

THE EFFECT OF THE HYDROGEOLOGICAL CONDITIONS OF THE CITY OF BUKHARA ON HISTORICAL MONUMENTS

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Abstract. *This article, using the data of the hydrogeological center of Bukhara, discusses the negative impact of increasing the level of groundwater in the ancient part of the city of Bukhara, and therefore, the walls of historical monuments moistened, covered with a salty coating, opened cracks in some parts of the walls.*

Keywords: *dynamics, reclamation state, ground water, Zarafshan River, subaerial, river terrace, irrigation, infiltration water, drainage well, Tyan-Shan, seismically active.*

In the article, using the information of the Bukhara GGS, we are talking about raising groundwater in the old part of the city of Bukhara and, the consequences are crushed soils, moisturizing the walls of the historic buildings of the city. Negative consequences associated with the rise of groundwater were formed.

Groundwater is the decisive component of determining the state of the ecology of cities and the study of their dynamics plays a big role in substantiating the melodic state of soils, as well as in protecting the environment among, the recovery of the social-ecological system. Having more than two half thousand years of history, the city of Bukhara is one of the cities that made a unique contribution to the development of world civilization. Since the ancient times of dwelling science, culture and education, this alley has been weakened all over the world.

Reaching its independence of the Republic of Uzbekistan, great efforts were made to restore and develop national dignity, to preserve cultural heritage, especially historical valuable monuments. To present the task of honoring their future generation in general-preservation. A number of unique miraculous works of ancient architecture: Maszhi-diKalon, Chorbakr, Fortress Ark – were restored, and they took the true shape. In the Buxorregion are preserved many, unique monuments of antiquity, in the years of independence they have turned into comfortable and beautiful places of pilgrimage. Over 2000 such historical monuments are included in the UNESCO World Heritage List.

In recent years, the deterioration of geocological conditions, as well as changes in the hydrogeological situation, have led to an increase in the level of groundwater and mineral salts in the composition of groundwater are rising, and saline soils are being formed. This case is observed directly in the Bukhara region and the territories of the Aral Sea, the central and old-town part of the city of Bukhara, they exert a great influence on historical values.

The territory of the city of Bukhara is located in the southeastern part of the Bukhara oasis, in the sphere of the subaerial valley of the Zerafshan River, the III terrace of the river is widely distributed in the northeastern part of the city. The main direction of the flow of groundwater from the northeast to southwest. The study shows that, ground waters in the districts of the formation due to irrigation waters, infiltration water wasteful consumption in the water sector, atmospheric precipitation and groundwater currents.

In the 20-30s of the last century within the territory of the general geological and hydrogeological research conducted by the following prospectors: V.A. Butov, S.F. Mashkovtsev, V.A. Nikolaev, M.M. Reshetkin, M.T. Burak and B. Mitgarts (1944-1945), A.A. Vetrov, O.K. Inzhevator (1949). Based on the results of their work, geomorphological, stratigraphic maps, groundwater map and a map of the groundwater of the territory were compiled. Special studies to provide the necessary water and some objects were conducted by Kargin I.E., Volkov V.P., Farmonov B.F. (The Uzbek hydrogeological trust 1959-1963). A.A. Khudoiberdiev and A. Vitta made a hydrogeological map of the territory of the scale 1: 100000 in 1953-1957. In order to study the flooding of the city of Bukhara in 1969-1970, the first hydrogeological investigations were carried out. In 2005-2007, the Institute of State Enterprise "GIDROINGEO" carried out a study on the study of seismic methods of the basis of the soil of historical buildings (on the example of the madrasah Abdulazizhan).

The geological section consists of siltstones, sandstone, sandy loam, loam, sand, gravel.

In the city of Bukhara, the rise in the groundwater table, the soil moisture that directly influences historical values. The quality of bricks of buildings under the influence of dampness is deteriorated. During the winter, salts raising the moisture by dampening will attract the corrosion of bricks (one of the properties of water is a decrease in volume at a temperature of no higher and lower than + 40 °C).

Within the territory of the city of Bukhara, as a result of ecological-hydrogeological and geotechnical studies conducted in 2004-2008 [3], according to the gradual sinking of water in the territory of the city of Bukhara, four lithological sites were identified:

1. Zones with groundwaters, where the level is less than 1m;
2. The average, 1-3 m.
3. The territory with water flooding possibilities is 3-5 m.

4. Not submerged in water, more than 5 m.

On the territory and area of Labi-Khovuz (11 madrassas), the seasonal changes in the groundwater table are registered up to 1.5-2.5 m.

The main factors of groundwater formation are atmospheric precipitation. Changes in the number of multi-annual precipitation in the Bukhara meteorological station (Table No. 1) showed that if the annual amount of precipitation in 2007 was 142.3 mm, then in 2008-2009, this figure reached a maximum by 7 years, 2011 is observed a decrease, and in 2012-2013 there is an increase in the amount of precipitation.

2004-2008 on the territory of the city of Bukhara, the level of groundwater in the sediments of the Quaternary period is recorded at a depth of 0.7 m to 5 m [3]. 2010-2013, in the process of reporting activities of the Bukhara hydrogeological station, there was an increased level of seepage of water – 0.5-2.0 m in the months of March-April and June-August, and a lower level – 2.5-4.5 m in the months of December and February, and the connection was marked by the scale of groundwater fluctuations – 0.40-1.5 m. The level changes were observed in comparison with the average of 0.2-0.7 m in some places up to 1.0 m.

The reasons for these changes are the uneven distribution of irrigation water and the unsatisfactory operation of drainage systems [3]. As a result, there is an increase in the level of groundwater along the territory of the city. And this phenomena in their turn, will lead to the damp brick walls internal and external foundation of madrasa Mir-Arab madrasah Ulugbek (3), Madrasah Abdulaziz (Figure 4), madrassas Kukaldash, HonakoKukaldash, Nodirdevonbegi and several other The buildings located in the old town of Bukhari. As a result, there are processes of moistening, salinization, corrosion and destruction, which strongly affects the integrity of the bricks of buildings and in general the historical value.

This structure, restored 20 years ago, differs from other buildings in that after laying a 4-5 row of bricks to it, a wooden frame is laid. However, the foundation of the structure to the skeleton has begun to collapse, and in a relatively sheltered part of buildings from rainfall, where there is no skeleton, the damp rises 60 cm upwards, along the wall.

Madrasah Abdulazizhan is a double building, built in 1652 by the architect MimkhanibnKhojaMuhammaddin, on the southern side of the ensemble. It is located in front of Madrasah Mirzo Ulugbek (1419). The main parameters are: circle 50x67 m, yard – 28x35 m. Madrasa was put in order mainly by minor repair works (the columns are restored by UstaShirinMurodov). From Fig. 3, it can be seen that the right side and the butt part of the rear wall, the corner part of the Abdulazizhan madrasa, the bricks of the foundation of the raw material are moistened, in some places the bricks have been destroyed, are crumpled, even cracks up to 2 cm in size were formed in the rear walls.

Such changes associated with an increase in the water table can be observed in several historical monuments located in the old city of Bukhara.

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О ВОЗДЕЙСТВИИ ГИДРОГЕОЛОГИЧЕСКИХ УСЛОВИЙ ГОРОДА БУХАРЫНА ИСТОРИЧЕСКИЕ ПАМЯТНИКИ

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Аннотация. В данной статье, на основе данных гидрогеологического центра Бухары, обсуждается вопрос о негативном влиянии повышения уровня грунтовых вод в древней части города Бухары, и как следствие этого, стены исторических памятников увлажнились, покрылись соленым налетом, открылись трещины на некоторых участках стен.

Ключевые слова: динамика, мелиоративное состояние, грунтовая вода, Зеравшанские реки, субэвралный, речная терраса, ирригация, инфильтрационная вода, дренажная скважина, Тянь-Шан, сейсмоактивные.