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PROBLEMS OF USING WATER RESOURCES OF THE BUKHARA OASIS

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Abstract: It is considered the dynamics of soil salinization, mineralization of surface and underground waters Bukhara's oasis, as well as explanation of different reasons of it's origin. On the basis of hydrochemical analyses. It was show ion composition of drinking water of Bukhara city and several districts of Bukhara region.

Keywords: oasis, drainage system, ground water, water divider, ion, mineralization, structure, salinity, alluvial deposits.

The Bukhara oasis is located in the lower reaches of the Zarafshan river and it is surrounded on all sides by the Kizilkum Desert. Only in the north-eastern part of the oasis is bordered by the valley of the river Zarafshan and the foothill plain of the Mountains of Ziyavutdin. The surface of the Bukhara oasis gradually declines from east to west and from south-west towards the Amu Darya River. This common gradient defines the movement of surface water and groundwater on all territory. Depending on the slope, the canals, irrigation ditch and drainage network in the Bukhara oasis are spread from east to west, from south to west. Ground waters also have similar direction of movement. Therefore the salinity of groundwater and soil grows from the upper eastern to north-eastern part of the oasis. Exceptions are separate local areas where groundwater salinity is connected by geological structure and landscape. Until the 60-70s of the last century, the Bukhara and Karakul oases were fully supported with water from Zarafshan River. However, due to the increasing of irrigated land in the middle reaches of the region, there was a shortage of water in its lower reaches of Zarafshan River. In order to provide water to the Bukhara and Karakul oases in 1959 started to build Amu-Buhara canal which finished in 1975. The road is 233 km long and has 112 m3/sec of throughput capacity. Water before pumping station the "Hamza II" flows by its own then the pumping station rises water to 47 m. Then the channel connects

with the route ABCK -1 which is widen to the size of the second line. The arrival of Amu Darya water has improved the water supply of irrigated lands of Bukhara Region under Bukhara oasis were created two water reservoir Kuyumazar and Tudakul. The Kuyumazar Reservoir was built in 1957, area of reservoir 16,3 км^2 , average depth 18.7 m, maximum depth-44m. full volume-306 mln.m^3 . The Tudakul reservoir is located south-east of the Kuyumazar reservoir. Its total volume is 875 miln m3. area of water surface-225 km2, The average depth is 3.8 m Both reservoirs is filled with Amu Darya water. Every year loss on the evaporation of the Kuyumazar reservoir is 20 million m3, and The Tudakulsky 400 million m3. Every year due to the filtration a huge amount of water is lost from Amu-Bukhara and other channels. As a result along the route were formed a lot of reservoirs, swampy areas and salines. In the west between the Bukhara and Karakul oases, and also in the north and north-east of the oasis, there are hundreds of drying ponds, large salines, from which salts are blown away by the wind and get into irrigated land, which further strengthens the salinity of the earth. Since the arrival of the Amu Darya water, the supply in the Bukhara oasis has improved dramatically. In many areas water was used for irrigation more than the norm. Half of watering standards on meadow soils come in every hectare of cotton. Per season 5000-6000 m3 of water. In the oasis up to 12000-13000 m3 of water were often used for per hectare. With excessive watering, groundwater levels are rise, the space of salted areas increases. The drainage system created in the 60-70s of the last century, both in density and depth does not meet the requirements of today. The bottoms of many drainage channels are covered with a thick layer of silt and overgrown with aquatic plants which hamper the free movement of drainage water. In 1975, the area of unsalted soils was 30%, low-salted soils 40%, heavily salted soils occupied only 10% of the lands of Bukhara. By 2000, in 25 years, the area of unsalted soils decreased two times to 11%, in 2010 7%. Progressively the area of medium-salted and highly salted soils is growing. In 2010, medium salted soils composed for 32% of the area, heavily salted compose 21%. This dynamics of soil salinization says that more salts are being injected into the Bukhara oasis as a whole than it is derived from the oasis. In the total, this process leads to the fact that, if radical measures are not taken to meliorate salt lands, most of grounds may become unsuitable for crop planting.

Due to the increasing mineralization of groundwater in many areas of the Bukhara oasis, the water became not suitable for drinking. Almost all of the territory groundwater mineralization averages 1500-2000 mg/L. Where medium and heavily salted soils are widespread, groundwater mineralization exceeds 3,000-4000 mg/l. Until the 1950s, almost all people of the Bukhara oasis used groundwater to drink. Near each yard there were wells 8-18 meters deep. Only in cities and large towns, drinking water was supplied through a centralized water network. After the 1960s, due to the intensive development of oasis lands, the flow of salts to the Bukhara oasis increased from Malikchul, lying in the north-eastern part of the Bukhara oasis, and Urtachul lying in the north of the Tudakul. Due to the fact that in Malikchul and Urtachul in the depth of 50-80 cm lies gypsum horizon, which with irrigation dissolving began to migrate down the surface and underground drains. Up to date the water-salt balance of the Bukhara oasis has not been calculated. According to I.K. Nazarov (1992), the average annual diversion of drainage water outside the oasis is about 30-40% of the total water intake. The total amount of drainage water diverted beyond the boundaries of the Bukhara and Karakul oases varies from 1.8 to 2.2 km3 / year. Their mineralization currently ranges from 3000 to 10000 mg/l. In order to reduce the accumulated salts, it is necessary to remove them as much as possible from the territory of the oasis. The output amount of salts everywhere must be greater than the incoming salt from the outside. Then happens a desalination of the territory. In order to remove more salt from the territory, it is necessary to rebuild the collector and drainage system. For today they do not meet the requirements of the conditions of the Bukhara oasis. It is obvious that in all areas where the water level is about 2 meters from the earth`s surface, it should be reduced to 3 meters, in same places up to 5 meters, and clean all main sewers and auxiliary drains. Basic solution of finding out the reasons for the territorial diversity of the salinazation of the soil and groundwater is a analysis of the landscape structure of the oasis. An oasis is not an ideal flat surface filled with alluvial deposits. It has local elevations, depressions in which the type and thickness of sedimentary deposits differ sharply. This affects the supply and quality of groundwater, and the salinity of ground water and soil. Therefore, structural landscape

analysis based on the geological and geomorphologic structure of the territory will help explain many negative natural phenomena that occur in the oasis.

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