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Studying The Geographical And Hydrological Features Of Some Water Structures

Y.Q.Khaitov Doctor of Geography (DSc) Professor
Bukhara State University,
Yozil1961mail.ru
I.A.Ramazonova, Independent Researcher
Bukhara State University

Annotation. In the article, some water structures are studied on a geographical and hydrological basis. In addition, the hydrological aspects and characteristics of these water structures are evaluated. Hydrological indicators and territorial geographical location are determined based on historical maps. The use of ponds and cisterns as drinking water is explained. Information is given about the schematic structure of these water structures, i.e., the dome is made of high-quality brick and alabaster, the top is perforated, and there are holes around them that empty into the pond. Their appearance is in the form of a dome made of bricks, on the nether side there are radial ditches that collect water during the rainy season are passed through slits to a well or other underground container. This, in turn, in improving people's knowledge of water science, the importance of some ancient water structures today and their effective use in the future, scientifically based proposals and recommendations have been developed. In the process of preparing the article, information from historical sources was used widely and effectively.
Key words: Pond, Bolo hovuz, Labi hovuz, cisterns, hydrological features, geographic map, width, length, depth of the pond, clean water, artificial water basin, ancient structures, geographical location, filter, drinking water, snow and rainwater.

Importance. It is known that the ancient water structures served not only as a source of water resources but also to balance the climatic conditions of the geographical area. We can mention some ponds and cisterns in the city of Bukhara as such water structures.
In order to prevent water shortage in winter, people dug artificial ponds and collected water. Ponds were dug in all neighborhoods and residents kept them clean. To prevent the shore of the pond from collapsing, trees were planted around it and stones were placed on the edges. In autumn, the ponds were cleaned and filled with water. Some neighborhoods are named after ponds. Kattahovuz, Hovuzbog, etc. Meanwhile, cisterns were built in the form of a closed pond and used as drinking water. Therefore, the study of the geographic and hydrological features of water structures is of great importance.
Goals and objectives.
The goal of investigating these ancient water structures is to study the ancient water structures Labi hovuz, Bolo hovuz and cisterns from a scientific point of view. To achieve the goal, the following tasks were performed:
- data bank on ancient water structures ponds and cisterns was collected and summarized;
- the hydrological characteristics of these water structures were evaluated;
- the data of historical sources related to water structures were analyzed;
- the geographical location of ancient water structures Labi hovuz, Bolo hovuz and cisterns was studied based on historical maps;
-recommendations and proposals were developed as results of scientific research.
A pond is a deep dug artificial reservoir for collecting and storing drinking water. There are rectangular, circular, and multifaceted types of ponds. They are widely used in Central Asia

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and some countries of the Near East. Mainly built around mosques, in city squares, parks, gardens, palace courtyards, etc. surrounded by stones or strengthened by planting trees. Ponds are associated with fountains. In addition, it has been effectively used as drinking water for the residents of Bukhara.

It is recorded in the documents of the 19th century that there were more than 300 ponds in the city of Bukhara. In the 20th century, under the pretext of sanitary requirements, most ponds were hardly used.

These ponds underwent hydrological and geographical research, and their maps were created.

Fig. 1. Map of ponds in Bukhara at the beginning of the 20th century. (Bukhara Water Supply Museum.)

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16.Bolohauz	40.Sufiyon	64.Garbiya	
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Let's talk about Labi hovuz and Bolo hovuz, some of the available ponds in Bukhara.
Labi hovuz ("by the pond", "by the basin") is one of the central squares of Bukhara. The architectural ensemble related to the Labi hovuz was created in the 16th-17th centuries. The square consists of the buildings of the Kukaldosh, the Devon Begi khanakah, its surroundings are combined with the Nodirbegi pond. The size of the ensemble is approximately 150x200 meters. The pond is 36 meters wide, 45.5 meters long, and 5 meters deep. Like many other ponds of Bukhara in the 1920s, the pond, which was built by many people, miraculously stops draining. After 1945, Labi hovuz, like many other ponds in the city, was drained. A fountain that was constructed by circling the pond with pipes at the end of the 1950s is still working. The main water source of the Labi hovuz is a tributary of the Shakhrud canal. Nowadays, the Labi hovuz ensemble in Bukhara has been renovated, it has become a favorite place for the residents of the city and for tourists.

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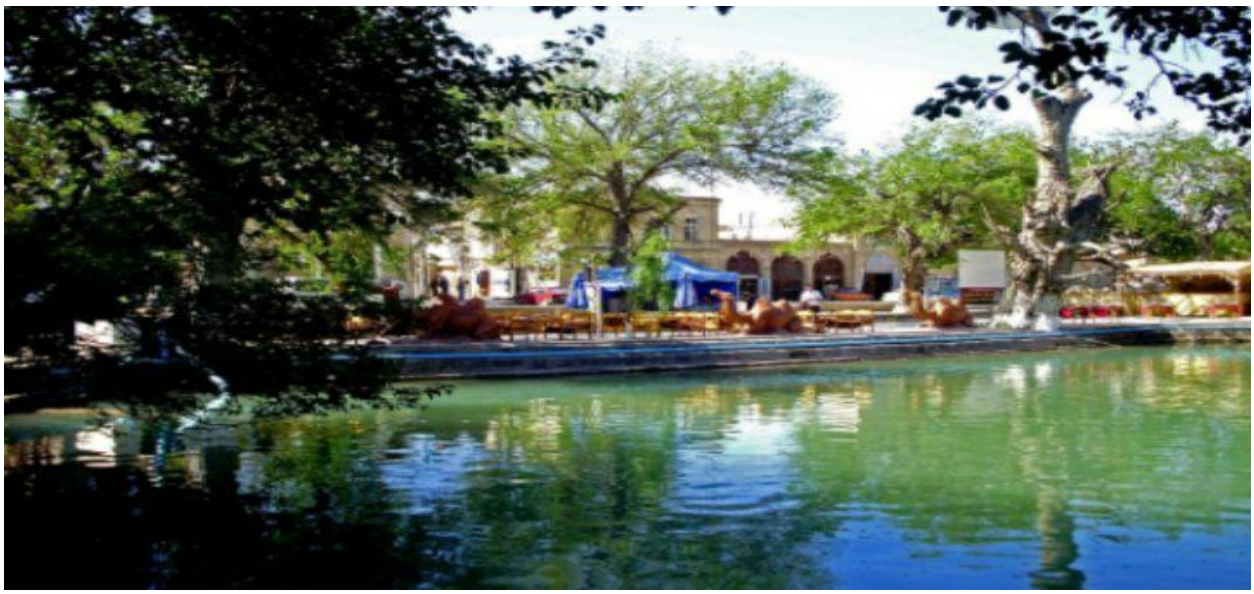
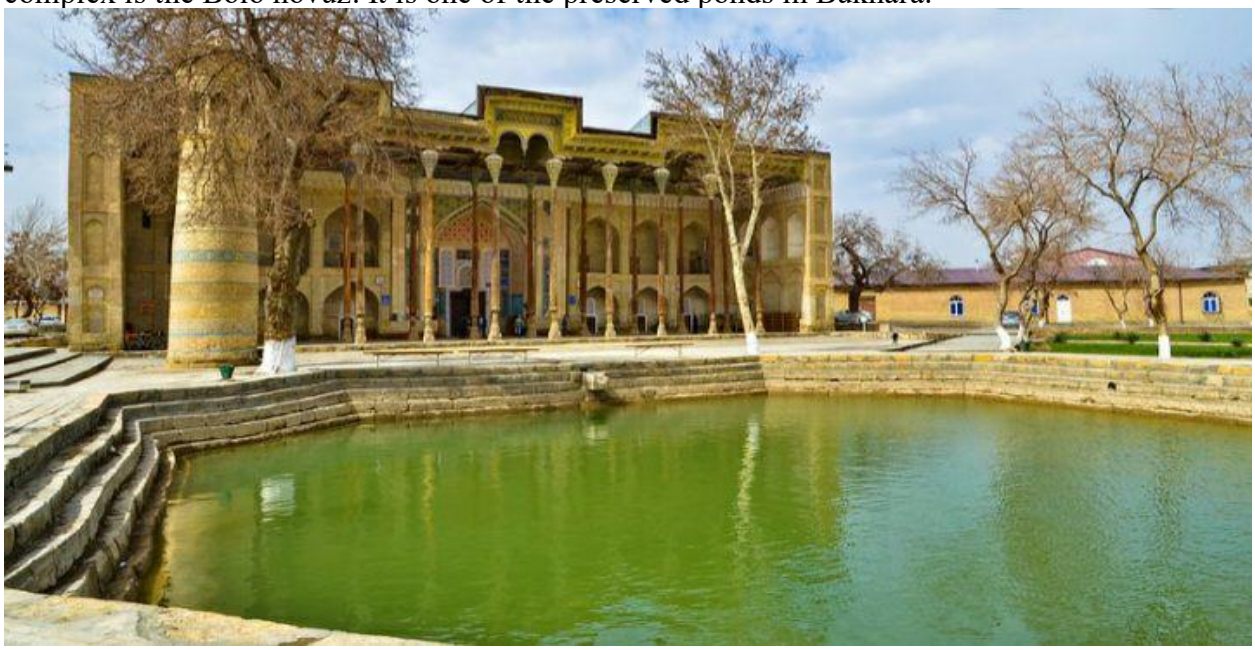


Fig. 2. Labi hovuz

The Bolo hovuz complex is the only preserved monument in the Registon area. It is located in front of Amir's castle – Ark and consists of Friday mosque and minaret The oldest part of the complex is the Bolo hovuz. It is one of the preserved ponds in Bukhara.



Picture 3. Bolo hovuz complex.

The word Sardoba – cistern (from the Persian language "sard" - cold and "ob" - water) is a domed pond specially built to collect and store water in regions with a shortage of water. It was built in Central Asia and other countries in the East. The cistern is a dome-shaped monumental structure, divided into two parts: the underground part is designed for collecting and storing water, and the above-ground part is built in the form of a round dome.

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A cistern is designed for water buried deep in the ground. It was usually built on caravan routes from the 10th century. The water in such cisterns was cool even in the hottest period of the year. The dome of the cistern is made of high-quality baked brick and alabaster, the top is perforated, and holes are made around it that empty into the pond. There is a door to enter the cistern, and the front of it is surrounded by a wall in order to keep the water clean. Next to the cistern, a manger was built for watering cattle, and water was poured to the manger through a special channel. Some cisterns had rooms for the Mirob who controlled and cleaned them. According to the geographical location of the cisterns, the nature of the place, the topography, there were several types of cisterns (water from the snow and rain, water from rivers, underground waters). Regardless of the size of the cisterns, the diameter is up to 15 meters and the depth is up to 10-15 meters.

The cisterns are filled with rainwater and melted snow, and sometimes with water from rivers and canals, they are partly built on the way of underground canals - culverts. Many cisterns had one hatch for water to pass through. Bukhara cisterns were distinguished by two hatches, but several hatches were installed around the Abdullah Khan cistern. In Uzbekistan, the main building material for the cistern is flat, rectangular, high-quality and solid brick. In Central Asia, cisterns served as a guaranteed storage and source of fresh water for centuries. Their external appearance is in the form of a dome made of bricks, with slits in the lower part. Through them, radial ditches that collect barren water during the rainy season are passed to a well or other underground capacity.

A detailed description of the cisterns has been preserved thanks to the handwritten sources of tourists. "Halfway between Malik and Mirza Rabat, on the side of the road, a tall round dome-shaped building can be seen. At the top of the dome there is a circular hole. A descent path behind the peaked gate leads into this circular building; seven pinholes are located symmetrically along the circumference of the thick wall. It is amazing how solidly the building is built, especially, from the bottom of its magnificent dome to its highest point, in countless circular rows, flat square-shaped bricks are laid horizontally in such an order that each brick in the upper row slightly protrudes towards the inside of the dome compared to the brick below; this dome generally resembles a flipped circular amphitheater stairs. Such a unique method of construction, despite how primitive it looks, amazes with its solidity. Such desert buildings are known as "Sardobalar" – "Cisterns". A traveler tired of walking in the heat of the summer will find great comfort under the high stone dome, the size of several sarjins, and it will serve as a shelter from snow storms in the harsh winter. When you go inside the building, you will see that its holes exactly correspond to the surrounding soil level. You will see that three sardines are exposed from below the stone building (1 sarjin = 2,134 m), so that the hall itself appears to be dug into the ground. This explains the need to have two or three raised bulwarks near each cistern. When the snow starts to melt in the spring, all the surrounding water flows towards the cistern and passes into it through its holes. That's why they tried to build such basins on sloping plains. In ancient times, cisterns played an important role in providing water for trade caravans and cattle in the steppes and deserts.

Suvloq is a place where cattle drink water. There is a cistern called Sangi suvloq in Kashkadarya region. Furthermore, there is a wooden cistern in Syrdarya region. This cistern is currently being used as a museum.

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Figure 4. Cisterns.

The construction of cisterns is not only on the plains, but also on the slopes of small mountainous areas. In these cisterns, two water receiving capacities were prepared, and one of them served as a filter, mud and other garbage settled at the bottom of it. The filter did not eliminate the need to clean the cistern, it only provided filtered water, which made it possible to clean the main water intake capacity less. Barren waters turbid with mud settle very slowly, so the local residents added table salt to the water in the cistern and cleaned it of suspended sediments. In some places, they added a mixture of table salt, limestone and coal to the water. As a result of such storage, water is preserved for a long time and its signs of getting spoiled are not noticeable. Desert residents constantly monitored the condition of such unique architectural complexes, cleaned the necessary domes and radial channels that bring water from mud.

The ruins of some cisterns have been preserved to this day, but the local residents have separated them into parts and are using them as building materials..There are several well-preserved cisterns today.

Suggestions and recommendations.

-water facilities serve to moderate the air of every place.

-changes people's attitude to water science.

-expanding a range of services around the pond in the administration of both internal and external tourism;

- organizing more trips to these places in order to form the youths' perspectives on hydrology;

- inculcate in our youth the idea that every drop of water is a source of life;

- to feel that the improvement of water ecology is in the hands of young people.

Conclusion. In conclusion, it should be said that we hope the study of the geographical and hydrological characteristics of ancient water structures such as Labi hovuz, Bolo hovuz, and cisterns will serve as a program for the development of the world view of water science among young students. We should protect historical water structures as the pupil of an eye for future generations.

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