APPROVED

Member of the Board - Vice-Rector for Scientific and Innovation Activities of NJSC "Al-Farabi Kazakh National University"

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PROGRAM FOR RATIONAL USE OF WATER RESOURCES

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PREAMBLE

Rational environmental management is the use of natural resources in volumes and in ways that ensure sustainable economic development, harmonization of interaction between society and the natural environment, rationalization of the use of natural resource potential, economic mechanisms for environmentally friendly environmental management. With rational environmental management, extracted natural resources are fully used and the volume of their consumption is reduced; restoration of renewable natural resources is ensured; All production waste is reused.

The rational use of water resources must be planned in an integrated manner, taking into account the needs of long-term as well as short-term planning, i.e. it must include environmental, economic and social factors based on the principle of sustainability; take into account the needs of all users and the needs to prevent and reduce water-related hazards; and form an integral part of the socio-economic development planning process. A necessary condition for the rational exploitation of water resources as a resource whose reserves are small and which is susceptible to the influence of external factors is to take into account all associated costs in the planning and development process. Planning considerations should reflect investment benefits, environmental and operational costs, and opportunity costs that reflect the most valuable alternative uses of water. In a real situation, these considerations will not necessarily be taken into account when determining water charges for all users. However, charging mechanisms should, where possible, reflect both the true cost of water when it is used as an economic good and the ability of the population to pay for it.

Water resources of Kazakhstan

The total water resources of the rivers are 101 km³, of which 57 km³ are formed on the territory of Kazakhstan. The rest of the volume comes from neighboring countries: Russia – 8 km³, China – 19 km³, Uzbekistan – 15 km³, Kyrgyzstan – 3 km³.

Meanwhile, the problem is only getting worse from year to year. According to World Bank forecasts, the volume of water resources in Kazakhstan will decrease from 90 to 76 km³ per year by 2030. This means that the water shortage in the country in just eight years will be about 12-15 km³ per year, that is, about 15%.

Among the reasons cited was a reduction in external water inflow, which is aggravated by its ineffective use. The characteristic problems include four reasons: climatic factor, highly deteriorated infrastructure, wasteful water consumption, and lack of legal framework.

Water resource assessment, including the identification of potential sources of freshwater supplies, involves an ongoing determination of the sources, size, dependency and quality of water resources, as well as the human activities affecting those resources. This assessment serves as a practical basis for their rational exploitation and a necessary precondition for assessing the possibilities of their development. However, there is growing concern that, at a time when more accurate and reliable information on water resources is needed, hydrological services and other relevant organizations are less successful than in the past in providing such information, particularly groundwater information. and water quality. The main difficulties are the lack of financial resources for conducting water resource assessments, the fragmented structure of hydrological services and the lack of qualified personnel. At the same time, developing countries' access to advanced data collection and management technologies is becoming increasingly difficult.

However, the establishment of national databases is essential for assessing water resources and mitigating the effects of floods, droughts, desertification and environmental pollution.

Ways to solve fresh water shortage

1. Preservation of fresh water reserves in reservoirs.

2. Technologies for water processing.

3. Desalination of salt water.

4. Breeding techniques for agricultural crops.

5. Drip irrigation.

6. Wastewater.

7. Artificial forest.

8. Wells and glaciers and so on.

Principles of rational water use

1. “Zero level” of water consumption

2. Compliance with the anthropogenic load of the natural resource potential of the university

3. Preservation of the spatial integrity of natural systems in the process of their use

4. Preservation of the naturally occurring circulation of water resources

5. Coordination of production and natural rhythms

6. Priority of environmental optimality for the long term when determining the economic efficiency of current environmental management

These principles are taken into account in the following measures at the university:

First of all, monitoring of taps and toilet flushes (economy mode).

Universal water meters.

Using water after washing vegetables and fruits to water plants.

In food places, the process of washing dishes in a sink filled with water.

Reuse of water (recycling), use of process water for water supply to university activities.

Introduction of a management system for the rational use of water resources and their protection from pollution, clogging, and depletion; management of operation of water management systems; management of prevention and elimination of harmful effects of water.

Water savings are achieved through the use of recycling and reuse water supply systems.

Events held within the university

The development of interactive databases, forecasting methods and economic planning models that meet the challenge of efficient and sustainable management of water resources will require the use of new methods, such as geographic information systems and expert systems, to collect, process, analyze and present multi-sectoral information and optimization of the decision-making process.

In addition, the development of new and alternative water supplies and the development of low-cost water management technologies will require advanced applied research. This relates to the transfer, adoption and dissemination of new methods and technology in developing countries, as well as the development of their own capacity so that they can address the wider challenges of linking the engineering, economic, environmental and social aspects of water management and predicting the impacts of activities person.

University projects:
“Assessment of the influence of natural factors and economic activities on the state of water bodies in urbanized areas (using the example of Almaty)”, scientific supervisor Ph.D., Associate Professor Duskaev K.K.

Determination of the characteristics of the spring flow of lowland rivers in Kazakhstan, scientific supervisor, Doctor of Geography, Professor Davletgaliev S.K.

Floods and the threat of flooding of riverine territories of Kazakhstan, scientific supervisor, Doctor of Geology, Professor Galperin R.I.

Development of the geographical foundations of water security in the northern half of the Republic of Kazakhstan in conditions of climatic and anthropogenic changes in river waters (water basins Ertissky, Yesilsky, Tobyl-Torgaisky, Nura-Sarysusky, Zhaiyk-Caspian), scientific supervisor, Doctor of Geology, Professor Galperin R.

Conditions for rational water use within the University

To achieve a state of sustainable (environmentally balanced) development are:

- The university’s concept for sustainable use of water resources (https://farabi.university/storage/document/28472233756544eff13c948543749868_pdf), capable of ensuring the participation of a wide range of public in decision-making;
- economic system (incentive system), which ensures technical progress on its own basis;
- social system (student projects on the rational use of water) and helping to relieve stress that arises in conditions of inharmonious economic development;
- a system of efficient production focused on preserving the environmental resource base;
- a technological system that could stimulate the constant search for new solutions;
- international (partnership) system for scientific and educational projects on water resources.

In creating favorable conditions for the exploitation of water resources at the appropriate lower level, the University's task is to mobilize financial and human resources, develop legislative norms, perform standard-setting and other regulatory functions, monitor and evaluate the use of water resources, and create opportunities for public participation. International agencies and donors play an important role in providing assistance. Such as: Regional Environmental Center of Central Asia, etc.

1. Water pollution prevention and control measures:

1) application, where necessary, of the "polluter pays" principle to all types of sources of pollution, including sanitary and preventive measures at domestic facilities and beyond;

2) encouraging the construction of treatment plants for domestic wastewater, as well as the development of appropriate technologies, taking into account traditional local practices;

3) establishing standards regarding the discharge of wastewater and the waters into which they are discharged;

4) applying water quality precautions where necessary, with an emphasis on minimizing and preventing pollution through the use of new technologies, changes in products and production processes, pollution reduction at source and wastewater reuse, recycling and reclamation, treatment and environmental safe disposal of wastewater;

5) mandatory environmental reviews of all major water projects that could cause damage to water quality and aquatic ecosystems, while developing appropriate measures to eliminate such damage and strengthening controls over new industrial installations, solid waste disposal sites, and infrastructure development projects;

6) making decisions in this area based on risk assessment and risk regulation and ensuring the implementation of decisions made;

7) identification and application of the most rational from an environmental point of view and relatively inexpensive methods in order to prevent the spread of pollution, namely through the limited, rational and systematic use of nitrogen fertilizers and other agrochemicals (pesticides, herbicides) in agricultural practice;

8) encouragement and incentives for the use of properly treated and treated wastewater in aquaculture and other sectors;

2. Development and application of environmentally friendly technology:

1) control of industrial waste discharges, including the use of low-waste production technologies and water recycling, in an integrated manner and through precautionary measures taking into account a comprehensive life cycle analysis;

2) treatment and safe reuse of municipal wastewater in agriculture and aquaculture;

3) development of biotechnology, in particular for waste treatment, production of biofertilizers, etc.;

4) development of appropriate methods for combating water pollution, taking into account sound traditional and local practices;

3. Groundwater protection:

1) development of agricultural methods that do not lead to groundwater degradation;

2) taking appropriate measures to reduce the effects of saltwater intrusion into small island and coastal plain aquifers resulting from sea level rise or overexploitation of coastal aquifers;

3) preventing contamination of aquifers by regulating toxic substances penetrating into the soil and creating water protection zones in areas of groundwater recharge and intake;

4) design and operate landfills based on reliable hydrogeological information and environmental assessments using the most appropriate and best available technology;

5) promoting measures to improve the safety and security of well areas and wellheads to reduce the amount of biological pathogens and harmful chemicals entering aquifers in these areas;

6) conduct, as necessary, monitoring the quality of surface and ground waters, which may be adversely affected by the disposal sites of toxic and hazardous materials;

4. Protection of aquatic ecosystems:

1) rehabilitation of polluted and degraded water bodies in order to restore the aquatic environment and ecosystems;

2) restoration programs for the land and for other users, taking into account equivalent measures for the protection and use of groundwater resources important for agricultural productivity and tropical biodiversity;

3) conservation and protection, taking into account socio-economic factors, of wetlands (due to their ecological significance for many species as their habitat);

4) combating harmful aquatic species that can destroy some other species living in the aquatic environment.

The above activities are reflected in the Green Technologies Zone, which was created to implement innovative projects on green technologies by creating comfortable working conditions and emotional and psychological relief for students and teachers of al-Farabi KazNU, as well as residents and guests of Almaty

Incentives that encourage and support good water management practices on campus

As water is recognized as a social and economic good, different payment options for water use (including residential, urban, industrial and agricultural water user groups) need to be further assessed and tested in practice. The following economic instruments have been introduced, taking into account opportunity costs and external environmental factors. Users' willingness to pay for water consumption should be studied in a real urban (university) setting.

To ensure the feasibility, acceptability and sustainability of water supply systems being designed, the technologies incorporated in them must be responsive to the needs and constraints of the community concerned. Thus, design criteria will take into account technical, sanitary, socio-

economic, institutional, environmental, and local factors that determine the characteristics, scope and cost of the designed system. The work is aimed at solving, among other things, the following problems: using, as far as practicable, low-cost scientific and technical means; Using traditional and local approaches, where practical, to maximize and maintain local participation.

Prevention of depletion, pollution and deterioration of the quality of water resources: the creation of treatment facilities that meet sanitary standards, using environmentally friendly, inexpensive and improveable technologies; implementing programs for urban stormwater and drainage systems; promoting recycling and reuse of wastewater and solid waste; control of pollution sources to protect water resources; protection of watershed areas in connection with the problem of depletion and deterioration of the quality of their forest cover and from the negative influence of human activities carried out in the upper reaches of rivers; encouraging research on the contribution of forests to the sustainable development of water resources; promoting the best practices in the use of agrochemicals to minimize their impacts on water resources.