

# **HYDROCHEMICAL ANALYSIS OF WATER COMPOSITION OF AYDAR-ARNASAY LAKE SYSTEM**

**Zuhra Yakhshieva<sup>1</sup>, Yorqinoy Ahmadjonova<sup>2</sup>, Zulayho Smanova<sup>3</sup>**

<sup>1</sup>*Jizzakh State Pedagogical University, Jizzakh, Uzbekistan*

<sup>2</sup>*Jizzakh Polytechnic Institute, Jizzakh city, Uzbekistan*

<sup>3</sup>*National University of Uzbekistan, Tashkent, Uzbekistan*

*Received: 25 december 2023*

*Accepted: 12 march 2024*

*Published: 30 may 2024*

---

Man-made changes on the planet occur so quickly that they can be compared with geological disasters. Despite all human efforts aimed at minimizing the negative consequences of human life on the planet, man has changed and continues to change the living environment to one degree or another.

The study of the hydrology and hydrochemistry of the Aydar-Arnasoy lake system (AAKT), that is, the quantity, composition, mineralization of water, the analysis of oxygen content, nitrogen compounds, heavy metals, the study of the morphology and biological potential of the area on the scientific base plays an important role in the development of fishing and ecological tourism .

For this reason, we studied the ecological condition of the water of a large lake in the territory of Uzbekistan, carried out monitoring of pollution with heavy metals, and set the main task of studying the pollution of heavy metals associated with ecotoxicants.

In the article, water contours in the Aydar-Arnasoy lake system (AALS) are analyzed by photocolometric analysis. The ecological status of AALS was analyzed through the chemical composition of water.

**Keywords:** Aydar-Arnasoy lake system (AALS), Ramsar Convention, ammonium ions, chloride ions, heavy metals, Tuzkon, Akbulok, Kli collector

---

On a global scale, in the conditions of global climate change, due to the increase in the water volume of the Aydar-Arnasoy lake system (AALS), the negative impact of the lake system on the environment has increased due to the flooding of pastures around the lakes, the quantity and quality of water resources have increased. indicators, the state of reclamation of irrigated lands has deteriorated due to the rise in the level of underground water. The constant fall of mineralized collector-drainage water from the irrigated fields of Jizzakh region has caused a gradual increase in the level of mineralization of water resources inAALS.

In this regard, it is necessary to analyze the extreme situations (rise and fall of the water level) of the Aydar-Arnasoy lake system, which is considered a unique object, to study,

identify and evaluate the dynamics of long-term hydrology and hydrochemical changes of water resources.

For this, it is important to study the dynamics of changes in the ecological state of water resources around the AALS.

First of all, if we get acquainted with the location and appearance of the lake, the Aydar-Arnasoy lake system (AALS) is located in the south-eastern part of Uzbekistan in the territory of Navoi and Jizzakh regions. It is bordered by the Kyzylkum desert in the north, the foothills of the Northern Nuratov mountains in the south, and the vast irrigated fields of the Holodnaya steppe in the east. The Aydar-Arnasoy lake system includes Aydarkol, Tuzkon, Arnasoy or Sharqiy Arnasoy lakes and surrounding desert areas.[1]

Aydar-Arnasoy lake system (AALS) is a system of artificial lakes created in 1969 by diverting flood water from Chordarya reservoir. Since 1993, the lake's water level and water volume have been increasing. During the years 2003-2005 and 2009-2011, the spatio-temporal distribution of pH, dissolved oxygen, ammonium, nitrite, nitrate, phosphate, chloride and biochemical oxygen demand (BOD) was determined by experts [2].

Based on the decision of the OliyMajlis of the Republic of Uzbekistan on August 30, 2001, the Republic of Uzbekistan joined the Ramsar Convention, and this decision came into force on February 8, 2002. Currently, Dengizkol and Aydar-Arnasoy lakes system with an area of 31.3 thousand hectares and 527.1 thousand hectares are included in the Ramsar list. After that, AALS became a wetland with an area of 4000 km<sup>2</sup> recognized as globally important by the Ramsar Convention. Today, the Aydar-Arnasoy lake system has become a huge reservoir with an area of 3702 km<sup>2</sup> and a water volume of 44.1 km<sup>3</sup>.

Not only is it a haven for birds and wild animals, it has also seen the emergence of fisheries and tourism. Understanding the behavior of water resources in terms of quantitative and qualitative aspects is important for future use and management, especially for the further development of fisheries and ecotourism. Based on the conducted hydrological and hydrochemical studies, it is recommended to develop fisheries in AALS.

AALS varies depending on the size, area and surface water resources of the Syrdarya flowing through the Chordara Reservoir. Currently, AALS has a significant impact on the regional ecosystem and socio-economic conditions. The study and assessment of AALS hydrology, water level volume, area and variability play an important role in the development of fisheries and ecotourism in the region as a whole.[3]

The Aydar-Arnasoy lake system (AALS) is one of the largest and newest lake systems that unites the Aydarkol, Tuzkon, and Upper Arnasoy lakes.

Because the three zones in the AALS have different saturation properties and depths, their hydrochemical parameters also differ [4].

As mentioned above, the large amount of water that flows into the Aydar-Arnasoy lake system is made up of collector-zovur waters. These waters come through Arnasoy, Kyzylkum, Central Mirzachol, Akbulok and Kli collectors.

Groundwater flowing into the negative part of the water balance of the Aydar-Arnasoy lake system is also included. They come from Nurotamountains, Kyzylkum desert, Mirzachol and Chordara reservoir. The water balance is the amount of precipitation that falls on the surface of lakes for a relatively large part of the inflow side. Due to the fact that the Aydar-Arnasoy lake system stretches from west to east, the amount of precipitation slightly increases from west to east. The output part of the water balance of lakes consists of water that evaporates from the water surface and water that seeps into the ground. From 1993 to 2006, a large amount of water was discharged from the Chordara reservoir to Arnasoykole every year. The largest water discharge was in 1994.[5]

Since 2006, the ability to release water from the Chordara reservoir of the Republic of Kazakhstan to the Syrdarya water gate has been improved, and the release of water to Lake Arnasoy has been stopped.

Therefore, if water is not poured from the Chordara reservoir into the Arnasoy lake, there will be a serious quantitative change in the volume of water in the Aydar-Arnasoy lake system and

In these lakes, the water volume of the system is decreasing due to the fact that the output part dominates over the input part of water [6].

The Aydar-Arnasoy lake system is saturated with local sewage and drainage. Due to the lack of fresh water in the lake over the years, salinity levels have risen, negatively affecting the natural reproduction of fish.

Therefore, our goal in analyzing changes in water volume in lakes is to study the natural geographical processes that occur or may occur in the surroundings of the lake with the increase and decrease of water. Because ecological safety is one of the most important and urgent problems of our society today and in the future. Issues of ecological safety and sustainable development are discussed on the example of the Aydar-Arnasoy lake system. The study of irrigated and anthropogenic lakes in our arid climate is important to ensure ecological safety in the face of the disastrous fate of the Aral Sea [7].

The following results were observed when we took samples from the Aydar-Arnasoy lake system and analyzed them.

INFORMATION on the results of the analysis of samples taken from the Aydar-Arnasoy lake system									
№	Object name	Sample place name	INDICATORS						
			pH	Hardness mg-eq / l	The chemical need of water for oxygen mg / l	Minerali zation	NH <sub>4</sub>	Cl <sup>-</sup>	Suspen- dedsub stances
1	Aydar- Arnasoy lake system (Tuzkon lake)	106-contour	6,7	22,6	18,25	4212	1,45	840	22
		PN		7	15	1000	0,39	300	15
		PN higher than		3,23	1,22	4,2	3,7	2,8	1,5
2		109-contour	6,5	23,2	18,93	4560	1,92	870	21
		PN		7	15	1000	0,39	300	15
		PN higher than		24,3	1,3	4,56	4,9	2,9	1,4
3		112-contour	6,5	7	19,03	4760	2,64	910	23
		PN		3,5	15	992	0,39	300	15
		PN higher than		2	1,3	4,8	6,8	3,1	1,5

The analysis also shows that the chemical parameters of the water in the water samples exceeded the permissible norm (PN).

In natural waters, the gas formed during the biochemical decomposition of nitrogen-containing organic compounds - ammonia (NH<sub>3</sub>) - accumulates when dissolved in water.

Dissolved ammonia (ammonium ion) enters the reservoir with surface and groundwater runoff, atmospheric precipitation, as well as industrial wastewater. The increasing concentration of ammonium ions in the water indicates the deterioration of the sanitary condition of the reservoir.

Chlorides in high concentrations worsen the taste of water. The amount of chloride is also strictly standardized for technical and economic purposes. In fishery reservoir water - 300 mg / dm<sup>3</sup>, the analysis shows that the concentration of chloride ions in the contour section increased by an average of 2.9 times.

Controlling the heavy metals identified on the basis of the above analyzes do not exceed the permissible norm (PN), assessing the volume and quality of water in the AAKT water sources, forecasting the amount of water and achieving the stability of water supply, improving the environmental situation around the AAKT and conservation, enables the development of biological resources, and develops practical work aimed at the development of the fishing industry in ensuring food safety.

Because one of the priorities of sustainable development in our country is to maintain a healthy ecological situation in the region. Wetlands play an important role in ensuring the stability and integrity of ecosystems as an important link in the system chain.

Maintaining water quality within the set standards is a necessary condition for maintaining public health, biological diversity, natural and industrial products, aesthetic and reactive potential of nature.

## REFERENCES

- [1] Rodina, K. Formation of human-induced lakes in Uzbekistan: The Aydar-arnasay lakes system case study, 2010
- [2] Kulmatov, R.; Mullabaev, N.; Nigmatov, A.; Kulmatova, D.; Sobirov, J. Qualitative and Quantitative Assessment of Water Resources of AydarArnasay Lakes System (AALS) Journal of Water Resource and Protection, 2013, 5 (10).
- [3] Taylakov, A. A.; Kulmatov, R. A.; Khasanov, S. Z. & Khudoyberdieva, G. K. Development of a visual programming algorithm for bim-models using a module of constructions using a dynamo module. ISJ Theoretical & Applied Science, 2020, 05 (85), pp.23-34. <https://dx.doi.org/10.15863/TAS.2020.05.85.6>
- [4] Ziyatovna, Y. Z.; Tojimurodovna, A. Y.; Tojimurodovna, A. U. Hydrological characteristics and ecological status of the Aydar-Arnasay lake system, Science and Education, 2021, 2(7), pp.160-169.
- [5] O'zbekiston Respublikasida atroftabiiy muhitni muhofazasi bo'yicha Milliy ma'ruza, Tashkent, 2008
- [6] G'o'dalov, M. R.; Abdukadirov, A.F.; Aydar Arnasoyko'llartizimita'sirida atrofla ndshaftlariningo'zgarishinibaholash, Journal of Natural Science, 2022, 1(6) pp.33-39 betlar. <http://natscience.jspi.uz>
- [7] Akhmadjonova, U.T.; Akhmadjonova, Y.T. & Yakhshieva, Z.Z. Technogenic Transformations of the Aidar-Arnasay Lake System and their Geological Consequences. Annals of the Romanian Society for Cell Biology, 2021, pp.2912-2916.