



# The formation of irrigation systems of the city of Samarkand and their importance in creating microclimate conditions for tourist routes.

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## ABSTRACT

This article describes the historically formed irrigation systems of Samarkand and their role in today's tourist route, as well as recommendations for attracting tourists to ditches, canals and ponds.

## Keywords:

Archaeological water structures, canals, ditches, tourist routes, tourism.

Despite the many sources on the medieval history of Central Asia, the issue of water supply to cities is covered very unevenly. Written sources mainly report about above-ground open main canals, houses and partially wells. Archaeological research shows that in Central Asian cities there were water pipes made of burnt bricks and pipes as well as open water pipes. V.V.Bartold, speaking about the issue of water supply to Samarkand, noted that the information of medieval authors about Samarkand and its irrigation is not very clear. [1]

Samarkand was one of the ancient settlements that left a deep mark in the history of world irrigation. The basis for this is the fact that elements of the ancient water supply were preserved in the remains of the ancient city of Afrosiyab, which was the administrative center of the Sugdian state from the middle of the 1st millennium BC to the beginning of the 17th century. An unknown geographer wrote in the 10th century "Hudud ul-Olam" - "Lead Water

Pipe" - Jui Arzis mentioned that a water conduit covered with lead passed through the roof of the bazaar in Samarkand and this conduit supplied Shakhristan with water. [2]

According to Ibn Khaukal [3], the fact that water is distributed to almost all households with the help of ceramic pipes clearly shows the level of development of the city of Afrosiyab.

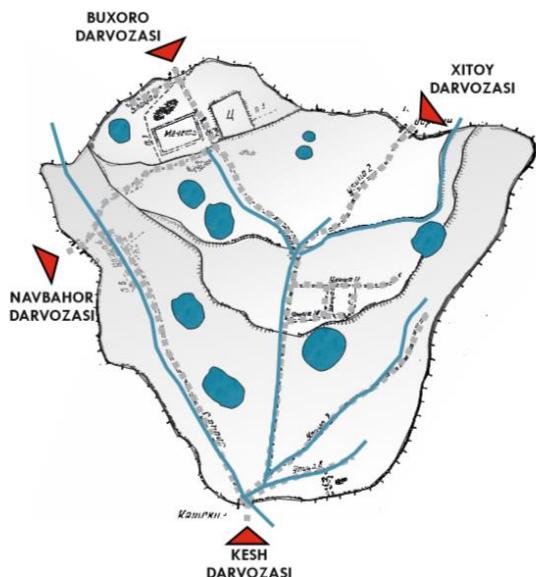
According to the 10th-century work "Hudud ul-Olam" by an unknown geographer, the "Lead water pipeline" - Juy-Arzis passed through the "market roof" of the city of Samarkand. The name itself refers to the water structure of ancient Samarkand, which supported the aqueduct, covered with lead. Juy-Arzis canal water shows that it was a causeway into the city. Every street and every house is supplied with water from it. [4]

In the Afrosiyob region, the central canal was led from the Kesh gate to the palace, and it was 2 meters wide and 80 cm deep. The edges of the ditch are covered with solid stones and in the same places with bricks. The ditch ran parallel

to the main street mentioned above, and the bending trees were placed along its sides, and this served to provide shade and coolness to the street. [5]

The second channel passed from Hazrati-Khizir and Shakhi-Zinda sides on the eastern side, widened from 2 meters to 3 meters, and craft centers were formed on the edge of the channel [5].

The third water ditch flowed along 10 streets, it was 1.5 meters wide and 60 cm deep. This ditch was used to irrigate the city's fertile lands.

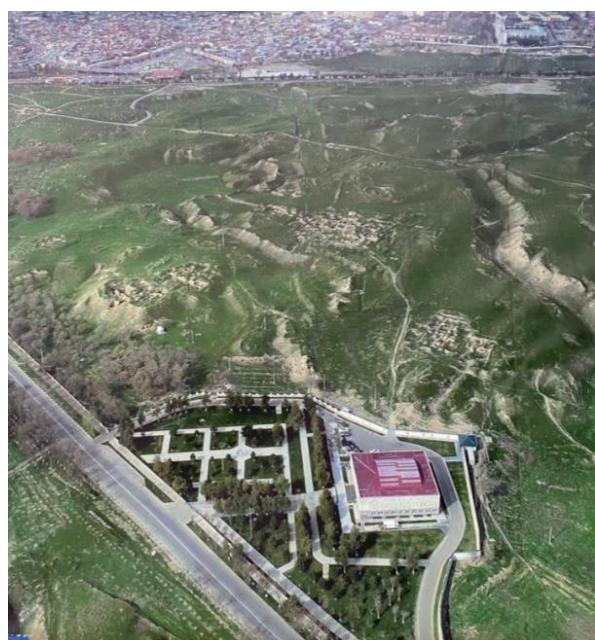


1. 7th-13th century. Afrosiab city pools and trunk canal scheme

In the south-western part of Shahristan, there is a large pond of approximately 100x100 meters, water is poured into it from the central canal.

Another large pool was discovered by archaeologists, the chats of the pool were covered with solid stones and the pool was accessed by steps.

In addition, 12 pond-like places have been identified in the territory of Shahristan. The whole city was supplied with water by means of ceramic pipes.[5] (1; 2 pictures).



2. Current state view of the afrosiobic archiological region

In addition to canals, water wells were widely used [6]. Archaeologists found a well 20.8 meters deep on the west side of the settlement, and it was found that there was water there until 1970. [6] Vyatkin pointed out that such wells were built in the form of a cistern, and it was necessary to go down with the help of stairs [7].

According to the sources, 4 main main canals "Chokardiza", "Muzakhin", "Iskandergham" and "Sengresan" supplied water to the southern part of the city [8].

A complex irrigation system covering all areas of the city was created to supply the city with water. The irrigation system consisted of a network of ditches, aqueducts made of adobe

bricks, a gallery of underground water pipes (one person could walk freely), and water reservoirs.

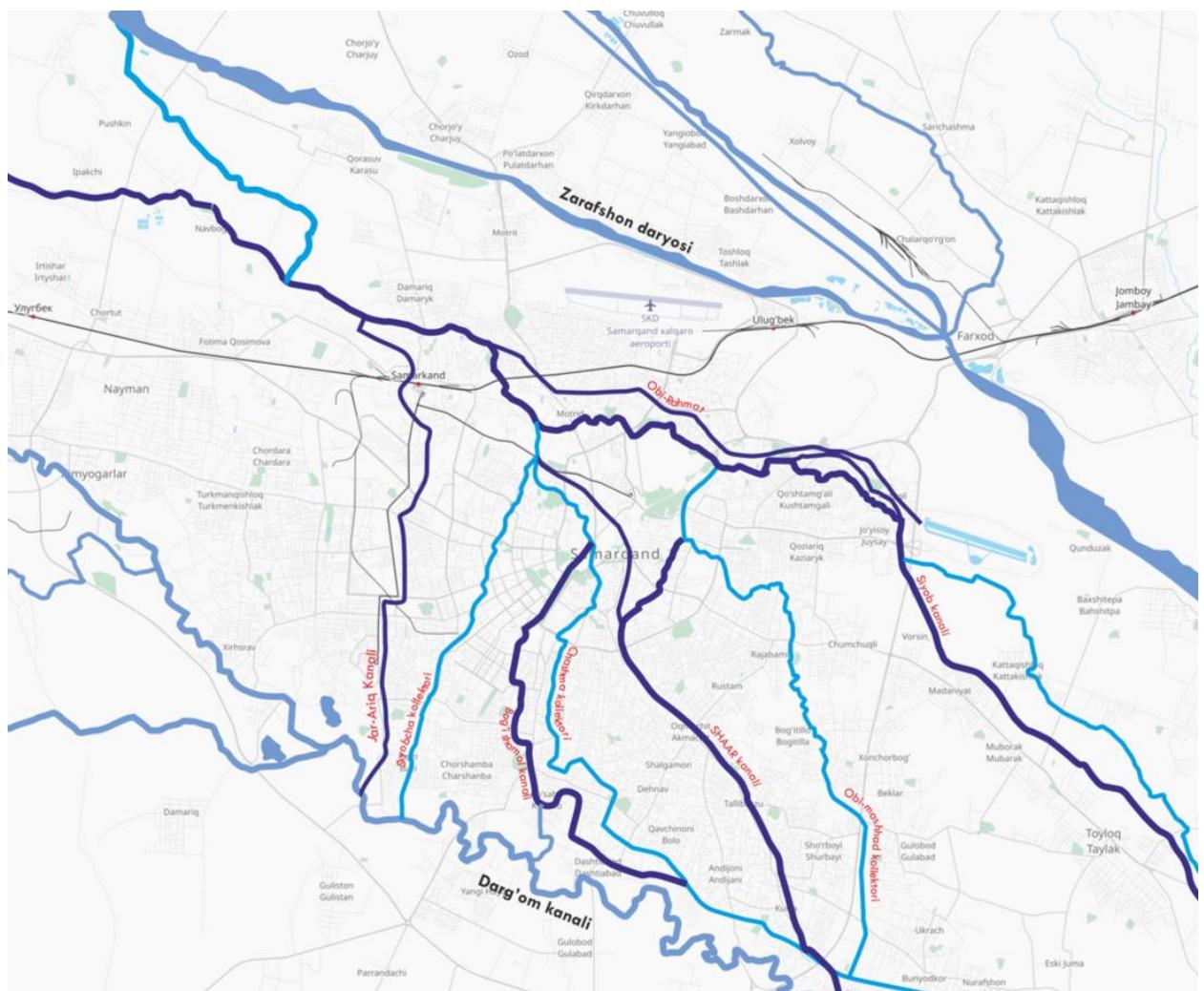
The Dargom canal was considered the main irrigation system of the ancient city of Samarkand. Iskandargom (now Dargom canal) separates from the Zarafshan river in Vargsar (now Ravothoja) and flows through the southern side of Samarkand city. The Shaudor canal receives water from the Dargom canal around Jumabazar and enters Samarkand from the south. Navbakhchiyan, Kavarzor, Dashtak, Shaar (Chakardiza), Khuja-ariq (Sangresan), Mazor (Sangin) canals receive water from the Shaudor canal.

The Dashtak and Mazor canals provided water to the villages of Kavarzor, Rajabamin and Kaftarkhana, and the Shaudor canal. The Khoja-ariq (Sangresan) canal is called Ark-arig'i in the city, and at the end it joins the Novadon canal and flows into the Chashma-soy in front of the brick factory and then into the Siyob river.

Basins of the Jar-soy, Yunushka-ariq, and Mazdakhin canals separate from the Navbakhchiyan canal. The Mazdakhin canal passes through Panjab neighborhood and divides into two streams in front of Temiryol

amusement park along the microdistrict called Jar-ariq. At the beginning of the microdistrict, Dam-Arik separated from this channel and flowed towards the village of Bukhara.

Through the Khoja Ahror and Sozangaron gates, the Karizgoh and Sozangaron ditches entered the city from the south. It was named Karizgoh (currently Khoja-ariq and Ark-ariq). Today, this canal passes through Lev Tolstoy Street and University Avenue and passes behind the regional government.



3. Samarkand irrigation systems scheme

Chakardiza - Sozangaron stream passed through the whole city and entered the city of Afrosiyab, and its name was called Shaar-arig. The Shaar brook, in turn, divided into the Kaval

and Mulyon brooks and supplied water to the southern part of the city. From these canals, small ditches separated and provided water to neighborhood pools located in the city (Pic. 3).

The role of springs in the city is also important. Examples of these are fountains near Hazrat Daniyor's grave, tourist hotel, Navadon and the back of SamDU.

The Abirakhmat canal, which is famous for its clean water, supplies Motrid, Bog'ibaland and Bog'maydon regions with water even now.

The canals supplying the city with water were considered the basis for research not only to provide water to the population, but also to create a favorable microclimate environment in the city with hot and dry southern climate, high solar radiation, and dusty winds in the hot seasons of the year. This, first of all, allows for the wide use of open spaces with greenery and ponds (courtyards, squares, semi-open summer rooms, small form and shading structures) in the collective-spatial structure of the residential environment.

Neighborhood centers with a historical structure are distinguished by having a smaller area. Their space is directly used by people. Tall, perennial, large-sized trees planted along the shores of the pool - maple, elm, poplar, sometimes walnut trees, wide verandas, sheds occupy the main part of the space and form a dark shade in the complex. Pools are of great importance in this [9].

By performing the function of storing water in ancient times, ponds made it possible to maintain moist air and low temperatures. Today, ancient ponds have been preserved in some places. They were kept not for the purpose of storing water, but as a source of cool air. Pools enrich the air with moisture and increase household comfort. In addition, favorable conditions due to the decrease in air temperature near the water also affect the increase of aeration. The average temperature flow in the streets of the neighborhood is lower than the city temperature flow and does not exceed the heating temperature limit.

By studying the microclimate characteristics of the streets in the environment of modern devices, it can be noted that the microclimate determination in them is in most cases close to the historical complexes. They usually have an oasis zone, ponds with sprinklers, irrigation canals running through the courtyard area, and large trees along its banks, such as historical

centers. Shade sheds and verandas are used in spatial composition. As a result, shading, landscaping, closed and compactness of the structure occurs, which leads to dryness of the general shade in the area and a decrease in temperature. Indicators of these streets have a level of comfort due to increasing humidity in the air and increasing aeration according to bioclimatic conditions [10].

In the study of the conditions of creation of microclimatic environment in different types of architecture of historical and modern streets, central squares, neighborhood centers, a complex relationship between the size and area of open spaces on the one hand, and shading of the territory on the other hand was determined. For them, the meaning of this complex relationship is that the larger the area and size of the free spaces, the less the total shading. And vice versa, as free space and areas decrease, the shading coefficient increases [11].

Historically formed street architecture and such objects in the structure of the first group of devices are not typical to have large gaps of areas in a generally defined pattern, which allows to maintain moderate humidity. The shading of public centers of the second group of devices is often carried out by means of architectural forms, where a lack of greenery is noticeable. The area of free spaces is large, which leads to a decrease in air humidity.

Studying the experience of microclimate development of historical and modern streets, comparing the design type and spatial-compositional characteristics of the microclimate environment, landscaping and improvements showed that there are favorable conditions in the historical neighborhood centers with a closed design structure, that is, there are public and pedestrian environment composition methods. traditional solution, there are pools, wide verandas, corridors, sheds and dense greenery.

Thus, the irrigation system of the city of Samarkand has a long and rich history. For many centuries, the importance of the irrigation system in the restoration and development of the city has been very great. Today, most of the above-mentioned basins exist and the main task assigned to them is to supply the city with water,

but at the same time they are not fulfilling this task. We witness that neighborhood ponds are in a very deplorable condition, sewage is directly discharged into them, and they are filled to the brim with household waste.

Today, the surroundings of the canal and ponds are being cleaned, and the work of organizing a

tourist route is developing rapidly. At the same time, the surroundings of the Obi Rahmat and Siyob streams in the city are being cleaned, and conditions are being created for local residents and tourists to enjoy their leisure time in the area. (Pic. 4)



4. The practice of organizing tourist routes along the Siyab canal

Using historic canals, ditches, and neighborhood ponds for tourist routes can be an interesting and educational experience for visitors, as well as a way to raise awareness about the preservation of cultural heritage and irrigation systems. In addition, the construction of tourist routes along these water channels and ditches, as well as the provision of services and facilities in them, remains one of our main goals today. As an example, we can mention several types of tourist routes (Pic. 5).

**Thematic excursions:** organization of thematic excursions along the historical canals, telling about their history, importance and role in the development of the region. This may include stories about the construction of canals, their use for agriculture and water supply, and the

stories of local communities associated with these canals.

**By bike or on foot:** cycling or walking route for tourists along the historical canals. This allows them to become more familiar with the surrounding nature and architecture, as well as enjoy the peace and privacy that the ancient canals offer.

**Boat Tours:** Tourists can explore the canals from the water with boat tours. This allows you to see the canals from a new perspective and enjoy the beauty of the surrounding nature.

**Interactive activities:** Organize interactive activities along the route, such as canal-making workshops, local food tasting or traditional crafts, to attract tourists and stimulate interest in the cultural heritage of the region.



5. Possible organization of ecomarshruts on the sides of the canal and ditches.

Information points and interpretation centers: Establish information points and interpretation centers along the routes where tourists can learn more about the history and significance of the historic canals, as well as get maps and recommendations for self-exploration.

Partnerships with local communities and organizations: Working in partnership with local communities and organizations to create unique tourism experiences that reflect local culture and traditions while preserving historic canals.

Eco Tours and Activities: Organization of eco tours and activities that highlight the importance of preserving the natural environment and biodiversity associated with historic canals.

One of the main tasks is not to forget that it is important to take into account the needs and interests of the local population, and to preserve nature and cultural heritage when creating tourist routes.

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