NJSC «AL-FARABI KAZAKH NATIONAL UNIVERSITY»

UNIVERSITY POLICY TO ENSURE THE AVAILABILITY AND SUSTAINABLE USE OF WATER AND SANITATION FOR

University action

Plan implementation goal

Obligations

ALMATY, 2023

GLOBAL CONTEXT

Clean water is essential to sustain human life and is of paramount importance for human health. There is enough fresh water on the planet for every inhabitant. However, a weak economy and a lack of infrastructure are causing millions of people, mostly children, to die from diseases associated with inadequate water supply, sanitation and hygiene.

The United Nations Sustainable Development Agenda makes access to water and sanitation a separate goal number 6. Goal 6 is inextricably linked to health, food security and climate change, as well as disaster resilience and ecosystem management.

The Global Development Agenda 2030 contains 17 Sustainable Development Goals (SDGs). There is no doubt that there is a strong relationship between changes in the volume and quality of water resources and sustainable development.

Achieving this goal includes enhancing international cooperation and supporting the strengthening of the capacity of developing countries in the implementation of activities and programs related to water supply and sanitation. These activities include water collection and desalination, improved water use efficiency and wastewater treatment, and the application of water recycling and reuse technologies.

UNIVERSITY ACTIONS

The contribution of Al-Farabi KazNU to achieve this goal is reflected in two main directions:

1. Training of highly qualified hydrologists-specialists at the bachelor's, master's and doctoral levels of study that are competitive in the domestic and international labor market, which involves the integration of research activities and training in the educational process, the implementation of the educational process on credit technology of education based on the principles of interdisciplinarity and a competency-based approach .

2. Carrying out research work in the field of rational use of natural resources, incl. water resources.

In world practice, the training of hydrological specialists is determined by the tasks of scientific and industrial activities and the economic needs of the country. At al-Farabi KazNU, in addition to the recommendation of domestic and foreign specialists based on the experience of training specialists in the hydrology field, the choice of areas and the list of disciplines is compiled taking into account the applications of the main employers for specialists and priority research in the hydrology field and water resources, determined by the National Academy of Sciences and Ministry of Education and Science of the Republic of Kazakhstan for the future and curricula of foreign countries.

The training of specialists in the field of hydrology in Kazakhstan has been carried out since 1966 at the al-Farabi Kazakh National University on the basis of the Department of Land Hydrology, currently - meteorology and hydrology. Hydrologists are in demand by organizations whose activities are related to the organization of monitoring of water bodies, the design and operation of hydraulic engineering structures, agricultural reclamation systems, utilities and services involved in the prevention and control of the consequences of hazardous hydrological phenomena. Among them is RSE "Kazhydromet" - the main customer, founder and direct active participant in the implementation of highly qualified specialists.

In addition, the following scientific, design and construction organizations are interested in graduates in hydrology - the Geography and Water security Institute, State Institution "Kazmudflow protection", LLP MC "KazZhol", PC "Institute Kazgiprovodhoz", LLP "Ecoterra", LLP "KAPE", akimats of all levels, etc. Over the 50-year period of training engineers, bachelor-hydrologists, the department has established itself as a reliable partner of these organizations, making changes to the curriculum for training specialists, according to the requirements of the time and specializations recommended by employers, and has great authority in Kazakhstan and abroad.

IMPLEMENTATION PLAN

the main directions of scientific activity in the field of hydrology:

- the influence of urbanized territories on the elements of the hydrological regime;
- modeling of hydrological processes;
- hydrological mapping in the GIS environment;
- space monitoring of water bodies;
- assessment and forecast of quantitative characteristics of flood hazards, floods;
- calculation of water erosion processes;
- water resources management.

Under the guidance of leading experts at the department of meteorology and hydrology, the following scientific projects were carried out:

1) Assessment of the degree of water-erosion hazard in the mountainous and foothill areas of South-East Kazakhstan, taking into account the influence of natural and anthropogenic factors, scientific supervisor Ph.D., associate professor Duskaev K.K.

The purpose of the project is to establish patterns of manifestation of water-erosion processes in the mountainous foothill zone of South-East Kazakhstan under the influence of economic activity and climate change, to develop a methodological basis that allows determining its intensity to justify environmental and anti-erosion measures.

Results:

- Scheme of formation of sediment runoff and erosion processes.
- A model of the erosion process and a databank of the erosion network for typical sections of the river basins of the mountainous and foothill regions of South-Eastern Kazakhstan.
- Features of the regime and the calculated main characteristics of the solid runoff of mountain rivers in South-East Kazakhstan.
- Morphometric characteristics of the erosion network.
- Erosion hazard maps.
- Recommendations for assessing the erosion hazard of the territory, including those involved in economic turnover.
- Quantitative characteristics of the intensity of erosion processes and patterns of their spatio-temporal changes.
- Stochastic model of water erosion forecast adapted for mountain rivers of South-Eastern Kazakhstan.

2) Determination of the characteristics of the spring runoff of the lowland rivers of Kazakhstan, scientific adviser, Doctor of Geological Sciences, Professor Davletgaliev S.K.

The purpose of the project is to obtain characteristics of the flow of lowland rivers in Kazakhstan, taking into account anthropogenic impacts on the natural environment and climate change.

Results:

- Forecasts of the spring runoff layer were made for 2025 and 2030 using the linear trend method. On most rivers of flat Kazakhstan, a decrease in the value of spring runoff is expected
- A method for forecasting meteorological data based on a hormonal analysis of observational data has been developed. The possibility of using this technique is shown on the example of the forecast of precipitation and air temperature at certain points of flat Kazakhstan.

3) Floods and the threat of flooding of the riverine territories of Kazakhstan, scientific adviser, Doctor of Geological Sciences, Professor Galperin R.I.

The purpose of the project is to assess the risk of flooding of territories adjacent to large rivers.

Results:

- Estimated flooding of riverine areas in the conditions of a disturbed regime.
- The influence of large hydraulic structures on the parameters of high flood waves was studied. Topographic data for specific sections were used

- Estimation of maximum discharges and water levels of exceptionally rare frequency

- The characteristics of flooding of riverine territories were studied: the frequency and depth of possible floodplain flooding, the frequency and magnitude of exceeding dangerous marks, the width of flooding.

4) Development of the geographical bases of water security in the northern half of the Republic of Kazakhstan in the conditions of climatic and anthropogenic changes in river waters (water management basins Yertiss, Esil, Tobyl-Torgai, Nura-Sarysu, Zhaiyk-Caspian), scientific adviser, Doctor of Geographical Sciences, Professor Galperin R.I.

The purpose of the project is to assess the likelihood and degree of danger of adverse hydrological phenomena in the water management basins of Kazakhstan.

Results:

- Statistical assessment of low water indicators of rivers (minimum average monthly and daily water discharges in summer-autumn and winter low water, drying up and freezing) and maximum annual discharges and water levels of rare frequency on the main rivers.

At the international level, in order to achieve the goals of sustainable development, the teachers of the department were participants in the international project "Integrated water cycle management: building capability, capacity and impact in Education and Business" (530718 - TEMPUS-1-2012-1-UK-TEMPUS-JPCR) Leading scientists and experts from Great Britain (Middlesex University), Germany (University of Leipzig), Spain (Technical University of Valencia) and Cyprus (University of Cyprus) participated in this project, as well as universities of Kazakhstan: Khoja Ahmed Yasawi International Kazakh-Turkish University and Sh. Ualikhanov Kokshetau State University.

Project objectives: development and delivery of master's and doctoral programs in accordance with the principles of the Bologna process, training of Kazakhstani teachers and students on the IUEC and support for a two-way dialogue between business, regulators and government structures.

As a result of the project, a collective monograph "Integrated Water Resources Management in Kazakhstan" was published in three languages, an educational master's program - Integrated Water Resources Management - was opened and implemented.

The current project at the department is carried out under the guidance of Ph.D., associate professor Duskaev K.K. The theme of the project is "Assessment of the impact of natural factors and economic activities on the state of water bodies in urban areas (on the example of Almaty)".

The purpose of the project is to identify patterns and take into account the influence of urbanized and adjacent territories on the elements of hydrological processes occurring as a result of anthropogenic and natural changes in the hydrological cycle, using the example of the largest metropolis of Almaty.

Results:

- Updated descriptions and large-scale maps of the Almaty hydrographic network using GIS technology.
- Determination of the zone of climatic influence of the city and related changes in the hydrological cycle, the regime of water bodies and water quality (table and graphs of the course of meteorological elements at weather stations in Almaty);
- Assessment of the channel water balance of the main rivers of Almaty
- Publication of the monograph "Small rivers of Almaty".

At the regional level, the Department of Meteorology and Hydrology of the Faculty of Geography and Nature Management, together with the Kazakh-German University, held an online video conference at the G-Global site, on the topic: “Water Day”. The online videoconference consisted of two sessions: the first Master class from an invited expert and a student colloquium.

During the first session, a report was heard from invited experts from Central Asia and the South Caucasus at the United Nations Department for Disaster Reduction (UNISDR), the reports were devoted to the topic: “Disaster Risk Reduction to Achieve the 2030 Agenda for Resilience”.

In the second session of the online videoconference, reports of undergraduates and students from partner universities were heard: Kazakh-German University, K.I. Satpaev KazNITU, KazNAU and L.N. Gumilyov ENU.

Conducting such online video conferences will contribute to the further development of our students, undergraduates and stimulate the interests of students, undergraduates in scientific ideas, provides an opportunity to exchange experience, knowledge and skills acquired in the educational process.

As part of the colloquia "Water Day", held jointly with the Kazakh-German University, students of the department had the opportunity to visit the scientific laboratories of partner universities.

Within the walls of the university, the Republican student subject Olympiad in the specialty "Hydrology" is held annually.

The purpose of the Olympiad: disclosure of creative abilities, selection and support of the most talented and gifted students; assistance in the formation of the intellectual potential of students; involvement of students and young scientists in solving scientific problems of our time as a sustainable development of water resources; development of interest in scientific activity.

Teams of al-Farabi KazNU, as well as invited teams of students from L.V. Gumilyov ENU take part in the Olympiad, Astana.

At the Department of Meteorology and Hydrology, a new educational program Hydrology in English was prepared and developed for the specialty "5B061000 - Hydrology".

In the development of the educational program, along with domestic specialists, specialists from far and near abroad from such universities as the Polytechnical University of Valencia (Valencia, Spain) took part; University of Oulu (Oulu, Finland); Kiel University (Kiel, Germany); Russian State Hydrometeorological University (Saint-Petersburg, Russia); University of Lincoln (Lincoln, UK); Humboldt University (Berlin, Germany).

ОП прошла экспертизу известных ученых-педагогов Казахстана, стран Евросоюза и Иордании. Все экспертизы имеют положительные заключения.

Факультет географии и природопользования КазНУ им. аль-Фараби организовал и провел краткий курс на тему «Применение дендохронологии в управление водными ресурсами». Данный курс проводился под эгидой Британского Совета в рамках Партнерской программы «Ньютон – Аль-Фараби», по проекту «Разработка управления водными ресурсами в Южном Казахстане с целью смягчения социальных последствий быстрого изменения климата».

The EP has passed the examination of famous scientists-teachers of Kazakhstan, the EU countries and Jordan. All examinations have positive conclusions.

Faculty of Geography and Environmental Sciences al-Farabi KazNU organized and conducted a short course on the topic "Application of Dendrochronology in Water Resources Management". This course was held under the auspices of the British Council within the framework of the Newton-Al-Farabi Partnership Program, under the project “Development of water management in South Kazakhstan to mitigate the social consequences of rapid climate change”.

The main goal of the short course is to familiarize students with the theory, laboratory and field methods of dendrochronology and modeling of water flow in the rows of tree rings. The lectures were read by Professor Irina Panyushkina, a visiting member of the Tree Ring Laboratory of the University of Arizona (Tucson, USA). To strengthen the listened lectures, on the second day of the course, an excursion to the Butakovka gorge with practical exercises was organized for the students.

COMMITMENTS

As part of a global community, we work to address water and water management challenges as part of our contribution to all of the Sustainable Development Goals.

Industrial discharges into water bodies. We will introduce "green" technologies for wastewater treatment, spread the ideology of rational use of irrigation water, such as capillary irrigation, expand the use of renewable energy sources and minimize wastewater discharges into the environment no later than 2050.

Education. All our students study a module related to the disciplines of water resources, rational use and restoration of water balance, sustainable development goals, regardless of the direction of the educational program or level of study. We aim to develop awareness and skills to address these challenges. It is worth noting that 90% of students have the opportunity to study sustainable use of natural resources, green technologies and/or water as part of their course; there are a number of interdisciplinary modules that offer students the opportunity to gain significant experience in the field of sustainability/water, including positive interaction with the community.

Research. Scientific researches of university scientists are connected with global and regional changes of modern water resource potential; mitigation measures and adaptation to evolutionary changes in the flow of water resources; conditions of water supply in Kazakhstan; the state of the water basin of the Republic of Kazakhstan; the impact of observed and expected changes in river ecosystems; identifying patterns and taking into account the influence of urbanized and adjacent territories on the elements of hydrological processes occurring as a result of anthropogenic and natural changes. The results of research by the teaching staff, young scientists are published annually in monographs and scientific high-ranking publications indexed in the Scopus and Web of Science databases