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Member of the Board – Vice Rector for the
Scientific and innovative activities

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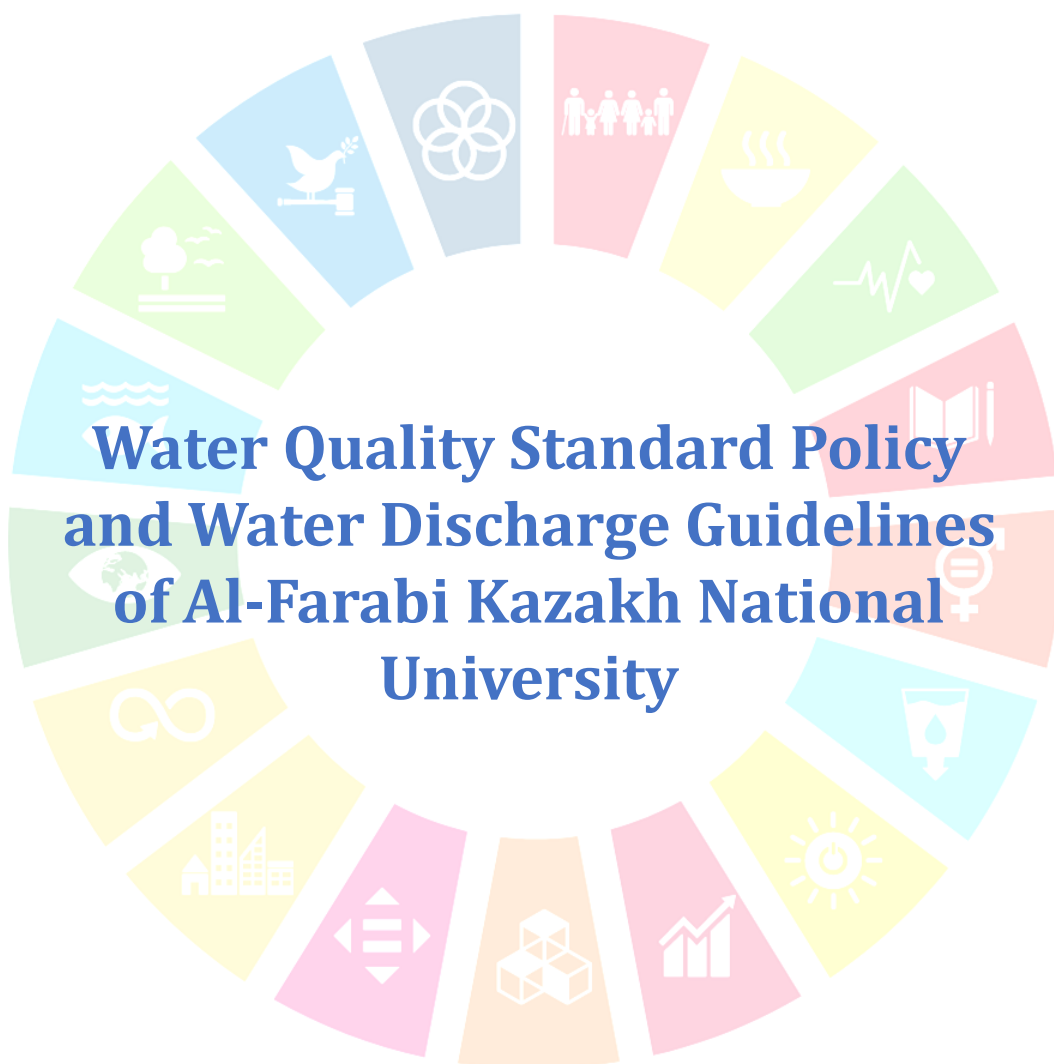


WATER QUALITY STANDARD POLICY AND WATER DISCHARGE GUIDELINES OF AL-FARABI KAZAKH NATIONAL UNIVERSITY

АЛМАТЫ, 2024



**NON-PROFIT JOINT STOCK COMPANY
KAZAKH NATIONAL UNIVERSITY
NAMED AFTER AL-FARABI**



**6 CLEAN WATER
AND SANITATION**





MEASURES IN THE FRAMEWORK OF THE IMPLEMENTATION OF THE QUALITY STANDARD POLICY

The measures implemented by Al-Farabi KazNU are in line with the general strategies adopted in Kazakhstan to ensure the purity of water resources. The country carries out systematic monitoring of water quality, covering microbiological, chemical and physical parameters. The university's policy on water quality standards and recommendations for wastewater discharge are based on the legislative acts of the Republic of Kazakhstan, which define the requirements for the protection of water resources and establish national quality standards for both drinking and wastewater. Al-Farabi KazNU applies these standards in its water resources management practice, which helps to ensure high quality water supply and minimize the negative impact on the environment. The university's water quality policy is aimed at compliance with established standards, including:

- The Water Code of the Republic of Kazakhstan, which serves as the main legal document in the field of water resources management;
- The UN Convention on Transboundary Watercourses and other international agreements, within the framework of which Kazakhstan actively integrates international standards into its water legislation;
- The Ak Bulak Program, aimed at providing all regions of the country with high-quality drinking water and improving the water supply infrastructure.



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CLEAN WATER AND SANITATION

Ensuring compliance of water quality with sanitary norms and international standards is an important task for maintaining the health and safety of the university environment and the surrounding ecosystem. Sustainable water resources management at the university should be aimed at optimizing the use of water, reducing its losses and preserving natural resources for future generations.

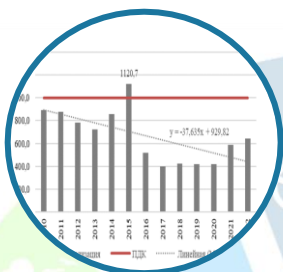




BASIC PRINCIPLES OF WATER QUALITY POLICY OF AL-FARABI KAZAKH NATIONAL UNIVERSITY

The water quality policy of Al-Farabi KazNU includes regular monitoring of water supply sources (rivers and groundwater), taking into account microbiological, chemical and physical parameters. This is aimed at identifying pathogenic microorganisms, toxic chemicals and deviations in the physical properties of water. An important part of the process is the audit of treatment facilities for their modernization and improvement of efficiency.

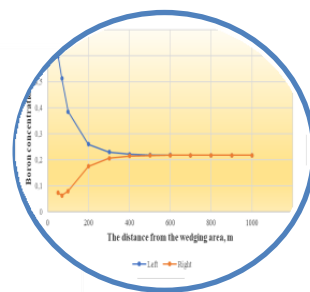
To implement the tasks of monitoring and managing water quality, Al-Farabi KazNU has a laboratory for modeling the dynamics of the qualitative composition of water resources. The laboratory is engaged in the assessment and forecasting of changes in the quality of groundwater and surface water using multivariate statistical and analytical models, and also develops water quality management methods to ensure environmental sustainability and safety of water resources.



Research of water quality parameters



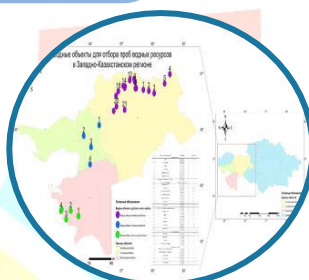
Assessment of the impact of anthropogenic factors



Modeling the dynamics of water quality changes



Research of water quality parameters



Research of water quality parameters



LABORATORY FOR MODELING THE DYNAMICS OF WATER RESOURCE QUALITY COMPOSITION

The purpose of the laboratory is to model the dynamics of the qualitative composition of water resources, which includes several aspects:



1. Investigation of water quality parameters:

The laboratory analyzes and evaluates various water quality parameters, such as pollution levels, the content of various chemicals, etc.



2. Assessment of the impact of anthropogenic factors:

The laboratory examines the impact of anthropogenic activities on water quality, such as discharges of treated wastewater from industrial enterprises and utilities, drainage of irrigation waters of agricultural massifs and animal stall facilities, etc.



3. Modeling the dynamics of changes in water quality:

Using mathematical models of dilution of wastewater discharges or discharge of contaminated groundwater, the laboratory creates models that allow predicting changes in water quality along a river stream.



4. Identification of natural and anthropogenic processes:

Identification of natural and anthropogenic processes that form the actual measured concentrations and composition of water quality indicators, with the construction of a map of the territorial dynamics of the intensity of the identified processes based on the use of multidimensional statistical models.



5. Development of measures to improve water quality:

Based on the results of field research, surface and groundwater quality monitoring data and modeling, the laboratory offers recommendations and strategies for possible improvement of water quality and pollution prevention.



LABORATORY FOR MODELING THE DYNAMICS OF WATER RESOURCE QUALITY COMPOSITION

Focus on Applied Solutions for Monitoring and Improving Water Quality

When performing research in the laboratory, the following equipment is used: a portable laboratory for water quality analysis; laying-laboratory "VHF-2" for field chemical control; an aircraft (DJI Mavic 3 Multispectral quadcopter), etc. In addition, the laboratory is currently transferring a multidimensional statistical software package to a new modern level - a complete model of component analysis with the construction of the type of main components, the objective interpretation of which provides the identification of natural and anthropogenic factors of changes in the quality of water resources and the territorial distribution of the intensity of their impact. The laboratory analyzes the composition of water resources for the presence of various pollutants and determines their level, which makes it possible to assess the degree of environmental impact and take measures to reduce the negative impact on ecosystems. The use of the analysis results makes it possible to take measures to protect public health and prevent the spread of infections through water. Laboratory data will allow government agencies and local executive bodies to make informed decisions related to the use of water resources, and will help determine the need to introduce additional measures for the purification and protection of water resources. The laboratory can contribute to the achievement of SDG 6 through the development and application of innovative methods and models to improve water quality control and management, which in turn can contribute to the conservation and restoration of water ecosystems. The development of an innovative software package that implements a complete model of component (factor) analysis allows us to judge specific natural and anthropogenic processes and the intensity of their manifestation in the formation of water quality, unlike all advertised statistical complexes, where the model of factor (component) analysis is limited to determining only eigenvalues and eigenvectors that do not take into account the distribution of the values of the initial parameters by observation points. The use of such limited models in cognitive modeling can lead to errors in the development of management decisions.



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CLEAN WATER AND SANITATION

An important aspect is the control of wastewater discharge, which must be carried out in strict accordance with environmental standards, preventing pollution and protecting ecosystems. In addition, increasing the environmental awareness of staff and students is necessary to form a responsible attitude towards the use of water resources and support sustainable development initiatives. Through these measures, universities can play a key role in promoting environmental responsibility and sustainable development.



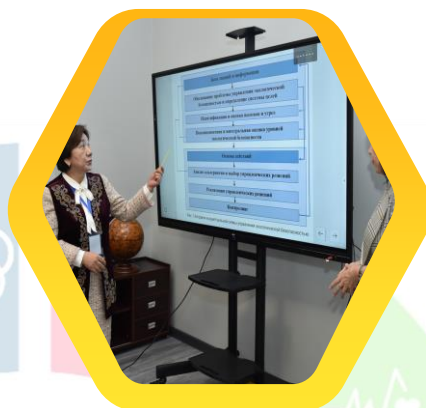


6 CLEAN WATER AND SANITATION

ENVIRONMENTAL SAFETY LABORATORY

To achieve control over wastewater discharge and maintain environmental standards, the Laboratory of Environmental Safety was established at Al-Farabi Kazakh National University. It aims to prevent pollution, protect ecosystems, and raise environmental awareness among staff and students, fostering a responsible attitude toward water resources and supporting sustainable development initiatives.

Objective: to develop scientific and applied aspects of environmental safety management based on a comprehensive study of the ecological state of natural and economic systems in Kazakhstan in the context of sustainable development.



Tasks:

1. To develop the concept of environmental safety management of natural and economic systems of the Republic of Kazakhstan.
2. To conduct research on the identification and identification of existing environmental challenges and threats in Kazakhstan as an information basis for ensuring environmental safety.
3. To develop a classification of all types of challenges and threats of a natural and anthropogenic nature in the Republic of Kazakhstan.
4. To investigate and assess the levels of environmental safety in the natural and economic systems of the Republic of Kazakhstan.
5. To develop a scientifically based comprehensive system of measures to manage the environmental safety of natural and economic systems of Kazakhstan.



6 CLEAN WATER AND SANITATION

ENVIRONMENTAL SAFETY LABORATORY

Focus on Applied Solutions for Environmental Safety

The developed concept of environmental safety includes two components: informational and applied. The informational component creates databases and contains information about the study area, identifying and systematizing environmental challenges and threats, including global (the impact of climate change), regional (the environmental condition of the transboundary Ural River, biodiversity), and local threats (atmospheric pollution, soil degradation). Special attention is given to the hydrosphere, including the assessment of water quality in rivers and reservoirs, which allows monitoring pollution levels, analyzing sources of threats, and proposing measures to improve the state of water bodies. A component-based assessment of the environmental condition (atmospheric, hydrospheric, and lithospheric) is also conducted, along with the creation of an ecological health risk map for the region's population. The applied component ensures the use of collected data to develop management decisions on environmental safety under various environmental scenarios: background, precautionary, extreme, and post-extreme situations. This component includes controlling — a system for managing and monitoring the effectiveness of actions aimed at reducing anthropogenic pressure and protecting water resources. The concept aims to achieve economic, environmental, and social benefits through the rational use of resources and sustainable development, helping preserve and restore water quality in the region.

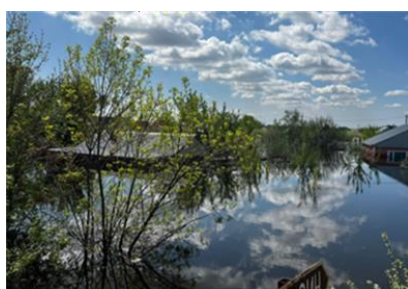




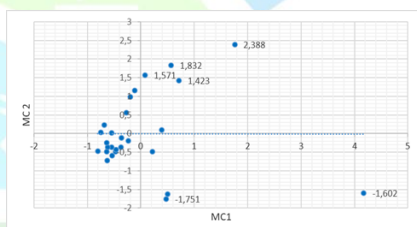
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LABORATORY OBJECTIVES

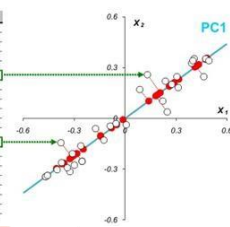
- Preparation of initial data on the qualitative composition of water resources (pollution parameters, pollution sources, data on the current state of water bodies);
- Conducting an analysis of the chemical composition of water resources at the research site;



- Carrying out multispectral survey of surface water resources and creating an orthophotomap;
- Determination of complex indicators of water resource quality and analysis of possible sources of pollution and the nature of interaction with groundwater;



	X_1	X_2
1	0.407	0.353
2	0.478	0.355
3	-0.088	-0.048
4	0.394	0.325
5	0.274	0.302
6	0.737	0.254
7	-0.053	-0.017
8	-0.124	-0.128
9	-0.469	-0.344
10	0.088	0.171
11	-0.261	-0.182
12	0.407	0.344
13	-0.378	-0.122
14	-0.291	-0.235
15	-0.325	-0.316
16	0.464	0.248
17	-0.310	-0.207
18	0.307	0.247
19	-0.399	-0.203
20	-0.253	-0.253
21	-0.341	-0.291



- Construction of maps of territorial dynamics of intensity of processes of formation of surface water quality identified by mathematical methods.



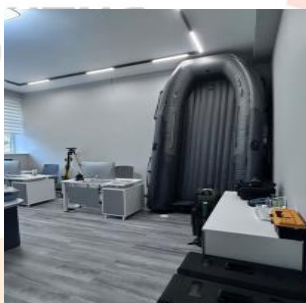
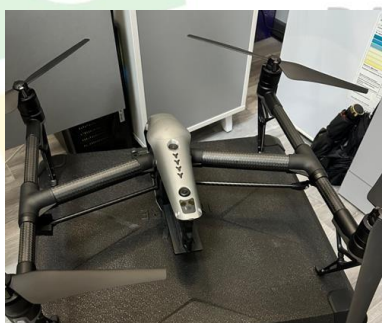
6 CLEAN WATER AND SANITATION

WATER QUALITY STANDARDS

The policy is based on national water quality standards, such as SanPiN of the Republic of Kazakhstan, as well as international standards, such as WHO and ISO recommendations.

The main water parameters that must be observed are:

- ➡ pH: 6,5–8,5
- ➡ MAC of heavy metals (mercury, lead, cadmium, etc.)
- ➡ Biochemical oxygen demand (BOD): to assess the level of organic pollutants
- ➡ The presence of nitrates and other chemical compounds must comply with the MAC.





6 CLEAN WATER AND SANITATION

WASTEWATER COLLECTION POLICY

Appropriate treatment methods and discharge standards should be developed for each category of water.



Mandatory wastewater treatment before discharge into natural reservoirs or sewers. The use of multi-stage cleaning systems (mechanical, – chemical, biological cleaning).

Regular monitoring of wastewater discharge to ensure their compliance with MPC standards and environmental standards.

Prohibition of the discharge of untreated wastewater into open reservoirs, especially near the university grounds.

The use of environmentally friendly technologies for the reuse of treated waters (for example, for irrigation of plantings).



6 CLEAN WATER AND SANITATION FOR IMPROVING

Cooperation with environmental organizations and government agencies to obtain recommendations for improving water management policies.



6 CLEAN WATER AND SANITATION

CONTROL AND MONITORING

Quarterly laboratory studies of water and wastewater with the involvement of independent experts.

Publication of reports on water quality and discharge monitoring on the official website of the University and in annual reports for public control and transparency.

The use of automated control systems, such as real-time pollutant sensors, to promptly respond to any deviations.



Sustainable Water Usage



Community Engagement



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CLEAN WATER AND SANITATION

RESPONSIBILITY

The University management is responsible for the development, implementation and compliance with this policy.

The Department of Economic Support is responsible for the control of water resources and the organization of monitoring.

The Environmental Commission verifies the implementation of all standards provided for in this policy and prepares reports for the university management and government agencies.





6 CLEAN WATER AND SANITATION

UNIVERSITY POLICY

This policy on water quality and wastewater discharge is aimed at ensuring sustainable water management of Al-Farabi Kazakh National University, as well as compliance with the requirements of Kazakh and international legislation. The University strives not only to comply with regulations, but also to continuously improve in the field of environmental responsibility.



БЕЗОГОВОРЧНО
ПРИНИМАТЬ
И ПОНИМАТЬ
ЦЕННОСТЬ
ВОДНЫХ РЕСУРСОВ



СООТВЕТСТВОВАТЬ
ТРЕБОВАНИЯМ
ЗАКОНОДАТЕЛЬСТВА
И МЕЖДУНАРОДНЫМ
ЛУЧШИМ ПРАКТИКАМ



УЧИТЫВАТЬ ВОПРОСЫ
СОХРАНЕНИЯ ПРЕСНОЙ
ВОДЫ ПРИ ПРИНЯТИИ
УПРАВЛЕНЧЕСКИХ
РЕШЕНИЙ



ОТСЛЕЖИВАТЬ
ПЕРВОНАЧАЛЬНЫЕ
ИСТОЧНИКИ
СВОЕГО ВОДОЗАБОРА



СТРЕМИТЬСЯ
НЕ ИСПОЛЬЗОВАТЬ ВОДУ
ПИТЬЕВОГО КАЧЕСТВА
ДЛЯ ПРОИЗВОДСТВЕННЫХ
ЦЕЛЕЙ



СТОПРОЦЕНТНЫЙ
ПРИБОРНЫЙ УЧЁТ
ВОДОЗАБОРА И
ВОДООТВЕДЕНИЯ



ВНЕДРЯТЬ
ВОДООБОРОТНЫЕ
И ВОДОСБЕРЕГАЮЩИЕ
ТЕХНОЛОГИИ



СОВЕРШЕНСТВОВАТЬ
УПРАВЛЕНИЕ
ВОДНЫМИ
РЕСУРСАМИ

The wastewater treatment process is important for al-Farabi Kazakh National University from an ethical, economic and environmental point of view for reuse for watering green spaces in the spring and summer period.

Wastewater treatment of the University is based on the application of a mechanical method. Grilles and strainers of various designs are used for mechanical cleaning.



UNIVERSITY POLICY

On the territory of the al-Farabi Kazakh National University, wastewater passes through grates and sieves. At this stage, large particles of mineral and organic origin are removed. Next, the wastewater is passed through sand traps, in which fine particles precipitate and through grease traps, which remove hydrophobic substances (oils, fats) from the water surface.

Moreover, there are septic tanks on the University grounds, and various biological processes will be used in these tanks to properly decompose solids before liquids enter directly into the drainage system. Septic tanks limit water pollution by effectively getting rid of pollution that is already in the water.





UNIVERSITY POLICY

To prevent contaminated water from entering the water supply system, the Al-Farabi Kazakh National University is taking a number of different measures:

Less toxic harmful fertilizers for green spaces are used in the adjacent territory of the University.

Pesticides are disposed of correctly.

Household chemicals are disposed of at the waste recycling center.

Walking with pets is prohibited on the territory of the University (in order to avoid pet waste).

Green spaces are being actively planted on the territory of the University.

The campus and the surrounding area are cleaned daily.

The traffic of motor transport in the territory is limited





6 CLEAN WATER AND SANITATION

IMPLEMENTATION PLAN FOR WATER QUALITY AND WATER RESOURCES MANAGEMENT POLICY IN THE AL-FARABI TREASURY

№	Scientific directions	The tasks set	Implementation period
1	Modernization and improvement of water treatment infrastructure	- Updating water purification technologies - Increasing the production capacity of treatment facilities	2024-2035
2	Expansion of fundamental and applied research	- Development of new methods for studying water resources - Interdisciplinary research - Attracting external funding	2024-2035
3	Digitalization and automation of water resources monitoring	- Implementation of automated monitoring systems - Use of artificial intelligence methods for forecasting - Development of mobile solutions	2024-2035
5	International cooperation and exchange of best practices	- Development of partnerships with foreign universities and research centers - Participation in global projects - Organization of scientific conferences and symposia	always
6	Evaluation of performance and revision of water quality standards	- Regular monitoring of treatment systems - Updating water quality and discharge standards - Implementation of innovative technologies	every year



WATER QUALITY STANDARD POLICY AND WATER DISCHARGE GUIDELINES OF AL-FARABI KAZAKH NATIONAL UNIVERSITY

This policy is aimed at ensuring water quality and water resources management at Al-Farabi Kazakh National University. The policy is based on the national standards of the Republic of Kazakhstan, as well as international recommendations on the sustainable use and protection of water resources.



SUSTAINABLE DEVELOPMENT GOALS

