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Predicting Changes In Landscapes Around The Aydar-Arnasay Lake System

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ABSTRACT

A short, medium and long-term forecast of changes in the surrounding landscapes due to the reduction of water in the Aydar-Arnasay lake system has been developed.

KEYWORDS

Aydar-Arnasay lake system, forecast, forecast lag, retrospective, lake level, water inflow, outflow, mineralization.

INTRODUCTION

The study, analysis and forecasting of the impact of natural increase or decrease of water in the Aydar-Amasay lake system on natural geographical processes and surrounding landscapes is of great scientific and practical importance. "Events in the forecast area, or the expected reality, start early and happen completely after a certain period of time. In this process, a certain amount of time elapses between the beginning and the end of the event. This

difference is called the time "lag" of the forecast. "Lag" is an English word consisting of the time between the beginning and end of two processes or events "[3. Rafiqov A]. In the Aydar-Amasay lake system, the forecast lag's period is 50 years, from 1969 to 2020.

In order to predict changes in the natural geographical process and landscapes under the influence of water increase or decrease in the Aydar-Amasay basin, the

substantiation period of the forecast - the time of the beginning of the retrospective - is important. The retrospective period began in 1969 with the unification of the Aydar-Amasay lake system. In the Aydar-Amasay lake system, the retrospective period covers the period from 1969 to 2020, that 50 years. When analyzing the water inflow and outflow balance in the Aydar-Amasay lake system, the probability of further decrease relative to the increase of water (decrease of water discharged from Chordara reservoir and collector-drainage water) is high. According to the Department of Ecology and Environmental Protection of Jizzakh region in 2019, the water inflow in the Aydar-Amasay lake system is 2.5 km³, the outflow is 4.4 km³, and there is a decrease in water. Mineralization has increased from 5.07 g/l to 8.59 g/l over the last 10 years due to water depletion. Another 1.9 km³ of water will be needed to keep the lake level at 245 meters. If water flow and income balance are not ensured, the lake level will drop to an average of 30 cm per year.

If the water level in the Aydar-Amasay lake system decreases, it will be necessary to scientifically substantiate the development of the surrounding landscapes and ecological conditions, and to develop forecast conclusions and decisions on management. The dynamic change of the Aydar-Amasay basin and the surrounding landscapes is directly related to the Aydar-Amasay lake system. Therefore, first of all, we need to know about the water sources of the Aydar-Amasay lake system that the revenue part [1. Alibekov L].

Among the water sources flowing into the Aydar-Amasay lake system, the water level in the Chordara reservoir is likely to decrease in the future. This is due to the fact that in recent years, the Republic of Kazakhstan has improved the ability to pump water from the Chordara reservoir to the Syrdarya. In order to collect excess water from the Chordara reservoir, the Kuksaroy reservoir was built in the Syrdarya valley near the city of Kyzylorda. As a result, the inflow of water from the Chordara reservoir to the Aydar-

Amasay lake system has sharply decreased [2. Ismatov N].

In 2019, 1 km³ (981.7 million m³) of wastewater flowed into Amasay and Tuzkon lakes through Akbulak, Border Collector, Qli, JBZ and PK-6 (Longitudinal) collector-ditches. Although the level of mineralization of collector-drainage waters is high, the Aydar-Amasay lake system is the main part of the inflow. Collector-drainage waters are formed mainly due to wastewater collected as a result of irrigation. As a result of agrarian reforms in Uzbekistan, irrigation and land reclamation networks are improving and drip irrigation systems are being introduced to save water. This, in turn, leads to a decrease in the amount of discharged water from irrigated lands in the Mirzachul area to the collector-ditches.

The analysis of water inflow and outflow in the Aydar-Amasay lake system shows that if a sharp decrease in water is observed in the future, it is important to have an idea of the bottom of the lake and the surrounding landscapes. In the Aydar-Amasay lake system, a decrease in water volume is observed, while changes in the surrounding landscape are observed in the semi-hydromorphic-hydromorphic-subacval direction from the shore to the bottom of the lake, and in the semi-hydromorphic-automorphic direction from the shore to the periphery. In the Aydar-Amasay lake system, it will be necessary to use this law in predicting the formation and overall change of landscapes in areas where the volume of water decreases and turns into land.

In developing the forecast of changes in the Aydar-Amasay basin landscapes due to the decrease in water volume of the Aydar-Amasay lake system, in 1979 V.A. The method of landscape forecasting developed by Nikolaev was used. V.A. Nikolaev states that landscape forecasting can be short-term (3-5 y) and long-term (30-70 y), which is determined by the size, size and many other characteristics of human impact on the landscape, speed and scale [3. Rafiqov A.]. In the object under study, V.A. Nikolaev's method of landscape forecasting was used, and in addition, a

medium-term forecasting period (6-29 years) was included.

In forecasting the landscape types that will appear in place of the Aydar-Amasay lake system, features such as the gradual landing from the shore to the bottom of the lake and the difference between the bottom of Aydarkol and the bottom of Amasay and Tuzkon were taken into account. In separating the landscapes that appear at the site of the lake bottom, According to V.A. Nikolaev classification scheme was divided into 1 landscape category and 4 landscape types.

The topography, morphology and geological-geomorphological structure of the Aydar-Amasay lake system were the same, the genesis was the same. Within this landscape category, 4 landscape types were distinguished based on the characteristics of vegetation, soil, relief and deposits [4. Go'dalov M].

The descent of water in the Aydar-Amasay lake system and the changes in the landscape at the bottom of the lake also take into account changes from the shore to the bottom of the lake.

A landscape of wavy surfaces, the surface of which is covered with fine sand, and the bottom of which consists of sand and gravel. This landscape type corresponds to 5 m around the lakes, the lower limit of which appears along the shoreline as a result of water depletion in the Aydar-Amasay lake system. Until 1969, there was a shallow river in the lower reaches of the Amasay, which joins Aydarkol, where water flows from time to time. In the years when there was no water in Aydarkol, this river looked like a waterless river covered with salt, swampy, and sometimes sand.

The height of the Amasay basin near the Chordara reservoir is 245-248 meters above sea level, and the height of the confluence with Aydarkol is 240-244 meters. Due to the small slope, water flows from Chordara to Aydarkol. For this reason, swampy lands occupy a large area.

This means that in the Aydar-Amasay lake system, the water level decreases and the first landscape type 1-k appears from the coastal retreat. In this landscape type, if the groundwater is 0.5 m, the soils are saline, loamy and swampy, and plants such as saline, sagebrush are formed. These changes can be assessed with a short-term forecast period.

In the dynamics of landscape type 1-k, when the groundwater level drops from 0.5 m to 2.0 m, meadow soils, creeks, izen plants, yakan plants are formed. These changes can be assessed with a medium-term forecast period.

A landscape of sparsely saline, partially swampy wavy surfaces with sparse sarsaparilla and saline growth. This landscape type occurs as a result of water depletion in the Aydar-Amasay lake system, the lower limit of which may be 10 m depth contour. In the undulating wave-like plains, salt marshes are spread, and in some places sand-covered areas are formed. From the plants emerge species such as sarsazan, several different salts, jingil (Tamarix). At higher altitudes, halophyte vegetation is also widespread in the sand-covered transit zone, which is composed of sandy loam and loam. With several species of saline grows a thicker (Aeluropus litoralis), pea (Astragalus filicaulis), rabbit (Halocharis hispida) and others.

If, on average, the water level in the Aydar-Amasay lake system drops below 30 cm per year, it will take 30 years for the 2-k landscape type to be completely free of water. It is also necessary to take into account the natural geographical processes that accelerate or prevent the reduction of water. In the Aydar-Amasay lake system, when the water level falls below 1 m, the slope of the collector-ditches flowing into it increases and the erosion base decreases. As a result, the flow of water in the collector-ditches is accelerated, and erosion and cracking of the bottom and banks are observed. At the bottom of the lake, the thickness of the deposits increases several times [5. Gudalov M].

Decreased groundwater levels and soil salinity can be observed in landscapes where collector-ditches such

as Akbulak, Border Collector, Qli, JBZ and PK-6 (Longitudinal) flow into the Aydar-Amasay lake system.

Strongly saline and swampy, in some places a landslide bottom landscape with a layer of salt scattered. This landscape type occurs at the bottom of Aydarkol as a result of water depletion in the Aydar-Amasay lake system. The height of the bottom of the lake is 214-218 m above sea level, with a slight slope from east to west. Prior to the regular flooding of the Aydarkol basin, the bottom was muddy, salty, 105 km long and 2-3 km to 12 km wide. The resulting saline and swampy area occupies a much larger area at the bottom of the Aydarkol basin. Plants are very rare in saline, muddy, and saline soils where groundwater is constantly rising to the surface. Sarsazan (*Halo cnemum strobilaceum*) is found around salt marshes. Along with it grows salts of salmon (*Salsola lanata*), saline land salts (*Salsola inteicata*), salts (*Spergularia glaucophylla*).

3-k landscape type arises from the long-term period of the Aydar-Amasay lake system, when the water decreases sharply and the bottom of the lake is exposed. The main part of the 3-k landscape type can be covered with a layer of salt a few mm thick. As a result, along with the dust under the influence of wind, salts are also released into the environment.

The edges are reed, salty lakes covered with chaff. This landscape type appears on the site of Lake Tuzkon as a result of water depletion in the Aydar-Amasay lake system. This land is located in the ancient lake basin by origin. Lake Tuzkon is saturated with groundwater from the Qli Reservoir, the Nurata Range, and the Molguzar Mountains. In ancient times, there was water in Tuzkon even in the years when there was no water in Aydarkol. Only in the dry years did the water evaporate completely and a few feet of table salt remained at its bottom.

(see Table 1).

Table 1

Forecasting changes in landscapes due to lake water depletion *

Groundwater level, m	Soil types	Plant species	Natural geographical processes
0.5	saline, marshy, swampy	shora, yantak, sarsazan	Groundwater rises, swamps, salt presses, and sometimes waterless streams filled with sand develop

0.5-2.0	Meadow salt	ajrik, izen, yakan	In place of the lake, there will be transit zones covered with sand, consisting of sand and gravel
2.0-3.0	typical salts	jinjak, shirinmiya, akbosh	Where groundwater rises to the surface, it develops saline, muddy, and saline soils
5.0-7.0	residual salts	shuralar, karasakovul, kandim	In the undulating wave-like plains, salt marshes are spread, and in some places sand-covered areas are formed.

10-15	desert sand soils	saxophone, juzgun, tuyatovon	Under the influence of wind, the sand undergoes deflation, transport and accumulation processes
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* Compiled as a result of literature, fund materials and author's observations

Until 1969, Lake Tuzkon was 16 km long and 4.5 km wide. Lake Tuzkon is connected to Aydarkol by a narrow 6 km long corridor in the form of a river. For many years, excess water flowed from this corridor to Aydarkol, and during the short years, the water was stored in muddy saline form.

The height of the bottom of Lake Tuzkon is 228-229 meters above sea level, and the deepest point is 220 meters. The absolute height of the surrounding shores is 238-242 meters. Depth of groundwater in the basin varies from 0.3 to 0.5 meters. In many places they lie on the ground [6. Sharipov Sh].

It can be predicted that the 4-k landscape type that appears at the bottom of Tuzkon Lake will appear later, in the long run, than the 1-k, 2-k, 3-k-landscape types. This is due to the depth of the bottom of Lake Tuzkon, as well as the fact that the main part of the groundwater, which collects and flows from Mirzachol.

Given that the Aydar-Amasay lake system contained several meters of salt at the bottom of the Tuzkan before the flood, and that 10.2 million tons of salt came from the collector-ditches per year, it can be said that there are large salt reserves here [7. Sharipov Sh].

If the decrease in water in the Aydar-Amasay lake system continues at the same rate, in the 1st, 2nd and 3rd landscapes the properties do not change in the short term, in the medium term from hydromorphic to semi-hydromorphic, in the long term to automorphic. Landscape types 4, 5, 6, 7 transition from a semi-hydromorphic feature to an automorphic feature in the medium term. The remaining landscape types of the object under study are autorphic, and although a decrease in water is observed in the Aydar-Amasay lake system, no significant changes in the structure of the landscapes are observed.

In the future, the volume of water in the Aydar-Amasay lake system will decrease, while in the Aydar-Amasay basin the area of automorphic landscapes will expand according to local conditions, and the area of subacval and hydromorphic landscapes will decrease.

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