

The Koyandy soviet reservoir as the symbol of clean up water in Kazakhstan

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ABSTRACT

This paper contains discussion about current state of Koyandy reservoir (historical soviet object) and requests several ways to improve its geoeological state. The relevance of the topic in recent years has increased sharply anthropogenic load on the ecosystem of water bodies and the reason for this is the growing intensification of economic activity on water intake sites, increasing water consumption and wastewater discharge, as well as the growth of recreational load. As a result, there is an urgent need to optimize the system of monitoring the quality of small water bodies and the development of effective protective measures to prevent contaminants from entering the water. As Koyandy reservoir is visited by residents and guests of the city Nur-Sultan, where rested, bathed, often take an active part in one of the resting places of the adults. Currently, the ecological status of Koyandy reservoir requires study.

Keywords: Koyandy water reservoir, geoecological state of reservoir.

1 INTRODUCTION

The surface water resources of Kazakhstan are 100.5 km³, of which only 56 km³ are formed on the territory of the Republic. The remaining area of 44 km³ comes from neighboring countries: China – 18.9 km³, Uzbekistan – 14.6 km³, Kyrgyzstan – 3.0 km³, Russia – 7.5 km³[2].

The problem of water supply is one of the most acute issues under consideration in Kazakhstan and, in general, there is a significant regional deficit, even if the country does not experience a national shortage of water resources.

The total water fund of Kazakhstan is 450 km³. In Kazakhstan there are about 39 thousand rivers and temporary streams, more than 48 thousand lakes and about 4.0 thousand ponds and 204 reservoirs.

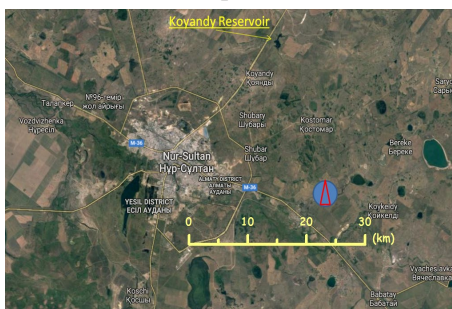


Fig. 1. Koyandy Reservoir North of Capital Nur-Sultan

The agricultural share accounts for more than 75% of the total volume of water resources used, the industrial share averages 18-22%, the municipal needs-about 7%. Water supply to the population averages 75% [3]. In order to provide the population with drinking water in the required quantity and quality,

the government of the Republic of Kazakhstan approved and implemented sectoral programs "Drinking water", "Ak Bulak". The efficient use and protection of water resources is an essential part of the integrated programme for the use of natural resources and environmental protection.

Based on the priorities of the Strategy «Kazakhstan-2030» and the concept of environmental safety of the Republic of Kazakhstan, strategic directions of development of the city of Nur-Sultan are a reliable and uninterrupted operation of the water supply and sanitation system of the city.

Future needs of the city, Nur-Sultan by 2030 will amount to \$ 209.4 million m³/year, including drinking needs-153.2 million m³/year, for technical needs-56.2 million m³ / year is considered [2].



Fig. 2. The view of Koyandy Reservoir

In accordance with the decree of the Government of the Republic of Kazakhstan dated December 21, 2004 No. 1344 reservoirs belong to the Republic. Also, by the resolution of the President of the Republic of Kazakhstan dated November 1, 2004 No. 1466 reservoirs are included in the list of water facilities of special strategic importance, including those that can be leased or managed in trust [32].

2 THE KOYANDY RESERVOIR

In this regard, there is a need for the effective use of nearby water sources for agriculture in the settlements adjacent to the city of Nur Sultan. One of them is the Koyandy reservoir.

Koyandy reservoir is located in the Akmola region, Tselinograd district, 35 km from the capital of Nur-Astana, along the river Koyandy. The area of the reservoir is 410 hectares and is an artificial reservoir.

Koyandy reservoir in use since 1989. The total design volume of the reservoir - 5.79 million m³, and a useful volume is 5.16 million.m³. The average and maximum length is 1.30 / 2.80 km. The average and maximum width is 1.10 / 2.0 km. The average and maximum depth is 3.22 / 16.80 meters. Total pond built of local material with a maximum high of 19,50 metres. The reservoir operates in a limited mode.



Fig. 3. Relaxing zone for people

3 WATER QUALITY OF KOYANDY RESERVOIR

The amplitude of water level changes depending on climatic features is from 0.5 to 1.1 meters. The bottom of the water in some places silted, the depth of silted sediments reaches 0.4-0.5 meters.[33].

Water salinity varies within 1,12-1,21 g/L. water clarity changes from 0.4 to 2.7 metres, depending on weather conditions and water depth.

The content of organic substances does not exceed the limit level of reservoirs for fishery purposes. The medium reaction is weak, pH = 7.1-7.4. the content of the main chemicals at the standard level.

The hydrochemical regime of water bodies depends on the ability of water to dissolve liquid, solid and gaseous substances. The combination of these substances, their nature and quantity largely determine the living conditions of fish in the pond.

Mineralization of water in different parts of the reservoir varies slightly (1.12-1.21 g / l). The transparency of the water in the reservoir varies from 0.4 to 2.7 meters and depends on weather conditions and to a greater extent on the depth. The concentration of phosphorus, silicon and iron occurs within the limits typical for surface uncontaminated waters. The content of organic substances does not exceed the maximum permissible concentration established for fishery reservoirs. The active reaction of the medium is weak, pH = 7.1-7.4. the content of the main chemical elements

within the norm. Chemical indicators of water Koyandy reservoir can be seen in the following first table.



Fig. 4. The pH decreased water pH / mV / Temp device

Control of the regime of hydrochemical and hydrobiological characteristics of reservoirs is very important, since most of these reservoirs are used for water supply, including drinking water.

The hydrochemical and hydrobiological regime of reservoirs in the first few years after their filling has a significant impact on underwater vegetation and soil cover. Decomposition of plant residues in the flood zone can adversely affect water quality. This process leads to a decrease in the oxygen content of the water layer before the appearance of a significant O₂ deficiency, which leads to the death of fish.

Macrophyte flora consists of 14 plant species, including 13 flowering hydrophytes and 1 coal algae. The level of growth of plants of the reservoir is relatively low. At the end of May, diatoms are growing everywhere, will decline in June and rise again in August.

Suppression of water area of plants is 5 %. Zooplankton consists of 23 species. The following fish species are grown and propagated on the reservoir: carp, carp, silver carp, Golden carp, pike, salmon. etc.

Table 1. Chemical indicators of water quality

Parameter's Name	Name of test method documentation	Norm of the ND	Actual value
Muddiness, mg / dm ³ no more	ГОСТ 3351-74	20	1.3
Color, degree no more	State standard 31868-2012	35	15
Hydrogen indicator, pH	State standard 26449.1-85	6.5-8.5	7.4
Alkalinity, mg equiv. / dm ³ no more	State standard 26449.1-85	-	2.4
Total hardness, mg equiv. / dm ³ no more	State standard 4151-72	7.0	4.4
Chlorides mg equiv. / dm ³ no more	National standard of the RK 10304-1-2009	350.0	128.3
Permanganate oxidation, mg O ₂ / dm ³ no more	State standard 26441.2-85	7.0	3.8
Sulphates, mg / dm ³ no more	National standard of the RK 10304-1-2009	500.0	95.1

Ammonium ions, mg / dm ³ no more	State standard 33045-2014	2.0	0.40
Nitrite, mg / dm ³ no more	National standard of the RK 10304-1-2009	3.0	0.034
Nitrate, mg / dm ³ no more	National standard of the RK 10304-1-2009	45.0	0.30
Dissolved oxygen, mg O ₂ / dm ³ no more	State standard 26449.1-85	4.0	7.8
Phosphates, mg / dm ³ no more	National standard of the RK 10304-1-2009	3.5	less 0.05
Fluorides, mg / dm ³ no more	National standard of the RK 10304-1-2009	1.2	0.16
Solids (mineralization), mg / dm ³ no more	State standard 18164-72	1000.0	530.56
Aluminum, mg / dm ³ no more	State standard 18165-2014	0.5	0.11
Manganese, mg / dm ³ no more	National standard of the RK State standard P 51309-2003	0.1	0.068
Total iron, mg / dm ³ no more	National standard of the RK State standard P 51309-2003	1.0	0.18

There is a deviation in two indicators, which is 4.5 dm³ of dissolved oxygen in the norm, and the results of the study are 7.8 dm³. The amount of deviations is 3.3 dm³. Aluminum at a rate of 0.5 dm³, and the result of the study-0.11 mg / dm³. The amount of deviations is 3.3 dm³. What did these figures 11 March 2019.

The growth of the reservoir is relatively low. In small quantities, hard plants (cane, horn) and soft aquatic plants contain blue-green algae. At the end of May, mass development of diatoms will begin. In June, the number of algae decreases. The increase in the number of diatoms in August is 5% - the degree of growth of the water area. The following table shows the bacteriological parameters of water of Koyandy reservoir.

There is not any deviations among bacteriological parameters of water of reservoir.

Nowadays, the main source of water in the city of Nur Sultan is the former Vyacheslav reservoir, its remoteness from the city, as a result of which high water consumption during water transportation requires the search for nearby reservoirs. In this regard, Koyandy reservoir can be not only a source of water, but subject to fisheries development, recreation, agriculture, and sports.

Table 2. Bacteriological indicators of water quality

As a result, the water quality meets the requirements of drinking water quality, but water, being a surface source, requires several stages of purification.

4 THE CURRENT GEOECOLOGICAL STATE OF THE KOYANDY RESERVOIR

Indicator's name	ND to the method of investigation	Amount according to the norm	Total amount
The number of LCPs in the stools is 1m ³	MY 3. 05. 039-97	No more than 10	60
The total number of microbes in the total microbial at 37 ° C (1 ml colony-forming bacteria)	MY 3. 05. 039-97	unmeasurable	6 195

In the future, there is a possibility of establishment of the beach on-site of Koyandy reservoir. Also in the future it is planned to create a fish hatchery or incubation shop.

In fact, the current ecological state of the reservoir requires its improvement.

Today this large reservoir equips several suburban communities, and residents pollutes the water waste. As Koyandy reservoir becomes one of the vacation spots of people. People who came to rest, pollute the coast with mining waste, household waste. Because Koyandy reservoir is one of the recreation places, where residents and guests of the city Nur-Sultan come to rest, bath. Also fishermen often shows activity there.



Fig. 5. On cleaning the territory of the reservoir

Unfortunately, it was found that currently the ecological status of Koyandy reservoir subjected to anthropogenic impact. Koyandy reservoir can be not only a source of water, but subject to fisheries development, recreation, agriculture, and sports.



Fig. 6. The contaminated plastics from coastal area of Koyandy reservoir

On the basis of officially published materials we can list the following environmental problems in the basin: siltation of the bottom; the lack of direct control of the water level, the characteristics of its seasonal changes; rare monitoring of water quality, water body use by local residents in the tourist purposes and for certain sports, which leads to increase of debris in the water, and changing of habitat of aquatic plants and animals.; in

settlements located near the reservoir, there is no centralized sewerage system, the population discharge wastewater into underground wells, which should be regularly cleaned, or will discharge into reservoirs.

As the Koyandy reservoir (historical soviet object)for the local population is not only a source of water, but also an object for various household and field farms, its crucial to implement the improvement of ecological status of Koyandy reservoir.

It is necessary to monitor the completeness of the preservation of biocenosis in the reservoir. It is necessary to clean regularly from dirty waters coming from outside.

CONCLUSIONS

To this end, I propose to carry out the following measures to improve the ecological situation of the reservoir:

- annual monitoring of water quality within the framework of state monitoring, including bacteriological and chemical analysis of water;
- strengthening of the system of protection and safety of the reservoir in order to protect against unauthorized discharge of wastewater, poaching from illegal fishing.
- establishment of the huntsmen service with vehicles and appropriate devices (boats, binoculars, special lights, etc.), placement of information boards on the status of water;

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