



## IRRIGATION SYSTEM OF THE ZERAVSHAN VALLEY AS THE BASIS OF THE ECONOMY AND REGIONAL PLANNING

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Annotation: In the article, the author highlights some of the features and conditions of the historical irrigation canals of the city of Samarkand, the Zeravshan valley, the problems of urban planning and resettlement, its influence on the formation of the general plan of the city of Samarkand, natural collectors of rivers, watercourses. The problems of preserving the architecture of the historical and natural landscape and the environment of the ancient city of Samarkand are touched upon.

Keywords: Key words: valley, Zeravshan, ridge, river, canal, population, city, territory, water supply.

The Zeravshan valley is located in the center of Central Asia and bordered by the Turkestan-Aktau and Zarafshan mountain ranges. The eastern extremity of the valley is narrow (3-5 km) in the gorge of mountains, in the west it extends along the plain up to 60-70 km, including three oases: Samarkand, Bukhara and Karakul. The nature of the valley represents the whole diversity of the landscape of mountainous, foothill, plain, steppe and desert zones. Entirely green oases are especially noteworthy [1]. The Zeravshan River, the main source of irrigation for irrigated agriculture from ancient times to the present, borders the valley with a golden belt.

Zarafshan in translation means "scattering gold". The sublime poetic name is fraught with a deeply symbolic meaning. From time immemorial, gold has been mined in the river basin, and in our time, a city of gold miners Zeravshan has grown in the middle of the desert (Fig. 1).



Fig.1. Zeravshan Valley Map.



In a figurative sense, the water of this river was more expensive than gold, because without it there would be no irrigation, no crops, no big cities, and therefore, the high civilization that was being created in the Zarafshan valley. And, finally, this toiling river, giving to the last drop of its water to the service of man: arising at the Turkestan ridge called Mastchakhdarya, at the confluence with the Fandarya, it becomes a full-flowing river and is distributed over numerous channels over 781 km, and when it reaches the Kyzyl Kum, it turns into a small irrigation ditch Taikyr [1].

The lands of the Zarafshan basin were part of Sogdiana, the country of ancient civilization, since ancient times they were densely populated, richly and generously showered with gifts of nature. Through its cities, as if strung by a separate branch of the Zarafshan River, the main trade routes passed. In the Middle Ages, until the destruction of Samarkand by Genghis Khan, the city and its environs were irrigated with the waters of Zeravshan through the Dargom irrigation system. Probably, one of the important reasons for the failure to revive life on Afrasiab after the Mongol invasion was the destruction of the lead aqueduct, because the restoration of this structure was beyond the power of the devastated and plundered Samarkand (Fig. 2).



Fig.2. General view of Afrasiab in antiquity (reconstruction)

After the destruction of the lead-water aqueduct Dzhui-Arzi as a result of the invasion of Samarkand in 1220 by Genghis Khan, the city was deprived of water, and the ancient water supply system of Afrasiab soon completely dried up [3]. Although life on Afrasiab died out, Samarkand did not stop its existence. Some time later, on the territory of the suburb, located south of Afrasiab, the city was rebuilt. True, in the suburbs, city life was in full swing back in the 10th-12th centuries. [2].

The Zeravshan valley is located in the central part of Uzbekistan and occupies the middle part of the country's territory within the republic. It has clear natural boundaries in the north, which is bounded by the Nurata mountains, spurs of the Turkestan ridge, in the south by the Chakylkalyan, Karatepa, Zirabulak and Ziyavuddin mountains, in the east it borders on Tajikistan, in the west it is separated from the Nizhnezravshan district by the Khazarin gorge [4]. (Fig. 3).



Fig.3. Ridges and watersheds of the Zeravshan Valley.

The mountain rises surrounding the valley from the north and south, in turn, are composed of limestone, crystalline and shale rocks of the Paleozoic age. These mountains have risen to the Hercynian folding. So, in the north of the district, the Nuratau, Aktau and Karatau ridges were formed, and in the south of the district - the Karatepa, Zirabulak and Ziyavuddin mountains. The modern appearance of these mountains has been significantly transformed by weathering and the activity of permanent and temporary water flows flowing in the direction of the Zeravshan River. The Zeravshan Valley is the largest intermountain depression in Central Asia, the length of which is equal to the length of the Zeravshan River (877 km). The ancient cities such as Samarkand, Bukhara (Uzbekistan) and Penjikent (Tajikistan) are located in the valley [5].

During the period of domination of the Kushan Empire at the turn of a new era, a new stage began. The slave-owning system in Central Asia reached its peak, and large-scale irrigation construction was carried out throughout the country. In order to develop the foothill plain of the left bank of the Zeravshan in the center of Sogd, the main canal Dargom was dug. He was taken away from Zeravshan. Thanks to this canal, the proluvial (above-floodplain) part of the vicinity of Samarkand was completely irrigated and cultivated (Fig. 4).







Fig. 4. Map of the Dargoma Canal.

The city branch canal, which was fed by the Obimashkhad and Novadon streams, switched the water supply system of ancient Samarkand to Dargom (apparently, it was he who later received the name Jakardiza or Chakardiza). It was an exceptionally important irrigation event that forever solved the problem of water supply not only for Samarkand, but also for its suburbs. This left traces on the settlement of Afrasiab, especially traced in sections of the central channel [6].



Fig.5.A. Siab River, Khoja Doniyor.

Fig.5. B. The Siab River runs parallel along the 3rd passage of Obi-rahmat.

The problem of water supply of the city was of great importance in the history of Samarkand. Without solving this vital issue, it was impossible to ensure the normal existence of the city in the most difficult terrain on the left bank of the Zeravshan. The foothill plain of the left bank of the Zeravshan valley (including the territory of Samarkand) has long been irrigated by the Dargom irrigation system, which originates in the area of Ravatkhodzha, 42 km southeast of Samarkand [7].

In order to find out the time of construction of the Dargom canal, a group of archaeologists conducted research in 1967 in the upper part of the Dargom irrigation system. This canal, the main water artery of the left-bank part of the Samarkand oasis, was built at the turn of our era, about 2000 years ago (Fig. 5.A, B). Dargom is therefore almost a thousand years younger than early Samarkand. And where did the ancient Samarkand on the Afrasiab hill get water from?

When conducting the most ancient irrigation systems of the city, the geographical position of the area was of paramount importance. The Samarkand oasis consists of two parts: the

floodplain and the floodplain. The floodplain, ancient valley of the Zeravshan, and the foothill above the floodplain. [eight]. The city is located on the floodplain of the foothill strip of the left bank of the Zeravshan, slightly rising above its ancient (floodplain) valley. The Samarkand plain has a dip from the east and southeast to the west and northwest, from the foothills to the Zeravshan valley.

According to G.V.Grigoriev, one of the first explorers of Samarkand, the irrigation system of the city was connected with the mountain tributaries-sai (stream). However, the mountain saia of Samarkand were of a temporary nature, did not have a constant flow of water: in the spring they turned into stormy ones, and in the summer they dried up. [nine]. The Samarkand area is rich in groundwater, which occurs at a depth of 1.2 m. With distance from the mountains, as the relief decreases, groundwater approaches the earth's surface, and in the lowest parts of the valley, especially in the deep beds described above, the sais wedge out in the form of springs with quite significant and constant debit And precisely, springs served as the main water resource of the most ancient inhabitants of Samarkand. This is clearly evidenced by the Upper Paleolithic site found on the territory of the Park Lake in Samarkand and located on the right bank of the Chashma Siab stream (Siab spring), fed from springs [10]. In the vicinity of the future city, springs could not but attract the attention of the ancient city planners of Samarkand.



Fig 6. A. Aryk Obimashkhad near the grave of Khoja-Doniyar.

Fig. 6. B Siab River near Samarkand (Zarafshan tributary).

On the territory of the city, there are still springs with a significant flow rate: on the border of the Afrasiab hill on the banks of the Siab, near the grave of Khodja-Daniyar, in the north-eastern corner of the settlement, on the left bank of the Obimashkhad ditch (the flow rate of the spring is 0.001 cubic meters / sec), near the lemonade plant at the Khoja Akhrar Gate of the city, at the Park Lake and in many other places. And these springs could provide water not only to the ancient settlement, but also to the ancient Samarkand that grew up on their basis with a population of many thousands [11]. (Fig. 6.A, B.)

Of the streams of Samarkand, the most abundant was Novadon, whose total debit, according to hydrological data in 1926, was 0.72 cubic meters per second or 72 liters per second, which is more than 6 million liters per day. And such a quantity of water could satisfy the domestic needs of not only ancient Afrasiab, but also densely populated Samarkand in the era of Temur and the Temurids. According to the description of Abu Tahir Khoja, "the Novadon spring entered the city of Samarkand from the outside from the south side, flowing past the city gates, called the gates of Khoja Akhrar Vali. This stream, passing through the middle of the city, flowed into the Siab. Therefore, there is some truth in the message of the author of the historical work "Samaria" that "Novadon is the very spring on which Samar was built." (Fig. 7).



Fig 7. Novadon spring.

Zeravshan valley, problems of urban planning and settlement. The eastern part of the Zeravshan valley formed a single whole with the territory of Sogd. Northern Tajikistan was partly part of Ustrushana, which took shape as an independent territorial-political unit, although it retained close ties with Sogd, and partly was part of Ferghana and Ilak [12]. (Figure 8).

The functional organization of the rural settlement of the mountainous regions, and, accordingly, the rural settlements of the Zeravshan valley, went through a number of stages of formation and development of their architectural and planning structure. The first stage covers the most ancient period (7th-6th centuries BC - the end of the 19th century). The second stage (the end of the 19th century - 1917) was the period when the Turkestan region became part of the Russian Empire. The third stage is the Soviet period (1918-1991), the time of social transformations and experiments to improve the agriculture of the republic [6].

The analysis of modern problems of settlement and architectural and planning organization of the structure of mountain settlements on the example of the Zeravshan valley determined the prerequisites for the development of rural settlements:

1. The ancient town-planning traditions of the formation of settlements on the territory of the foothills and mountainous regions were formed back in the early Middle Ages. They include experience in the construction of settlements, residential formations, individual estates on difficult terrain, adaptation to natural and climatic conditions, artistic mastery of architectural and decorative processing of wood, stone, and other local materials;
2. A natural mountain landscape with a complex rugged relief is an objective, permanent condition for the formation of a rural settlement and individual architectural objects in general, as well as an integral compositional element of an architectural complex;
3. When choosing a site for building a settlement, a complex of natural-geographical factors and natural-climatic features of the area, as well as the socio-economic living conditions of the population, taking into account the maximum preservation of fertile land plots, is taken into account;



4. Depending on the landscape characteristics and socio-historical traditions, three types of rural settlements were formed in mountainous areas: foothill, low-mountain and middle-mountain [6].

Influence on the formation of the general plan of the city of Samarkand of natural collectors of rivers, watercourses. The main distinguishing feature of the city, which determines its uniqueness, is that Samarkand is a historical city of global significance.

Analysis of the current state of the environment, presented in the project, shows that the ecological situation in the city is characterized as tense, which is explained by both natural and anthropogenic factors. The natural conditions that contribute to the emergence of a tense situation include: unfavorable engineering and geological processes (erosion, ravines, landslides, dumps, suffusion, destruction of the coast, an increase in soil tasks); high level of groundwater occurrence, flooding, swamping and salinization of the territory; aridity, stagnation in the active layer of the atmosphere [9] (Fig. 6).



Fig. 8. General plan of Samarkand IX-XIX centuries.

Anthropogenic factors include: low level of sanitary cleaning of the city, lack of an equipped city garbage dump; building up ravines, trimming slopes, increasing the load on slopes (vibration, etc.); unregulated surface runoff, insufficient coverage of the population with centralized sewerage (63%), lack of water protection of collector and canal zones, high level of surface water pollution, poor condition of water intakes and lack of sanitary protection zones, low level of landscaping (3 m / person). [5] (Fig. 8).

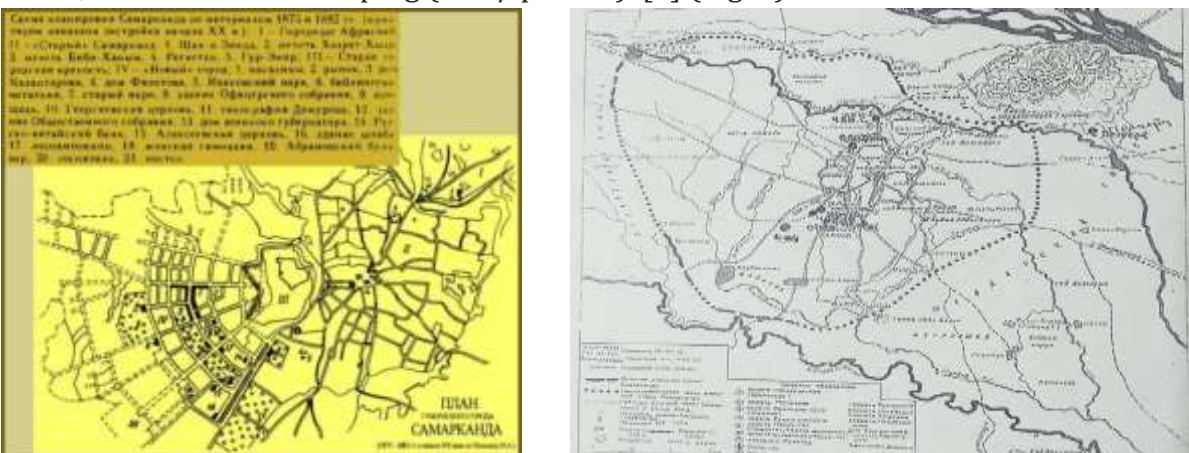


Figure 9. Influences on the formation of the general plan of the city of Samarkand of natural collectors of rivers, watercourses.

Problems of preservation of the architecture of the historical and natural landscape and environment of the ancient city of Samarkand. The problem of preserving the natural geomorphological environment, including the system of irrigation and drainage collectors, which are also monuments of the material culture of the city of Samarkand, is important and this column focuses on the problem of preserving the irrigation system of the city of Samarkand. It is also proposed to expand the range of objects visited by tourists in natural landscape and park areas and by including a huge number of monuments of material culture available within the city and barriers.

Conclusion. The ancient irrigators of Samarkand knew well and took into account the natural features of each piece of terrain and very successfully carried out the ancient channel of the canal in the conditions of the most difficult relief of the territory of Afrasiab. And this is confirmed by the fact that throughout history, from the moment of the formation of Samarkand and until its destruction by Genghis Khan, the direction of the main water arteries of Afrasiab, of course, has not changed. The abandoned channel was restored over time, or the newly built canal passed, as archaeological excavations showed, along the beds of the ancient Afrasiab canal. It is now necessary to expand the range of objects visited by tourists. Not only in Samarkand, but also in other areas, there are hundreds of objects that require advertising and lighting. They will be visited not only by pilgrims, but also by tourists. For example, in the city of Nurota, a lot of work has been done on the reconstruction of the mosque, madrasah and improvement of the squares near the monuments of material culture. But at the same time, the ancient bath-hammam was demolished. The question is, why? and why? this is an irreparable mistake. In Nurata, it is necessary to preserve the ancient irrigation systems, water through these ditches from sources penetrates the entire fabric of the historical settlement, it must be preserved at any cost, and it is necessary to inform the public about it, because this irrigation system encodes an understanding of the subtle connection between ecology and the basic principles of living in this district.

Since this is the only source of drinking and irrigated water in a vast area where the dry hot climate creates optimal conditions for development, there is a source of microbes and microorganisms in the water, which accompanies the rapid overgrowth of the canal bed.

The project of reconstruction of the above-mentioned irrigation systems will have to be carried out taking into account all technical and environmental requirements. For such work, it is necessary to connect the scientific potential of the Department of Architecture, the Department of Improvement, the State. ecology and universities of SamSU, SamGASU, TASI, etc. The section discusses a small range of problems and objects that need to be preserved, revived and included in tourist routes. The significance, role and features of the irrigation system and its impact on the landscape, microclimate and the formation of the city's ecology as a whole are determined. As a result, an important factor and shaping historical environment is the preservation of irrigation and the landscape of the historical city. The restoration of architectural monuments cannot be complete if the issues of restoration and preservation of the historical landscape and the irrigation and irrigation system of the city are not resolved, which is also important for the development of tourism. Solving the vital task of



preserving the material and cultural heritage is very important for our national culture and the development of tourism in the Republic of Uzbekistan.

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