly to meeting the electricity demand for the economy and population of Surkhandarya region.

In particular, the 37-megawatt "Zarchob-1" HPP was launched in December 2020, and the 38-megawatt "Zarchob-2" HPP in September 2021. Furthermore, to provide the region's population with clean drinking water, a total of 382 kilometers of water pipeline was laid from the Tupolan reservoir to Termiz city and Muzrabod district, supplying 1.7 million residents with clean drinking water.

Keywords: Southern Uzbekistan, Hissar mountain range, Boysuntog‘, Ko‘hitang, Bobotog‘ range, Surkhandarya, Sherabaddarya, Topolan, Khonjiza, Sangardak, Kizilsuv, Khojaipok, Bandikhonsoy, Machaysoy, Shurobsoy, Panjabsoy, Uchkyzyl, Southern Surkhan, Zang, Sherobod, Khazarbog‘-Oqqopchig‘oy, Qumqo‘rg‘on, Amu-Iskra, Amu-Zang machine canal, “Zarchob-1”, “Zarchob-2” HPP, “Isfara micro GES-1”.

Introduction: The history of water science in Uzbekistan dates back to ancient times. Irrigated agriculture existed in this ancient land even before the new era, meaning that existing rivers were dammed, irrigation canals were drawn from them, and they were widely used for farming and agricultural activities. Sources indicate that during the I-IV centuries of the new era, canals such as Zang in Southern Uzbekistan (Surkhandarya), Bozsuv and Salor in the Tashkent oasis, Siyob, Eski Anhor and Tuyatortar in the Samarkand oasis, Shohrud and Romitanrud in Bukhara, and Qirqqiz and others in Khorezm were dug.

The irrigation facilities in Surkhandarya that water existing hectares of land—magistral canals, dams, and reservoirs—were operational thousands of years ago. Information provided in the book “Irrigation of Uzbekistan” states that the main income of the Bactrian state came from agriculture on irrigated lands.

Unprecedented irrigation structures were built in the territory of Bactria. The ancient magistral canal, dug before our era, drew water from the Sangardak river and flowed parallel to the Surkhandarya river for hundreds of kilometers along its right bank, dividing into two branches in the Jarqo‘rg‘on area. The canal water supplied the cultivated fields in Sherobod and Termiz districts. The canal water was passed over elevations constructed from stone and brick across the gullies along its route.

In recent years, consistent reforms have been carried out concerning the efficient use of land and water resources, the improvement of the water resource management system, and the modernization and

development of water management facilities.

Main Part. It is crucial to research issues related to achieving sustainable development through the organization of efficient use of water resources in economic sectors in the regions located in the Amu Darya basin (Surkhandarya and Sherobaddarya rivers), and especially in the Surkhandarya region [28].

The relief of the Surkhandarya region consists of mountains, foothills, and plains, which slope and widen from north to south. The plain through which the Surkhandarya and Sherabaddarya rivers flow is surrounded on the north and northwest by the high Hissar mountain range (highest point 4643 m.) and its spurs (Boysuntog‘, Ko‘hitang). It is bordered by the Bobotog‘ ranges in the east. Its southern part extends past the Amu Darya river.

The main rivers of the Surkhandarya natural geographical region are the Surkhandarya and Sherabaddarya, along with their tributaries such as Karatog, Tupalang, Khonjiza, Sangardak, Kizilsuv, Khojaipok, Bandikhonsoy, Machaysoy, Shurobsoy, and Panjabsoy. These rivers, fed by mountain snow and glaciers, as well as rainfall, are able to supply water to the northern part, mountain and foothill, and central zones of the region. However, a constant water shortage is observed in the wide plains of the south.

Due to the growing demand for water, in the second half of the last century, reservoirs such as Uchkyzyl (165 million m3) were constructed (1957–1958), followed by Southern Surkhan (800 million m3) (1959–1962), and Degrez (12 million m3) (1962). Later, Oqtepa (500 million m3) (1982), Topalan (500 million m3) (1986), and Hangaronsoy reservoir (2021) were built [18].

Furthermore, to convey the water from these reservoirs to the desert-plain areas, large machine-irrigation canals and numerous internal canals were constructed, including Zang, Sherobod, Khazarbog‘-Oqqopchig‘oy, Qumqo‘rg‘on, Chilmirob, Bobotog‘, Bandixon, Khayrobod, Amu-Iskra, and Amu-Zang.

We will analyze the sources related to the topic using the example of the Khazarbog‘ – Oqqopchig‘oy irrigation networks built in the Surkhandarya region.

The Khazarbog‘ – Oqqopchig‘oy Canal starts from the right bank of the Tupalangdarya River. The canal was built between 1929 and 1938. Its initial length was 36.5 km, with a water capacity of 18 m3/s. As a result of subsequent reconstructions (1953–1967), the canal's water capacity was increased to 70 m3/s. The current length of the canal has reached 156 km.

The Khazarbog‘ Canal connects the Tupalangdarya, Sangardak, and Khojaipok rivers. The route of the Khazarbog‘ Canal intersects many small ditches in a southwesterly direction. The Khazarbog‘ Canal is fed by water from the Topalang River and primarily supplies water to nearly 55 thousand hectares of fields in the northern parts of Denov, Oltinsoy, Sho‘rchi, Bandixon, and Qumqo‘rg‘on districts, and also feeds the Degrez reservoir (with a capacity of 12.8 million m2) in the area. [10, 20, 30].

The status of the efficient use of water resources. In our country, the waters of existing rivers, canals, lakes, and reservoirs are used not only for irrigating agricultural crops and supplying the population with clean drinking water but also for generating power through the construction of several HPPs (Hydroelectric Power Plants). Currently, the energy generated by the HPPs built at the country's water facilities constitutes only about 10% of the total hydro energy resources of the Republic's water structures.

Water sources are a massive energy resource. Therefore, HPPs, which provide the cheapest electricity, have been and are being constructed on many rivers, canals, and reservoirs.

“To develop the micro-hydropower plant network in the regions of the Republic in 2025–2026, a total of 2,983 micro HPPs with an aggregate capacity of 164 MW (1184+1799) shall be constructed, producing 500 million kWh of environmentally clean electricity per year. Based on this decision, the construction of 387 micro-hydropower plants (87+300) shall be designated for the Surkhandarya region during this period.”

Obtaining cheap energy resources through the use of water is important in our country's energy sector. While the total hydro energy resource capacity is 10.76 million kW, 0.7 million kW of this capacity falls to Surkhandarya alone (Topolon HPP).

Today, the Topolon HPP, along with its follow-up numerous micro HPPs, contributes significantly to meeting the electricity demand for the economy and population of the Surkhandarya region.

The installed capacity of the Topolon HPP is 175 MW. The annual electricity production is 467 million kWh. The first stage of the reservoir (30 MW) was commissioned in 2006. Two hydro-electric units were installed—2 turbines, each with a capacity of 15.5 MW, and 2 generators with a capacity of 18.75 MW. The annual electricity production in the first stage was 63 million kWh, covering 40–50 percent of electricity consumption in the Surkhandarya region.

The second stage (145 MW) was commissioned in 2023. Two hydro-units, each with a capacity of 72.5 MW, were installed.

Based on the relevant decision of the country's leader, subsequent small power stations have also begun

construction on the Topolon River. In particular, the 37-megawatt “Zarchob-1” HPP was launched in December 2020, and the 38-megawatt “Zarchob-2” HPP was launched in September 2021 (Figure 1).

Figure 1. "Zarchob-1" HPP.

Later, another small HPP, "Zarchob-3," was designed and commissioned in a short period on the lower part of the river. The capacity of this "Zarchob-3" HPP will be 16 megawatts, and it produces 70 million kilowatt-hours of environmentally friendly electricity annually.

These small micro HPPs currently generate enough electricity to supply 78 thousand households.

Furthermore, to utilize the potential of the Sherabad Canal flowing through the Kizirik district and to supply 460 households living around the canal with electricity, the "Isfara Micro HPP-1" was launched at its middle stream in early 2025. It has a capacity of 230 kW and an average annual production capacity of 1,076,000.0 kWh of electricity.

Repair work is being carried out on all canals and ditches in the Surkhandarya region to efficiently utilize the water resources of the existing irrigation networks. In particular, attention was focused on the reconstruction of the Khazarbog‘ (Khazarbog‘-Oqqopchig‘oy) Canal, one of the first canals commissioned in the region. The repair process of the canal became an agenda item for the Ministry of Water Resources of the Republic of Uzbekistan, as well as at the government level. For this reason, support from the Islamic Development Bank was enlisted for the repair work of the "Khazarbog‘-Oqqopchig‘oy" Canal (Figure 2).

Figure 2. Repair process of the Khazarbog‘ - Oqqapchig‘oy canals.

These works, implemented within the framework of the project "Improving Water Resources Management in the Surkhandarya Region (Reconstruction of the Khazarbog – Oqqapchig'oy Canal System)," were allocated a total of $122.72 million. Of this amount, $89.55 million constitutes the investment from the Islamic Development Bank.

According to data, to execute this work quickly and efficiently, builders reconstructed 538 hydraulic structures along the 156-kilometer canal and its branches, with some being newly constructed.

Over 600 workers labored to fully commission this important facility within the specified timeframe, efficiently utilizing the power of 213 machines and mechanisms.

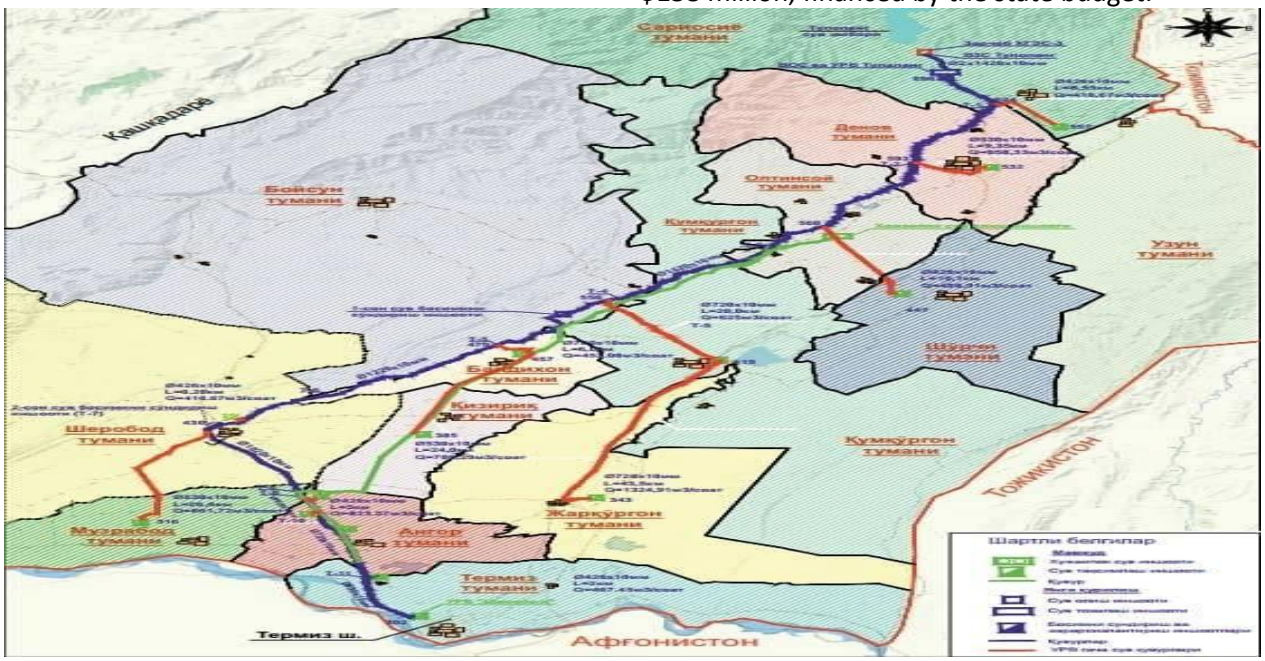
According to experts, the implementation of the project with the participation of the Islamic Development Bank plays a crucial role in fundamentally improving the region's water supply and providing self-flowing life-giving water to agricultural lands.

It saves electricity and the funds spent on it. Water savings are achieved in the water-scarce region. For instance, once the facility is fully operational, 103.4 thousand hectares of irrigated land will be reliably supplied with water, and 38.5 thousand hectares of irrigated land will be converted to a gravity-fed water supply. Furthermore, the operation of 2 units, each with a capacity of 20, at the "Sherobod" pumping station will be halted, and the "Bandikhon-2" and "Do'stlik" pumping stations will be shut down. As a result, $157.6 thousand will be saved annually from the exploitation costs of pumping stations, and $2,925.0 thousand (62.1 million kWh) will be saved from electricity costs. As a result of increasing the efficiency coefficient of the canals from 0.72 to 0.92, their reliable and safe operation will be ensured, and 294.1 million cubic meters of water will be saved annually. Employment in agriculture will be provided for 231.7 thousand people, and the volume of production of various food products in the region will increase.

Process of Supplying the Population with Clean Drinking Water. It is known that, until recently, 46 percent of the population in the Surkhandarya region was not supplied with centralized drinking water. The existing 218 water facilities and more than 3 thousand kilometers of networks required repair, and the water mineralization level had increased in the southern districts of the region and in the city of Termez.

During the visit of the President of our country, Sh. M. Mirziyoyev, to the Surkhandarya region on June 1–2, 2021, among the urgent socio-economic problems of the region, he also addressed the issue of supplying the region's population with clean drinking water and spoke about bringing water from the Topolon reservoir to the city of Termez and Muzrabod district via water pipelines (Map-Diagram 1).

The President's words pleased the people of the region greatly, and project work was swiftly organized to implement this process, leading to targeted actions. This project was designed to supply 1.7 million residents of Sariosiyo, Denov, Sho'rchi, Qumqo'rg'on, Jarqo'rg'on, Bandixon, Kizirik, Sherobod, Angor, Muzrabot, Termiz districts and the city of Termez with clean drinking water. The project cost amounted to $138 million, financed by the state budget.



Map-Diagram 1. Construction project of the main water network from the Topolon reservoir to the city of Termez in the region.

Initially, facilities for pressure reduction, water treatment, and distribution were constructed in the lower part of the Topolon reservoir. From there, a total of 361 (382) kilometers of pipeline were laid to the water distribution hubs in the districts. The mega-project outlined the construction of a main water network spanning 382 kilometers from the Topolon reservoir to Termez. Of this, 160 kilometers constitute the main trunk line, and 222 kilometers consist of internal pipelines leading to the distribution hubs that supply the 12 districts of the region and the regional center with mineral-rich clean water (Figure 4).

The clean drinking water delivered to the region's population from the Topolon reservoir will curb various internal diseases among the population, thereby contributing to the development of a healthy young generation.

As a result of the construction of the 382-kilometer main water network from the Topolon reservoir to Termez within this mega-project, the clean drinking water demand of 1.7 million residents in the aforementioned areas of the region is being fundamentally improved today.

CONCLUSION

It should be noted that one of the main tributaries of the Surkhandarya River, which is considered the primary water source, flows from the territory of neighboring Tajikistan. Furthermore, the water of the Amu Darya, a transboundary river, is widely used for irrigating crops in the region.

The productive use of water resources in all agricultural sectors of the region, particularly in economic development, is yielding positive results.

However, the issue of accurately determining the boundaries of these opportunities through geographical and hydrological studies, ensuring rational use by considering natural conditions and other factors, and identifying measures for water resource protection remains relevant.

Figure 4. Construction process of the main water network from the Topolon reservoir to the city of Termez in the region.

Therefore, the modernization and technologies characteristic of our time require fully satisfying this region's water resource needs and correctly organizing all sectors of the economy based on available opportunities.

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