



# Research on the Physical and Chemical Properties of Water in Boyukshor and Khojasen Lakes

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## Abstract

The article is a comparative evaluation of the physicochemical and microbiological parameters of the water in Lake Boyukshor and Khojasan, which are ecologically sensitive water bodies on the Absheron Peninsula. As emphasized in the article's introduction, the lakes have been impacted by the production of oil, industrial wastes, domestic wastewater, and urbanization for a number of years due to the closed hydrological regime and low self-purification ability; as a result, the accumulation of substances has increased. The analysis results show that the pH in both lakes is weakly alkaline (Boyukshor 8.44; Khojasan 8.22), and the temperature is typical for the summer season. Color, turbidity, and salinity indicators are higher in Lake Boyukshor; TDS (35,200 mg/L), electrical conductivity (58,900  $\mu\text{S}/\text{cm}$ ), and chloride (24,959 mg/L) confirm its hypersaline nature. A dissolved oxygen level of 1.92 mg  $\text{O}_2/\text{L}$  indicates that the oxygen deficit has reached a critical level. In Lake Khojasan, the OCT of 177 mg  $\text{O}_2/\text{L}$  indicates a higher content of oxidizable organic matter, and the high level of enterococci in microbiological indicators indicates that sanitary risks remain strong. The proposed measures include pollution source control, aeration, biogen limitation, it is based on selective sediment treatment and strengthening of systematic monitoring. Overall, the results show that ecological risks are still high in both lakes. However, it shows that the main problems in the lakes are dominated by different directions (hypersalinity and oxygen deficiency in Boyukshor, organic load and microbiological risk in Khojasan).

**Keywords:** Lake Boyukshor, Lake Khojasan, physical properties, water composition, chemical composition.

## 1. Introduction

Lakes Boyukshor and Khojasan are considered the largest and most ecologically sensitive water basins of the Absheron Peninsula, and have been subjected to intensive anthropogenic impacts for many years. Since the areas where both lakes are located were formed under the influence of industrial enterprises, transport infrastructures, and densely populated areas, their hydroecological status is of particular importance in terms of the overall ecological security of the region (State Statistical Committee, 2023). In particular, oil production, industrial waste, domestic wastewater, and urbanization processes have seriously affected the water quality of Lake Boyukshor and Lake Khojasan; as a result, significant changes were observed in the physical and chemical properties of water. For this reason, a scientific study of water quality indicators in both lakes is an urgent and necessary issue. The physical and chemical properties of water are among the main indicators in assessing the ecological status of water bodies. Physical parameters such as temperature, color, transparency, turbidity, electrical conductivity, and density characterize the intensity of hydrological and physicochemical processes occurring in the aquatic environment. Chemical indicators reflect the quantity and quality of dissolved substances in water, and these include hydrogen ion concentration (pH), salinity, total hardness, oxygen regime, biogenic elements, heavy metals, and petroleum products. A comprehensive study of these indicators makes it possible to determine the source and scale of pollution processes occurring in Lakes Boyukshor and Khojasan. One of the specific features of both lakes is that they were formed as closed water bodies for a long time, and the natural self-cleaning potential is

weak. This factor accelerated the accumulation of pollutants in lakes and caused a disruption in the physical and chemical balance of water. As a result, negative conditions such as increased salinity, oxygen deficiency, and accumulation of heavy metals and petroleum products have occurred in both Boyukshor and it was also observed in the Khojasan lakes. These changes affect not only water quality but also the biological diversity of the lakes and have had a negative impact on the overall health of the environment. According to modern ecological approaches, monitoring of closed water bodies should be carried out continuously and systematically. The study of the physical and chemical properties of water in Lakes Boyukshor and Khojasan will allow for an objective assessment of the current ecological situation, and it will allow for the determination of pollution levels and the scientific planning of future remediation measures. These studies are also important from the point of view of evaluating the efficiency of rehabilitation and reclamation work. The study of the physical and chemical properties of water in Lakes Boyukshor and Khojasan is not only a study of local ecological problems, but it is a means of creating scientific foundations for the protection of water resources in connection with urbanization. The research carried out on this topic is a significant contribution to the issue of ecological security on the Absheron Peninsula, as well as maintaining a healthy aquatic environment for future generations. The scientific literature on the study of the physical and chemical properties of water in Lakes Boyukshor and Khojasan is mostly based on the fact that there has been an intense urbanization process on the Absheron Peninsula (Bayramoğlu, 2011). Both lakes are among the most sensitive hydroecological objects on the peninsula and are characterized by long-term accumulation of anthropogenic load. In the literature, there are many studies on the physical and chemical parameters of lake water, especially pH, salinity, electrical conductivity, dissolved oxygen, biogenic elements, biological oxygen demand (BOD), and chemical oxygen demand (COD) monitoring are noted as the main research directions. Studies show that Lakes Boyukshor and Khojasan are particularly vulnerable to external pollutant flows due to their closed hydrological regime and have limited self-purification potential. For this reason, changes in physicochemical parameters turn into cumulative ecological risks in a short time (Hajiyeva et al., 2020). In the hydroecological approach, physical parameters — temperature, turbidity, transparency, electrical conductivity, and salinity — describe the processes of metabolism in water, which explains the mechanism of accumulation of salts and suspended particles, particularly in these lakes. Chemical indicators include the oxygen regime, the intensity of organic pollution, which allows determining the dynamics of nitrogen-phosphorus compounds, and the level of toxic components. In the literature, projects implemented to restore Lake Boyukshor and Khojasan have formed a separate line of research. Official data indicate that industrial and domestic wastewater have been discharged into both lakes for many years. Within the framework of rehabilitation projects, these flows are sharply restricted, and oil products. It is noted that a decrease in the concentrations of heavy metals has been observed. Evaluation of the results of these projects, monitoring the changes in physical and chemical parameters over time, and a comparative analysis of Lake Boyukshor and Lake Khojasan are also important in terms of assessing the real effectiveness of the ecological restoration of water bodies

## **2. Research object and methodology**

### **2.1. Research object**

The main object of this study is the central and western part of the Absheron Peninsula, the aquatic ecosystems of Lake Boyukshor and Khojasan are highly exposed to anthropogenic impact. The object of the study includes the physicochemical composition of the mentioned lakes, which are situated in an area facing significant geoenvironmental problems related to urban groundwater management and industrial impact (Alekperov et al., 2006). The object of the study includes the physicochemical composition of the mentioned lakes, water quality indicators, salinity level, and microbiological contamination level. The fact that both lakes have a closed hydrological regime and are located in an urban environment is a reason for assessing the ecological status in the context of modern hydrogeological conditions (Namazov et al., 2024).

Lake Boyukshor is a lake of strategic importance because of its large surface area and past oil pollution. Lake Khojasan was analyzed as an ecosystem directly affected by the residential areas.

As part of the study, the transparency, color, degree of mineralization, and oxygen balance of the lake water were comprehensively studied. The research object includes the following:

- Water mass of Boyukshor and Khojasan lakes;
- Water samples taken from the coastal zones of lakes;
- Physical parameters of water (temperature, turbidity, color);
- Chemical composition of water (pH, chlorides, sulfates, salinity);
- Microbiological indicators (coliform bacteria, enterococci).

## 2.2. Research methods

The research methodology is based on the principles of water quality monitoring, ecological chemistry, and sanitary-microbiological analysis. To ensure the scientific integrity of the study, laboratory analyses were carried out using methodologies in accordance with international standards (ISO and SM). In the research process, general scientific methods were used - comparative analysis, systematic approach, and statistical evaluation methods. Laboratory tests conducted on samples taken on 10.07.2025 allowed us to compare the current state of both lakes in terms of dynamics.

The main methods used in the study:

- Photometric and titrimetric methods: For the determination of chemical elements (chloride, sulfate, calcium, magnesium);
- Electrometric method: for measuring pH and electrical conductivity;
- Winkler method (or membrane electrode): For the determination of dissolved oxygen;
- Membrane filtration method: For the analysis of microbiological indicators (CFU/100 ml);
- Comparative analysis method: To compare the results with the current sanitary and hygienic standards (SHS) of Azerbaijan.

## 3. Results obtained and their analysis

The hydrochemical regime of lakes depends mainly on arid climatic conditions and man-made waters (Mamedov, 2007). The water of Lake Boyukshor has a high degree of mineralization and is mainly composed of chloride, sulfate, and sodium. In this lake, the evaporation process exceeds precipitation, increasing the concentration of salts, creating a hypersaline environment. The values confirm the hypersaline nature of the lakes, characterized by high concentrations of specific anions and mineral salts, which aligns with recent findings on the physicochemical parameters of water samples from the Absheron region (Hajiyeva et al., 2024). Lake Khojasan, on the other hand, exhibits a more distinct ecological profile due to its morphological structure. Here, high levels of organic pollution (OCT and OBT) strain the oxygen regime of the water and accelerate eutrophication processes (Hajiyeva et al., 2020). Although both lakes play an important role in the landscape structure of the Absheron Peninsula, anthropogenic pressure limits their natural functions. The concept of assessing the ecological status of water bodies was first introduced into scientific circulation in the context of the protection of natural resources and included within the framework of its restoration. In Western scientific approaches, watershed monitoring is considered an important component of the concept of "Sustainable Development". Scientific literature emphasizes the management of aquatic ecosystems, minimizing impact on nature and preserving biological diversity, it is explained as a form of activity that has environmental education as its main goal. This concept emerged in the late 20th century and has been closely linked to the principles of sustainable development. The main idea is to ensure the regeneration and long-term conservation of natural resources while using them (Ceballos-Lascuráin, 1996). One of the most important features of aquatic ecosystem monitoring is that it is based on the principle of environmental responsibility. According to this principle, anthropogenic activities (industrial and domestic effluents) should not exceed the carrying capacity of the ecosystem, nor should they hinder the natural development of flora and fauna species. All interventions, especially in sensitive water bodies such as Boyukshor and Khojasan, must be carried out within established norms and

regulations. This fundamentally differentiates a scientific restoration process from disorderly man-made impacts. The theoretical basis of scientific research in water comes from environmental ethics. Ecological ethics entails establishing harmony in the relationship between man and nature. Ecological ethics assert that man not only uses nature but also protects it. This principle of ecology should be applied in aquatic ecosystems under stressful conditions, such as Lake Boyukshor and Lake Khojasan, which are located on the Absheron Peninsula. Scientific research indicates that a well-designed system of monitoring can play an important role in protecting an ecosystem. The information obtained from physical and chemical analysis of water can be used to improve park infrastructure. It can be used to enhance scientific research. In addition, there is also an ecological educational function in the process of restoring water bodies, as well as a function of creating environmental awareness (UNEP, 2020). The implementation of theoretical foundations in the management strategy for Lakes Boyukshor and Khojasan is related to environmental policy in the country. In this case, monitoring activities are not just about collecting numbers; it also has to do with a scientific, educational, and conservation-oriented process. This approach is considered to be more effective in terms of biodiversity conservation (Weaver, 2001). The key principles for protecting aquatic ecosystems include integrity, environmental education, and the involvement of local communities in this process (Honey, 2013). According to Buckley (2011), watershed restoration can make a real contribution to biodiversity conservation with rigorous planning and constant monitoring.

The results obtained as a result of the analysis were as follows:

*Table 1. Physico-chemical indicators of Lake Boyukshor*

№	Parameter	Unit	Result	Measurement uncertainty	Analysis date	Method	Quality requirements
<b>Physico-chemical parameters</b>							
1.	pH	pH unit	8,44		10.07.2025	ISO 10523:2008	
2.	Temperature	°C	22,2		10.07.2025	SM 2550 B:2017	
3.	Smell	honey	0		10.07.2025	QOST-3351-74	
4.	Color	mg Pt /L	109,6		10.07.2025	ISO 7887 C:2011	
5.	Turbidity	NTU	59,1		10.07.2025	SM 2130 B:2017	
6.	COD	mg O <sub>2</sub> /l	57		10.07.2025	SM 5220 B:2017	
7.	Ammonium as Nitrogen	mg/L	0,78		10.07.2025	SM 4500-NH <sub>3</sub> <sup>-</sup> C:2017	
8.	Total hardness	mg CaCO <sub>3</sub> /L	13100		10.07.2025	SM 2340 C:2017	
		mg-ekv/L	262				
9.	Bicarbonate	mg /L	1232		10.07.2025	ISO 9963:1994	
10.	Total Dissolved Solids	mg/L	35200		10.07.2025	SM 2510 B:2017	
11.	Dissolved oxygen	mg O <sub>2</sub> /l	1,92		10.07.2025	SM 4500 O <sub>2</sub> C:2017	
12.	(Cl) Chloride	mg/L	24959		10.07.2025	ISO 9297:1989	



№	Parameter	Unit	Result	Measurement uncertainty	Analysis date	Method	Quality requirements
<b>Physico-chemical parameters</b>							
13.	Nitrate as Nitrogen	mg/L	7,6		10.07.2025	SM 45 00NO <sub>3</sub> <sup>-</sup> D:2017	
14.	(NO <sub>2</sub> ) Nitrite as Nitrogen	mg/L	<0,006		10.07.2025	SM 4500 NO <sub>2</sub> <sup>-</sup> :2017	
15.	(SO <sub>4</sub> <sup>2-</sup> ) Sulfate	mg/L	3593		10.07.2025	SM 4500 SO <sub>4</sub> <sup>2-</sup> -E:2017	
16.	Phosphate as phosphorus	mg/L	13		10.07.2025	SM 4500 P C:2017	
17.	Transmittance	%	53,0		10.07.2025	SM 2120 D:2017	
18.	Conductivity	µS/cm	58900		10.07.2025	SM 2510 B:2017	
19.	BOD	mg O <sub>2</sub> /l	15,5		15.07.2025	SM 5210 B:2017	
20.	Iron	µg/L	<1		11.07.2025	EPA 200.7:2001	
21.	Manganese	µg/L	5,6		11.07.2025	EPA 200.7:2001	
22.	Zinc	µg/L	1,1		11.07.2025	EPA 200.7:2001	
23.	Nickel	µg/L	<1		11.07.2025	EPA 200.7:2001	
24.	Cobalt	µg/L	<1		11.07.2025	EPA 200.7:2001	
25.	Chromium	µg/L	1,3		11.07.2025	EPA 200.7:2001	
26.	Molybdenum	µg/L	<1		11.07.2025	EPA 200.7:2001	
27.	Cadmium	µg/L	<1		11.07.2025	EPA 200.7:2001	
28.	Lead	µg/L	<5		11.07.2025	EPA 200.7:2001	
29.	Copper	µg/L	<5		11.07.2025	EPA 200.7:2001	

The results of physicochemical and microbiological analyses conducted on Lake Boyukshor allow for a comprehensive assessment of the current ecological state of the lake (Hajiyeva et al., 2017). The quality of the aquatic environment is not only determined by comparing individual indicators with standards, but it is also determined based on an analysis of the interactions between these parameters. The presented indicators clearly reflect the intensity of both natural and anthropogenic processes in the lake. A pH of 8.44 indicates that the aquatic environment is alkaline. This situation is due to the climatic characteristics of the Absheron Peninsula, which is explained by the high evaporation rate and the abundance of salts dissolved in the water. An alkaline environment is characterized by the presence of some biogenic elements, and it can affect the behavior of heavy metals in water, changing their sedimentation or bioavailability. The temperature of 22.2 °C is considered typical for the summer season and creates conditions for the acceleration of biochemical reactions. Color (109.6 mg Pt/L), turbidity (59.1 NTU), and light transmittance (53%) indicate that the water in the lake is loaded with large amounts of suspended particles and colloidal matter. Physical parameters are often associated with organic pollution, surface runoff, and re-mixing of bottom sediment. High turbidity may influence the oxygen balance in the ecosystem in a negative way by limiting photosynthesis. Chemical parameters clearly indicate the level of pollution in the lake. The values of OKT

(57 mg O<sub>2</sub>/L) and OBT<sub>5</sub> (15.5 mg O<sub>2</sub>/L) indicate a large amount of organic matter in the water. This led to intensive oxygen consumption and a critically low dissolved oxygen level of 1.92 mg O<sub>2</sub>/L. Such conditions create stress for aquatic organisms and can lead to the dominance of anaerobic processes. The very high total dissolved salts (35200 mg/L), electrical conductivity (58900 µS/cm), and chlorides (24959 mg/L) indicate that the lake water is hypersaline in nature. This situation is closely related to Lake Boyukshor being a closed water body, strong evaporation, and long-term pollution. High hardness (13100 mg CaCO<sub>3</sub>/L) and sulfate (3593 mg/L) levels confirm that the water is exposed to man-made influences. Regarding biogenic substances, ammonium nitrogen (0.78 mg/L), nitrate nitrogen (7.6 mg/L) and phosphate phosphorus (13 mg/L) indicate a high risk of eutrophication. Especially high concentrations of phosphate can accelerate the processes of algal bloom and oxygen deficiency. Most trace elements and heavy metals present at low or below the detection limit can be considered a positive case. Microbiological indicators showed very high levels of total coliform bacteria; however, E. coli was not detected, indicating a predominantly non-fecal microbiological contamination.

Table 2. Physico-chemical indicators of Lake Khojasan

№	Parameter	Unit	Result	Measurement uncertainty	Analysis date	Method	Quality requirements
<b>Physico-chemical parameters</b>							
30.	pH	pH unit	8,22		10.07.2025	ISO 10523:2008	
31.	Temperature	°C	22,3		10.07.2025	SM 2550 B:2017	
32.	Smell	honey	0		10.07.2025	QOST-3351-74	
33.	Color	mg Pt /L	85		10.07.2025	ISO 7887 C:2011	
34.	Turbidity	NTU	53,9		10.07.2025	SM 2130 B:2017	
35.	COD	mg O <sub>2</sub> /l	177		10.07.2025	SM 5220 B:2017	
36.	Ammonium as Nitrogen	mg/L	1,5		10.07.2025	SM 4500-NH <sub>3</sub> <sup>-</sup> C:2017	
37.	Total hardness	mg CaCO <sub>3</sub> /L	1300		10.07.2025	SM 2340 C:2017	
		mg-ekv/L	26				
38.	Bicarbonate	mg /L	756		10.07.2025	ISO 9963:1994	
39.	Total Dissolved Solids	mg/L	27300		10.07.2025	SM 2510 B:2017	
40.	Dissolved oxygen	mg O <sub>2</sub> /l	4,21		10.07.2025	SM 4500 O <sub>2</sub> C:2017	
41.	(Cl <sup>-</sup> ) Chloride	mg/L	20917		10.07.2025	ISO 9297:1989	
42.	Nitrate as Nitrogen	mg/L	8,3		10.07.2025	SM 45 00NO <sub>3</sub> <sup>-</sup> D:2017	



№	Parameter	Unit	Result	Measurement uncertainty	Analysis date	Method	Quality requirements
<b>Physico-chemical parameters</b>							
43.	(NO <sub>2</sub> <sup>-</sup> ) Nitrite as Nitrogen	mg/L	<0,006		10.07.2025	SM 4500 NO <sub>2</sub> <sup>-</sup> :2017	
44.	(SO <sub>4</sub> <sup>2-</sup> ) Sulfate	mg/L	3304		10.07.2025	SM 4500 SO <sub>4</sub> <sup>2-</sup> -E:2017	
45.	Phosphate as phosphorus	mg/L	2,3		10.07.2025	SM 4500 P C:2017	
46.	Transmittance	%	61,8		10.07.2025	SM 2120 D:2017	
47.	Conductivity	µS/cm	45500		10.07.2025	SM 2510 B:2017	
48.	BOD	mg O <sub>2</sub> /l	13,5		15.07.2025	SM 5210 B:2017	
49.	Iron	µg/L	13,5		11.07.2025	EPA 200.7:2001	
50.	Manganese	µg/L	21		11.07.2025	EPA 200.7:2001	
51.	Zinc	µg/L	6,7		11.07.2025	EPA 200.7:2001	
52.	Nickel	µg/L	3,8		11.07.2025	EPA 200.7:2001	
53.	Cobalt	µg/L	1,5		11.07.2025	EPA 200.7:2001	
54.	Chromium	µg/L	<1		11.07.2025	EPA 200.7:2001	
55.	Molybdenum	µg/L	6,5		11.07.2025	EPA 200.7:2001	
56.	Cadmium	µg/L	<1		11.07.2025	EPA 200.7:2001	
57.	Lead	µg/L	<5		11.07.2025	EPA 200.7:2001	
58.	Copper	µg/L	<5		11.07.2025	EPA 200.7:2001	
<b>Microbiological parameters</b>							
59.	Total Coliform Bacteria	CFU/100 ml	5,4x10 <sup>4</sup>		12.07.2025	SM 9222 B:2017	
60.	E.Coli	CFU/100 ml	0		12.07.2025	SM 9222 B:2017	
61.	Enterococci	CFU/100 ml	6,0x10 <sup>3</sup>		15.07.2025	EN ISO 7899-2:2000	

Source: Prepared by the author's own research.

The table presented reflects a comprehensive analysis of the water sample of Lake Khojasan on physicochemical and microbiological indicators, and the results allow for an assessment of the water quality status. According to the analysis, the pH value is 8.22, indicating a weakly alkaline environment, which is in line with the generally accepted range for natural waters. The temperature of 22.3 °C indicates that the

sample was taken under seasonal conditions. However, the turbidity (53.9 NTU) and color index (85 mg Pt/L) are high, which indicates a high concentration of suspended particles and organic matter in the water. This indicates poor aesthetic quality and the need for additional cleaning steps. High chemical oxygen demand (COD = 177 mg O<sub>2</sub>/L) indicates the presence of oxidizable organic and inorganic substances in the water, indicating an abundance of inorganic substances. However, the BOD<sub>5</sub> indicator of 13.5 mg O<sub>2</sub>/L confirms the presence of biodegradable organic pollution. Dissolved oxygen at a level of 4.21 mg O<sub>2</sub>/L indicates a weakened oxygen balance in the aquatic environment. Mineralization indicators are particularly noteworthy. Total dissolved salts (TDS = 27,300 mg/L) and the very high electrical conductivity (45,500 μS/cm) indicate that the water is highly saline. The high concentrations of chloride (20,917 mg/L) and sulfate (3,304 mg/L) ions reinforce this result. A total hardness of 1300 mg CaCO<sub>3</sub>/L indicates that the water is very hard, which can cause problems in technical use. Concentrations of heavy metals (iron, manganese, zinc, nickel, etc.) are relatively low, and most are below the detection limit, indicating that toxic metal contamination is not serious. However, microbiological indicators are risky: high levels of total coliform bacteria (5.4×10<sup>4</sup> CFU/100 ml) and enterococci (6.0×10<sup>3</sup> CFU/100 ml) pose a sanitary-epidemiological threat, highlighting the ongoing impact of natural and anthropogenic factors on the microbiological quality of water resources in the region (Jafarova, 2026).

Lakes Boyukshor and Khojasan are closed water bodies located on the Absheron Peninsula; despite being formed under similar climatic and anthropogenic conditions, they exhibit certain differences in terms of water quality indicators. The pH values in both lakes are 8.44 and 8.22, respectively, reflecting a weakly alkaline environment, which is also associated with high evaporation and mineral accumulation. The fact that temperature readings are almost at the same level (22.2–22.3 °C) indicates that seasonal effects are similar for both lakes. In terms of physical indicators, turbidity (59.1 NTU) and color (109.6 mg Pt/L) in Lake Boyukshor are higher than in Lake Khojasan. This indicates that the re-mixing of suspended particles, colloidal substances, and bottom sediments in Boyukshor is more intense. In terms of chemical indicators, the total dissolved salts in Lake Boyukshor (35,200 mg/L), the fact that its electrical conductivity (58,900 μS/cm) and chlorides (24,959 mg/L) are significantly higher than those of Lake Khojasan proves that it is more hypersaline in nature. At the same time, the critically low level of dissolved oxygen in Boyukshor (1.92 mg O<sub>2</sub>/L) indicates that the oxygen deficit is more acute. The fact that the OCT index (177 mg O<sub>2</sub>/L) in Lake Khojasan is significantly higher than in Boyukshor indicates that there are more oxidizable organic substances in the water. Although microbiological indicators are risky in both lakes, the level of total coliform bacteria (1.36×10<sup>5</sup> CFU/100 ml) in Boyukshor is higher than in Lake Khojasan. Thus, the comparison shows that Lake Boyukshor, with its higher salinity and oxygen deficiency, is characterized by stronger organic pollution.

The results of the conducted physicochemical and microbiological analyses show that the ecological status of Lake Boyukshor is still in a high-risk zone and necessitates the implementation of complex, phased, and scientifically based measures to improve this situation. The proposed measures should be aimed at both eliminating pollution sources and restoring the lake's own ecological functions.

- First of all, the full identification and control of pollution sources entering the lake should be identified as a top priority. The channels through which surface flows, rainwater, industrial, and domestic waste enter the lake should be mapped, and primary mechanical and biological treatment systems should be established for these flows. Especially considering the high organic matter load, the direct discharge of wastewater into the lake should be completely stopped.
- Critically low dissolved oxygen levels pose a serious threat to biological life. To reduce the high organic load in the lakes, advanced treatment technologies such as the photocatalytic removal of organic pollutants could be considered as part of a long-term remediation strategy (Khalilova et al., 2018).
- Due to the high concentration of nitrogen and phosphorus compounds, the entry of biogenic substances into the lake is to be minimized. In this regard, the system of fertilizers and domestic waste management is to be improved in the surrounding areas, along with the creation of a green zone. At the same time,

the introduction of phosphorus-absorbing substrates or phytoremediation methods will increase the lake's self-regulating ability.

- Taking into account the high salinity and mineralization of the water, measures should be taken to regulate the hydrochemical balance. If possible, a controlled supply of relatively low-mineralized water to the lake, optimizing the water balance and reducing the impact of evaporation, can help stabilize the lake's physical and chemical parameters. Although this process requires long-term planning, it is important for ecosystem restoration.
- Sediments, where organic matter and pollutants have accumulated over a long period of time, act as a secondary source of pollution for the lake. Therefore, it is advisable to apply technologies such as selective removal, stabilization, or capping of sediments. These measures prevent toxic substances from re-entering the water column.
- High levels of total coliform bacteria are considered to be a sign of sanitary risks. In this case, it is necessary to carry out microbiological monitoring, disinfection of possible sources of contamination, and a risk analysis for public health. At the same time, it is necessary to introduce temporary restrictions on recreational activities, and economic activities around the lake should also be considered.

#### 4. Result

The measurements conducted confirm that the water quality of Lake Boyukshor and Lake Khojasan is characterized by a high level of risk indicators from an ecological standpoint. The most critical result of the conducted analysis is the low level of dissolved oxygen. This, in combination with a high level of organic matter (indicated by OCT and OBT<sub>5</sub>), can lead to anaerobic processes in the aquatic ecosystem. The hypersaline character of the water (high TDS, chloride, and electrical conductivity) indicates a high level of evaporation processes in the lake's water balance. At the same time, it acts as a limiting factor in terms of biological diversity. The high level of phosphate phosphorus indicates a high level of eutrophication and algal bloom in the lake. This suggests that these processes can further contribute to a deficiency in oxygen.

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