Roadmap for the Protection and Restoration of the Aquatic Ecosystem of Lake Balkhash

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SYMBOLS AND ABBREVIATIONS

SDG	- Sustainable Development Goals
PRC	- People's Republic of China
XUAR	- Xinjiang Uyghur Autonomous Republic
NMU	- adverse weather conditions
RGP	-republican state enterprise
MEGNR RK	- Ministry of Ecology, Geology and Natural Resources Republic of Kazakhstan
MPC	- maximum permissible concentration
BS	- Baltic system
HPP	-hydroelectric power plant
IBB	- Ile-Balkhash basin
CWR	- Committee for Water Resources
GEF	-Global Environment Facility
UN	-United Nations
SPECA	- UN Special Program for the Economies of Central Asia
ESCAP	- United Nations Economic and Social Commission for Asia and the Pacific ocean
SVDMA	- Meeting on Interaction and Confidence Building Measures in Asia
NATO	- North Atlantic Treaty Organization
MIO	-local executive bodies
MOA	-Ministry of Agriculture
MIIR	-Ministry of Industry and Infrastructure Development
MNE	-Ministry of National Economy
MON	-Ministry of Education and Science
CREAM	- Committee for the Regulation of Natural Monopolies
RK	-The Republic of Kazakhstan

INTRODUCTION

Lake Balkash is one of the largest lakes on the planet and is a unique drainless relict reservoir. This reservoir forms all the constituent components (atmosphere, soil cover, flora, fauna and others) of the multifaceted ecosystem of the vast region of the Republic of Kazakhstan.

With the beginning of intensive economic activity in the basin, the natural regime of the ecosystem was disturbed, including the hydrological regime of Lake Balkash. In the 1980s, there was a decrease in the level of Lake Balkash and degradation of coastal areas. The current problems of Balkash are the result of ill-conceived irrigation policy projects. Today they have been exacerbated by water and air pollution, mismanagement of water, desertification, and the threat of a decrease in river flow.

Economic activity in the region, which does not take into account natural, environmental restrictions, leads to pollution and destruction of the ecosystems of the Ile-Balkhash basin. In the waters of the Ile River and Lake Balkash, there is an increased content of sulfates, nitrites, organic compounds, pesticides and heavy metals.

The ecological situation in the area of the Balkash basin is characterized as unstable, with the progressive vulnerability of Lake Balkash. This is caused by irrational water use, an imperfect resource management system, interstate water allocation problems and other factors.

Preservation of the ecosystem of Lake Balkash is the main condition for the conservation and maintenance of life in the basin.

This work is a roadmap for the protection and restoration of the aquatic ecosystem of Lake Balkash (hereinafter referred to as the Roadmap). It was developed on the basis of an analysis of the current state of Lake Balkash and its basin, covering historical data, natural-climatic, hydrological, hydrochemical and other conditions of the object. The main goal of the Roadmap is to stabilize and improve the environment in the Balkash Lake basin.

The roadmap was developed by the Center for the Promotion of Sustainable Development of the Republic of Kazakhstan within the framework of the project on the protection and restoration of freshwater ecosystems to achieve SDG 6.6.1 indicators "Dynamics of change in the area of water-related ecosystems" with the support of the Global Water Partnership (GWP) and the International Cap-Net Network , as well as UNEP and UNDP, under the leadership of UNEP-DHI, based on the analysis and evaluation of the current legislative and regulatory and technical documents of the Republic of Kazakhstan, as well as in interaction with stakeholders.

This Roadmap takes into account the goals and objectives of the following strategic documents, state plans and programs in the field of sustainable use of water resources:

- National project "Zhasyl Kazakhstan" for 2021-2025, approved by the Decree of the President of the Republic of Kazakhstan dated October 7, 2021 No. 670
- The Concept for the transition of the Republic of Kazakhstan to a "green economy", approved by Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577, and the Action Plan for the implementation of the Concept for the transition of the Republic of Kazakhstan to a "green economy" for 2021-2030, approved by the Decree of the Government of the Republic of Kazakhstan dated July 29, 2020 No. 479;
- Strategy "Kazakhstan-2050", approved by Decree of the President of the Republic of Kazakhstan No. 636 dated February 15, 2018;
- National project for the development of the agro-industrial complex of the Republic of Kazakhstan for 2021 - 2025, approved by the Decree of the Government of the Republic of Kazakhstan dated October 12, 2021 No. 732;
- The State Program for the Development of Regions for 2020 - 2025, approved by the Decree of the Government of the Republic of Kazakhstan dated December 27, 2019 No. 990;
- The State Program for the Development of the Tourism Industry of the Republic of Kazakhstan for 2019-2025, approved by the Decree of the Government of the Republic of Kazakhstan dated May 31, 2019 No. 360;
- National Development Plan of the Republic of Kazakhstan until 2025, approved by Decree of the President of the Republic of Kazakhstan No. 636 dated February 15, 2018 (as amended as of February 26, 2021);
- The General Scheme for the Integrated Use and Protection of Water Resources (SKIOVR), approved by the Decree of the Government of the Republic of Kazakhstan dated April 8, 2016 No. 200.

The roadmap also takes into account the international documents adopted in recent years, which are approved and signed by the Republic of Kazakhstan, such as: “**Sustainable Development Goals”**(SDGs), formally known as Transforming Our World: The 2030 Agenda for Sustainable Development (2015) and the Paris Agreement (2015), an agreement underUnited Nations Framework Convention on Climate Change, regulating measures to reduce carbon dioxide in the atmosphere with2020other. The Roadmap gives possible ways to solve the problems of preserving Lake Balkash, taking into account the most important aspects: maintaining the level of Lake Balkash and improving the quality of surface waters. Scientific articles and reports previously published in the open press, materials

from various forums and other sources devoted to the problems of Lake Balkash were used as scientific and analytical support.

1. ANALYSIS OF THE CURRENT SITUATION

1.1. Assessment of the current state of Lake Balkash

Lake Balkash for Kazakhstan as a whole, and its southeastern region, is of great ecological, socio-economic and socio-political importance. The lake is an object that regulates the state of the natural environment of the adjacent territory, a unique biotic complex, the basis for fishing and hunting, a regulator of sanitary and hygienic living conditions for the population of the coastal zone, a source of water supply for the population and objects of the Balkash region.

The area of the lake is 16400 km2. The greatest depth in the eastern part of the Balkash is 26 m, and the average depth is 5-8 m. The length of the coastline is 2385 km. Transparency up to 5.5 m. Inflowing rivers - Ile, Karatal, Aksu, Lepsy, Ayagoz (Ayakoz). Ayagoz brings its waters to the lake only in high-water years.

Balkash region, as a single water basin, is located on the territory of Kazakhstan and the People's Republic of China (PRC). The main waterway of the lake is the river. Ile. About 70% of the catchment area of the lake is the basin of this river and 80% of its total surface runoff is formed in it.

The Ile River is a transboundary river, and the main runoff-forming part of the basin is located in China, on the territory of the Xinjiang Uygur Autonomous Republic (XUAR), where 65% of the river flow is formed.

Table 1.

Runoff and average annual water discharge of the Ile River

years / stock	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
China runoff, km3	18.87	14.73	10.92	10.16	8.132	12.546	19.026	14.819	11.95	13.37	9.807
Drain RK, km3	8.64	7.40	5.94	6.46	4.94	6.468	6.806	6.811	6.204	5.37	4,890
Tot. runoff, km3	27.51	22.13	16.87	16.62	13.07	19.014	25.832	21.630	18.156	18.74	14.698

Table 1 shows that over the past three years, the flow from China along the river. Ile is decreasing. Compared to 2010, it's doubled.

In the Ile River basin, a critical situation has developed with the water supply of irrigated lands in the Almaty region, where in June this year the average water flow was 70-80 m3/sat an average annual rate of 500 m3/s, in July 100 m3/s with

an average annual rate of 835 m3/s; in August, an average inflow of 150 m3/s was observed at an average annual rate of 673 m3/s, which is a historical minimum of the hydrological water flow in the Ile River for the entire observation period.Conducted comparative analysisshows that a similar situation was in 2014 due to abnormal drought (Table 1.).

A particularly critical situation has developed in the Kapshagay reservoir, which is designed to provide drinking water supply to the city of Kapshagay, Shengeldy irrigation array, Akdala array, hydropower and fisheries.

At present, the main consumer of water in this basin, both on the territory of the Republic of Kazakhstan and on the territory of the XUAR, is irrigated agriculture, for the needs of which more than 70% of water resources are spent. The use of water for the needs of irrigated agriculture tends to increase, especially in the XUAR, which causes concern for the safety of Lake Balkash and for the ecological situation in the basin. Reduction of transboundary water flow along the river. Ile, the main supplier of water resources of Lake Balkash, can lead to a shallowing of the lake with catastrophic consequences for it. Balkash can repeat the fate of the Aral Sea.

The main threats and challenges in the conservation of Lake Balkash are: global and regional climate change, environmental and demographic changes; inconsistency in interstate relations with the People's Republic of China; the use of water-consuming technologies in the sectors of the economy; imperfection of technical means of accounting and monitoring of water, water treatment technologies; lack of modern water resources management tools based on automated control and distribution systems.

The consequences of untimely adoption of measures to prevent the drying up of Lake Balkash may be the emergence of new centers of environmental instability, disruption of the implementation of the socio-economic development of the entire region.

Desertification processes are already intensifying in the Balkash region. They cover about one third of the basin, and out of 16 lake systems, only five remain. Due to the change in the hydrological regime downstream of the Kapshagai reservoir, the delta of the river has degraded. Ile. In 1970, its area was 3046 km2, now it has decreased to 1876 km2, that is, 1.6 times. Hence the decrease in biodiversity.

The change in the water level in the lake directly depends on the flow of water through the rivers, especially along the river. Ile. So, for example, on the river. In Ile, in 1970, the Kapshagay reservoir with a hydroelectric power station was put into operation. When filling this reservoir, the water balance of Balkash

was disturbed. From 1970 to 1987, the water level dropped by 2.2 m[1], and the volume - by 30 km³, which caused a deterioration in water quality, especially in the eastern part of the lake.

After 1988, the water level in Lake Balkash began to grow significantly due to an increase in the water content of the river. Ile, and in recent years fluctuates between 342.15-342.73 m[2]. Level rise has occurred due to the increased melting of glaciers due to global warming, a reduction in the area of irrigated land and a decrease in water consumption in the Kazakhstani part of the river basin. ile[3].

The main factor influencing the ecology of the Northern Balkash region is**emissions**enterprises of LLP "Corporation Kazakhmys" (formerly Balkhash Mining and Metallurgical Combine).

Other factors are also the presence in the city of Balkash of a large number of construction companies, enterprises of the fish and meat industry, food industry enterprises - Balkash-Nan LLP, Balkashsut LLP, Balkashbalyk, etc. In total, over 400 enterprises are located in the city.As a result of the activity of these stationary sources, about 491 thousand 200 tons of chemicals enter the surface layer of the atmosphere every year. All sources emit 39 types of harmful substances into the atmosphere, of which 33 are specific and 5 groups of substances that have the effect of summing the harmful effects[4].

According to the Department of Ecology for the Karaganda region, a significant proportion of atmospheric pollution in the region (85%) falls on manufacturing enterprises.

An important role is also played by adverse weather conditions (NMC), which are a combination of short-term meteorological factors (calm, light wind, fog, inversion), respectively, contribute to the accumulation of harmful (polluting) substances in the surface layer of atmospheric air.

A large role in the pollution of the Balkash is played by communal, domestic wastewater. From the cities of Balkash, Priozersk and rural settlements, they are dumped without cleaning onto the terrain or into old storage tanks (from the times of the USSR), which are mostly in a non-working condition. Also, with river runoff, collector-drainage water from irrigation fields and wastewater from enterprises in the Chinese part of the basin enter the lake.

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[1]Lake Balkhash. Britannica Online Encyclopedia. Retrieved 29 January 2009.archivedAugust 18, 2011

[2]Propastin. P. A simple model for monitoring the water level in Lake Balkhash and discharges of the Ili River: Application of remote sensing. Lake reserve. Res. Manag. 2008.

[3]Luo, L.; Gao, YQ Current status of policies and laws for sustainable development strategies. J. South. Agric. 2011, 42.1579-1582.

Piven E.N. Modern climate changes in the glacial-nival zone of South-Eastern Kazakhstan (according to regime observations)//Terra. 2007. Issue. 2, #1.

[4]Namazbayeva Z. I., Dyusembayeva N. K., Mukasheva M. A., Sadykov K. I. Risk factors in violation of the reproductive function of the organism under the influence of the territorial-industrial complex // Hygiene and Sanitation. -2010. - No. 1. Page 51-54.

In the absence of sewerage systems and enterprises for the collection and processing of municipal solid waste, rural settlements have become one of the main and dangerous sources of pollution of river valleys and water resources.

In addition, areal oil pollution of coastal areas has not yet been eliminated (for example, bitumen-polluted salt lake south of the city of Priozersk, Karaganda region).

Water pollution in Lake Balkash is carried out not only due to economic activities near the lake. Polluted waters also come from China - a strong excess of copper and other substances is recorded at border points, the water has a V pollution class.

At the same time, the high content of copper (10-21 MPC) in the waters of the Karatal River indicates its background origin in many parts of the Balkash Lake basin. Moreover, it is possible that the Aksu and Lepsy rivers can also be sources of pollution, which requires special studies.

In recent years, Kazhydromet gives more moderate indicators of water quality. But at the same time, it does not explain why there was a relative improvement in water quality in the southeastern part of the lake.

It is likely that the cause of this is the runoff and wind mixing of water. Improvement of water quality can also be justified by water protection measures carried out by Kazakhmys Corporation. According to the Basin Agreement, from 2009 to 2018, 1.5 billion tenge was allocated and disbursed for environmental activities.

In 2017, in Lake Balkash, at a water temperature of 9.9-25.3ºC, a pH of 8.80 and a concentration of oxygen dissolved in water of 10.4 mg/dm3, BOD5 of 1.66 mg/dm3, there is no improvement in water quality fixed. Excesses of MPC were recorded for substances from the groups of heavy metals (copper (2+) - 17.0 MPC, zinc (2+) -1.7 MPC, manganese (2+) - 1.1 MPC), biogenic substances (salt ammonium - 3.5 MPC, fluorides-4.2 MPC) and the main ions (sulfates -20.2 MPC, magnesium - 7.4 MPC, sodium - 9.6 MPC, chlorides-3.6 MPC). The state of the quality of surface waters of Lake Balkash according to the RSE "Kazhydromet" for 2018 is presented in Table 2[5].

In 2018, the water temperature in Lake Balkash was in the range of 13.0-26.7ºC, the pH value was 8.71, the concentration of oxygen dissolved in water was 10.6 mg/dm3, BOD5 was 1.26 mg/dm3. Excesses of MPC were recorded for substances from the groups of heavy metals (copper (2+) - 10.5 MPC, zinc - 1.4 MPC, manganese (2+) - 1.3 MPC), biogenic substances (ammonium saline - 3.5

[5]Information Bulletin on the State of the Environment of the Balkash Lake Basin and the Alakol-Sasykkol System, 2018

MPC, fluorides - 3.4 MPC, total iron - 1.1 MPC) and main ions (sulphates -16.4 MPC, magnesium - 6.9 MPC, sodium - 9.1 MPC, chlorides - 3.9 MPC).

At present, RSE "Kazhydromet" on the basis of a letter from the Vice-Minister of the MEGNR RK ref. No. 29-02-01-05/6591 dated 01/16/2020 does not have the ability to assess the quality of lakes and seas of the Republic of Kazakhstan according to the Unified Classification. The results of monitoring the quality of surface waters of lakes and the Caspian Sea are published in bulletins by regions. At the same time, with regard to water quality, its assessment began to be characterized not by maximum permissible concentrations (MPC), but by background indicators. Therefore, in the bulletins starting from 2019, water quality is not assessed in MPC.

According to Kazhydromet data as of the first half of 2021 (Karaganda region)[6], at water temperature at the level12.0-22.0ºC, pH 8.29-8.60, water quality in the lake was characterized by the following indicators: concentration of oxygen dissolved in water - 7.65-10.0 mg/dm3, BOD5 - 0.28-0 .87 mg/dm3, transparency - 50-320 cm, COD - 6.1-80.4 mg/dm3, suspended solids - 15-43 mg/dm3; mineralization - 1066-2647 mg/dm3; heavy metals (copper - 0.0013 mg/dm3); nutrients (salt ammonium - 1.2 mg/dm3, total iron - 0.025 mg/dm3); main ions (sodium + potassium - 498 mg / dm3, magnesium - 120 mg / dm3 sulfates - 773 mg / dm3, chlorides - 339 mg / dm3).

The quality of water from the Almaty region, for the first half of 2021, at a water temperature of 11.0-23.0 ºC and a pH value of 8.4-8.7 is characterized by the following data: the concentration of oxygen dissolved in water is 7.65-10.9 mg/dm3, BOD5 1.0-1.5 mg/dm3, COD 9-18 mg/dm3, transparency 21-30 cm, suspended matter 2.0-17.0 mg/dm3, mineralization 4643-5073 mg/dm3 ; heavy metals (copper - 0.038 mg/dm3, zinc - 0.04 mg/dm3); nutrients (salt ammonium - 1.35 mg/dm3, total iron - 0.16 mg/dm3); main ions (sodium - 868 mg/dm3, magnesium - 341.7 mg/dm3, sulfates - 1929 mg/dm3, chlorides - 1016 mg/dm3).

The content of heavy metals in the bottom sediments of Lake Balkash, according to Kazhydromet (2018), varies within the following limits: cadmium from 0.055 to 0.215 mg/kg, lead from 10.55 to 13.25 mg/kg, copper from 1.055 to 1.205 mg/kg kg, chromium from 0.14 to 0.475 mg/kg, zinc from 9.63 to 13.75 mg/kg, arsenic from 1.43 to 3.44 mg/kg, manganese from 729.63 to 890 mg/kg.

The same indicators for the 1st half of 2021 are: cadmium - 0.02-0.03 mg/kg; lead - 5.7-8.3 mg / kg; copper - 0.09-0.13 mg / kg; chromium - 0.20-0.73 mg / kg; zinc - 1.30-1.80 mg / kg; arsenic - 5.70-8.60 mg / kg; manganese - 157.5-275.3 mg / kg.

[6]Information bulletin on the state of the environment of the Karaganda region. issue 9, 1st half of 2021

Despite the decrease in some indicators, the content of heavy metals in bottom sediments is still high.

At the same time, the results of the analysis of bottom sediments of surface waters of the lower reaches of the Ile River show that the copper content in bottom sediments in the Tamgalytas tract (near the Kapchagai reservoir) is 0.67 mg/kg, while in the area of Zhideli village (near Lake Balkash) the copper content in bottom sediments increases several times and amounts to 3.1 mg/kg. The maximum concentration of copper in bottom sediments is observed in Akkol settlement (5.1 mg/kg).

In order to obtain data for the last year, they were requested from RSE Kazhydromet. And will be attached to the version for approval of the document.

An assessment of the current state of Lake Balkash shows that the ecological situation that has developed in the Balkash basin is characterized as critical, with a progressive vulnerability of the ecosystem and instability of the level of Lake Balkash caused by problems of water allocation, degradation of mountain ecosystems (cuttingforests, irreversible melting of glaciers, etc.) and other threatening factors. Pollution and mineralization of water are growing. The areas of saline and flooded lands are increasing, desertification is progressing, tugai forests, nests and colonies of waterfowl are burning, saxaul forests are being destroyed. From year to year, unjustified, mismanaged losses of water resources continue, caused by outdated technologies of irrigated agriculture, poor accounting and control of the use of water resources.[7].

[7]Smolyar V. A., Mustafaev S. T. Hydrogeology of the Balkash lake basin. Almaty. Gylym: 2007.

1.2. Analysis of the current policy of state regulation of Lake Balkash and its legal support

In accordance with the Decree of the Government of the Republic of Kazakhstan dated January 21, 2004 No. 59 “On approval of the List of water bodies of special state importance and features of the legal regime for regulating economic activities at water bodies of special state importance”, Lake Balkash belongs to a water body of special state importance.

In this regard, the regime of economic activity in the Balkash Lake basin should comply with the following principles:

1. priority of activities aimed at maintaining and improving the sanitary-epidemiological and environmental situation;
2. permanent reduction of the impact of economic activity on the ecological system and the sanitary and epidemiological situation;
3. balance of solutions to socio-economic problems and protection of the lake, based on the principles of sustainable development;
4. obligatory state ecological expertise;
5. implementation of public control over the preparation and adoption of economic and other decisions that may have a negative impact on the state of the lake, the environment, environmental safety and sanitary and epidemiological well-being of the population.

On the basis of the said resolution and in accordance with the article of the Water Code of the Republic of Kazakhstan, the following activities are prohibited on the territory of Lake Balkash:

1) Economic and other activities that cause the destruction of the natural ecological systems of the lake basin, changes in the environment that are dangerous to the life and health of the population;
2) Import into the lake zones, as well as storage or burial of radioactive waste and products that cannot be neutralized or disposed of;
3) Mowing reeds and burning dry vegetation, uprooting forests, developing riverbeds of spawning significance;
4) Economic activity and production on the territory of works and services without mandatory state environmental and sanitary-epidemiological examinations.

However, the current legislation is not perfect in terms of water saving requirements. For example, water supply from main and distribution canals is carried out without taking into account the level of operation of irrigation systems and their equipment with water metering stations. The existing 120 normative legal acts relating to water resources mostly contradict each other and require optimization and streamlining.

Groundwater remained abandoned. They were excluded from the Code "On Subsoil and Subsoil Use", and now they do not belong to the subsoil, and only the issuance of a permit for special water use was included in the Water Code. If earlier control over subsoil use was entrusted to environmentalists, now it is unknown. Groundwater monitoring is not provided. Methods of search and exploration for groundwater are not legally defined. Issues of approval or re-approval of groundwater reserves are not regulated.

Moreover, individuals and legal entities drill many wells for their own needs, without registering them anywhere and without submitting reports to state bodies and statistics. management, since in the Water Code in Article 91 it is written “at the discretion of the balance holder”, it means that groundwater may be depleted, and if they are hydraulically connected to surface water, then depletion of the latter is also inevitable.

To date, there are no state programs or other strategic documents in the field of water resources management in Kazakhstan. The State Program for Water Resources Management was transformed into the State Program of the Agro-Industrial Complex for 2021-2025. with a significant reduction in the main activities in terms of regulating the use in the sectors of the economy and water management, taking into account the boundary status of the main river basins of Kazakhstan.

Thus, taking into account the current state of Lake Balkash and its impact on the ecological and socio-economic sphere, it is necessary to develop and take measures to stabilize the level of Lake Balkash and ensure the proper quality of the lake’s water resources using new approaches related to the entire basin of the lake in question.

2. NECESSARY MEASURES TO ENSURE THE SUSTAINABILITY OF THE FUNCTIONING OF THE WATER ECOSYSTEM OF OZ. BALKASH

2.1. Measures for the conservation and restoration of the ecosystem of Lake Balkash

Preservation of the lake ecosystem is the main condition for the preservation and maintenance of life in the basin. At the first stage of the Roadmap, it will be necessary to assess the capacity of the basin ecosystem, determine the ecological limits for economic activity, followed by the development of limits and standards for nature management, mechanisms to support a healthy state of the environment.

The level of Lake Balkash is one of the main indicators of the state of the basin ecosystem. To maintain the optimal hydrological regime of a lake with a level of at least 341 m, it is necessary to develop a strategy for integrated management of the basin's water resources, develop and refine water use limits and standards, and improve mechanisms for monitoring and stimulating water conservation.

An analysis of the key problems of the development of the Ile-Balkhash region and the preservation of the ecosystem of the basin will make it possible to determine a list of goals for stabilizing the situation in the region.

one. Preservation and restoration of ecosystems in the Ile River Delta. The delta of the Ile River is part of the Lake-Delta ecosystem, and acts as a natural counter-regulator of the flow to the Balkash. To preserve its ecosystems, it is necessary to restore the natural hydrological regime of the Ile River.

To this end, it is proposed to study the state of ecosystems, develop a set of measures for their conservation and restoration. An important role is played by the increase in the forest cover of the catchment basins of the rivers of the Ile-Balkhash region, the assignment of the forests of this zone to the appropriate categories of protection, as well as the justification of other issues, the solution of which will have an impact on the improvement of the ecological situation in the region and the preservation of Lake Balkash.

To take measures for the construction of the Kerbulak counter-regulator with a useful volume of 20 million m3 and a hydroelectric power station. The Kerbulak HPP can eliminate the uneven water releases from the Kapshagay HPP, which is destructive for ecosystems, and will increase its productivity. At the same time, this can create favorable conditions for biota, reduce damage and the threat of flooding of settlements.

It would also be expedient, using the capabilities of the Kapshagay reservoir in combination with other power generating capacities, to create conditions for the revival of spring floods for the Ile River Delta.

In addition, in order to restore the ecosystems of the delta, it is planned to develop and implement a set of hydro-reclamation measures, including the creation of at least 10 lake systems with an area of 123.6 thousand hectares, including 17.0 thousand hectares for muskrat breeding, 56.4 thousand hectares for fish farming. ha.

2.Involvement in circulation of additional water resources. The basin has certain reserves of water resources that can be used to stabilize the water balance.

It is necessary to take measures to save water resources and reduce the volume of irretrievable water consumption in agriculture, improve the structure of sown areas, and consistently reduce the use of pesticides in the cultivation of agricultural crops to a complete cessation.

As one of the measures, it is proposed to build a waste and collector-drainage network. This type of work is most effective on saline and swampy lands, where drainage and streamlining of discharge from irrigation fields not only improves the ameliorative state of soils, but also improves environmental conditions. Collector-drainage, waste and waste water can be used for reuse on irrigated lands after additional analysis and appropriate preparation.

Groundwater is a major reserve in order to increase the water supply of the IBB with fresh water, especially for drinking water supply. Their balanced use, taking into account the mutual influence with surface waters, can significantly improve the ecological situation of the Ile River and Lake Balkash.

3. Improving the quality of surface waterwill be based on the protection of water sources from pollution and water protection measures. Protection of IBB water bodies from pollution as a result of economic activity is supposed to be carried out in three main areas: protection of small rivers, protection of the coastal zone and the water area of Lake Balkash.

To protect the waters of small rivers, it is proposed that cities and settlements develop a set of water protection measures to prevent pollution of rivers with a tightening of the control system for their implementation. It is advisable to draw up and refine the schemes of small rivers, with a set of measures for their protection.

The protection of the waters of the Kapshagai reservoir involves the implementation of major measures, such as the reconstruction and expansion of treatment facilities and sewerage systems of cities, the use of wastewater for irrigation of agricultural crops, the establishment of water protection belts and zones along the perimeter of the reservoir, the creation of forest parks in the recreation areas of the reservoir.

Issues of protection of Lake Balkash and the delta of the river. Ile are closely related to the quality of conservation activities in the basin. The task is to develop and implement measures to reduce harmful emissions and discharges, and, above all, LLP "Corporation" Kazakhmys ". An important measure for the protection of the lake is the organization of work on water protection belts and zones.

To supply high-quality drinking water to the population in district centers, central estates and workers' settlements, it is proposed to develop a special subprogram for water supply to the population of the basin. It is necessary to develop and implement a set of water protection, technical and technological measures using, for small settlements, modern efficient local installations and technologies. Such a subprogram will have to be coordinated with the developed water supply programs for the regions of the Balkash Lake basin.

Issues of transboundary water use. Reducing the risk of disturbance of the water balance of the basin depends on the issues of transboundary water use. It is proposed to study the possibilities of interaction and increase the interest of neighboring countries in the conservation of the ecosystem of the lake basin.

It is necessary to work out possible areas of cooperation with the PRC and foreign countries to resolve the entire range of transboundary issues and use the best world experience in the use of transboundary watercourses.

It is proposed to consider the possibility of granting preferential treatment for investments of other guarantor countries in environmental and other sectors, the creation of a water protection association of enterprises with foreign participation. Consolidated large international capital, dependent on the quality of the ecological resources of the basin, can become a guarantor for preventing the degradation of its ecosystems.

To study the possibilities of creating the Balkash Regional Insurance Fund for Safe and Sustainable Development to support projects for the preservation of the hydrological regime, international tourism, and the organization of transport infrastructure. Such a fund can accumulate funds for insurance against political, military and environmental risks in the Balkash Lake basin.

2.2. Measures to improve the efficiency of management and rational use of water resources of Lake Balkash

The Balkash-Alakol Basin Water Resources Administration is the official state body for regulating the use and protection of water resources of the named basin. The basin management body reflects the interests of the state in all water relations, being a representative state body for managing the water resources of the basin and its protection, exercising exclusively control and regulatory functions.

The basin principle of water resources management makes it possible to ensure their rational regulation and distribution among consumers, to eliminate the

contradictions that arise at the intersectoral level. This principle has been in force in Kazakhstan since 1987 and proceeds from the unity of these resources and the multilateral nature of their use.

The primary link in the water management system is the territorial water management departments. It is at this level that territorial problems are solved in terms of water supply for the population and sectors of the economy, maintenance and operation of hydraulic structures. Therefore, it is included in the structure of local executive power, and on the other hand, in the structure of the Committee for Water Resources of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan (hereinafter CWR MEGNR RK), thus having dual subordination.

In the context of the formation of market relations and the corresponding organizational and economic structures, the adopted management system is designed to ensure the protection and reproduction of water resources, optimal conditions for water use, and the preservation of the environmental sustainability of the environment within the basin of Lake Balkash and adjacent territories.

At the same time, the departmental subordination of the CWR to the MEGNR of the RK does not contribute to the development and effective implementation of the state water policy of the country, intersectoral coordination and integration of the interests of water users, the solution of growing problems both at the national and interstate levels of management, as well as the sustainable development of the water sector of the republic as a whole. .

In this regard, increasing the efficiency of management and rational use of water resources, including in the Balkash-Alakol water management basin, should be carried out in the following areas:

- consider the possibility of creating an independent state body that is part of the government of the Republic of Kazakhstan, or create additional Departments for water management balances and basin management within the structure of the MEGNR;
- increase the staffing of the Basin Administrations, which would ensure the implementation of the competences assigned to them in accordance with the Water Code of the Republic of Kazakhstan;
- to strengthen the role and competence of the Basin Councils as a basin organization that ensures the participation of state organizations, water users, civil society in water management and takes into account the interests of the population, economic sectors and the environment when regulating the use of water resources of a particular basin, as well as the Balkash Lake basin;

– provide a sufficient number of vehicles and office equipment in order to effectively carry out the functions assigned to them.

In addition, an important role in water resources management (management of demand and consumption) is played by a balanced tariff policy, which is aimed at stimulating water conservation and efficient water consumption in all sectors of the economy, including housing and communal services. Improving the tariff policy in the water sector of the economy should ensure that all operating costs are covered. Without defining a clear pricing mechanism for water resources, it is not possible to select the most cost-effective investment projects for rationalizing water use and regulating river flow.

The effectiveness of state regulation in the field of the use of the protection of the water fund, accounting for water resources directly depends on the degree of implementation of automation systems and systems of mathematical modeling, improvement of methods for monitoring water resources based on innovative technologies.

In modern conditions, automation and digitalization are effective tools for improving the efficiency of management and technological processes. In this vein, the digitalization of the water industry should develop in two complementary directions.

The first is the creation of a tool for assessing the resources of the river basins of Lake Balkash and modeling the development of the situation in order to increase the efficiency and validity of making strategic decisions in water management.

The second is the automation of the measurement of water metering indicators, the organization and implementation of a monitoring system, dispatcher data collection and management of reservoirs in the lake basin, the creation of a single data warehouse for primary water metering.

Effective management in the water sector of the economy requires the availability of qualified personnel in all areas and levels of the water sector. The practice of water management design and construction shows that graduates of a number of universities do not meet the qualification requirements for workers in the water industry.

This requires the implementation of effective measures to improve the system of training and retraining of specialists in the field of water management, ensure the rapid development of the scientific and technical potential of the industry, train new specialties, and strengthen the role of scientists in solving urgent problems of the industry.

First of all, on the basis of the new Professional Standards, it is necessary to revise the educational programs of the main basic specialties of the water profile: irrigation and drainage, hydraulic engineering construction, mechanization of

irrigation and drainage works, water supply and sanitation, water management economics.

2.3. Measures to improve the regulatory and legal framework for water management of Lake Balkash

The national water legislation is based on the Constitution of the Republic of Kazakhstan and consists of the Water Code and other normative legal acts. These include:

- 28 international treaties,
- 11 Codes,
- 37 laws,
- 21 Decree of the President of the Republic of Kazakhstan
- and 115 resolutions of the Government, in one way or another affecting the issues of water resources management.

The current Water Code of the Republic of Kazakhstan (hereinafter referred to as the Code) was adopted in 2003. Over the sixteen years of the application of the existing Code, amendments and additions were made to it 62 times (an average of a little more than 3 times per year). As a result, according to many experts, frequent changes and additions to the Code in the interests of business led to a loss of consistency in law enforcement, which generally worsened the situation at all levels of water use and water management.

In addition to the main provisions regulating the management of water resources, the Code includes provisions regulating the sphere of public water supply and sanitation, which leads to confusion, segmentation and cumbersomeness of the document. A similar situation has developed with regard to ensuring the safe operation of the GTS.

Such important issues as providing the population with drinking water and sanitation, as well as the operation of hydraulic structures associated with possible emergency situations, require separate special legislative acts.

Despite the fact that the Water Code does not contain direct norms for large water bodies such as Lake Balkash or the Aral Sea, all articles of the Code are also directly related to them.

At the same time, the current realities in the transboundary Ile-Balkhash basin, and in general in the basin of Lake Balkash, require the adoption of a separate law "On the conservation of Lake Balkash", which would lay the foundation for transboundary cooperation with China and targeted financing for the progressive development of water management in Kazakhstan. part of the Balkash lake basin.

2.4. Measures to develop sustainable economic activity

In September 2015, within the framework of the 70th UN General Assembly at the UN summit, the President of the Republic of Kazakhstan N.A. Nazarbayev, along with other leaders of the UN member states, signed a new document for further global development, emphasizing that the goals and guidelines of the Sustainable Development Goals (SDGs) fully coincide with the priorities and objectives of Kazakhstan.

The SDGs are a comprehensive set of goals and indicators until 2030 aimed at improving the quality of life of citizens, socio-economic development and environmental sustainability of states. The SDGs consist of 17 goals to be achieved by 2030, as well as 169 related targets and 242 indicators. The goals and objectives of the SDGs are designed to contribute to the achievement of sustainable development through the integration of three components: economic, social and environmental.

The presence of a close relationship between the three components of sustainable development is of particular relevance in modern conditions, when the serious consequences of climate change and the need to conserve limited natural resources and transition to a "green" economy are becoming apparent.

In this regard, the conservation of Lake Balkash involves the support of industries that provide both economic and environmental benefits. These include sectors, the development of which is due to the growth of environmental benefits and resources (tourism, fishing, muskrat breeding), and sectors of environmental business (waste processing, involvement of renewable energy sources, forestry).

The state needs to provide support, stimulation of strong and competitive export-oriented industries. This is the production and export of cheap electricity, processing and production of environmentally friendly agricultural products, fine-wool sheep breeding and fur farming. Intersectoral relations will be formed on the basis of an integrated basin approach and mutually beneficial actions.

The Balkash Lake basin has all the conditions for the development of sustainable energy and the production of its own electricity. In the Almaty region, along with the existing generating capacities, the Moinak hydroelectric power station (300 MW) has been built and is operating. It is also necessary to design and build the Kerbulak counter-regulator (50 MW), which should ensure the environmental sustainability of the river delta. Ile. In addition, there are unique opportunities for the development of small hydropower.

The basin has unique opportunities for developing wind energy, which, in combination with other sources of electricity, can cover the demand for electricity in adverse weather conditions. The development of wind farms can be realized as a

commercial direction if there is a market for trading in greenhouse gas emissions under the Kyoto Protocol.

All these measures can provide significant tax and foreign exchange revenues for the development of the Balkash Lake basin. Including a large metropolis of the country, Almaty. It is promising to convert CHPPs and boiler houses using coal to gas and liquid fuels.

With regard to the development of the basic industry - non-ferrous metallurgy, it is necessary to assess the impact of industry on ecosystems and human health, the consequences of the development of new deposits of copper ore in the Balkash region, the development of the gold industry and the increase in the capacity of the Akbakay GOK, the expansion of the production of rolled products in the form of strips, sheets and strips, copper rod at JSC ZOTsM (Non-ferrous metal processing plant).

The Ile-Balkhash basin has a huge potential for the development of agriculture. In modern conditions, the agrarian and related segments of the food sector of the economy, the market institutions emerging in this chain should be considered together as a single object of the state's agro-industrial policy.

Through the introduction of corporate governance, the problem of employment, small, family and household business can be solved, since the investor will benefit from the widespread use of efficient technologies. With an appropriate management system, it will be profitable to invest in such activities as the distribution of seeds, planting material, young animals of new breeds of domestic animals, the fight against harmful insects and animals, the distribution of know-how and licenses.

By increasing employment, it will be possible to reduce rice cultivation, which will significantly increase river flow and improve water quality. It is planned to restore irrigated lands withdrawn from circulation on an area of 210.9 thousand hectares and grow wheat, rice, beets, corn, vegetables and fruits on them. There are opportunities to significantly increase the yield of these crops. With the development of the energy sector, the program will provide for the expansion of areas of watered pastures and the restoration of the forage base in deltas and river valleys.

Stabilization of the hydrological regime and improvement of water quality will contribute to the restoration of spawning grounds and the development of fish farming. Commercial cultivation of sturgeons in lakes and pond farms, development of a subprogram for the conservation of the gene pool of valuable fish species in the Balkash itself is planned.

The development of sustainable transport involves the restructuring of the road network through the reconstruction of local, republican and international

roads. Air transport can be developed through the expansion of the Almaty airport, the development and expansion of the service system for the basin areas by local aviation from the base airports of Boroldai, Taldykorgan, Balkash, Ayagoz. The program will explore the possibilities of developing passenger water transport along the Ili River (330 km of navigable routes), the Kapshagay reservoir and Lake Balkash, in recreational areas and natural areas.

It is necessary to develop sustainable tourism as a profitable sector of the region's economy by creating a highly profitable tourism industry capable of producing and selling a high-quality, competitive product in the international tourism market. The Government of the Republic of Kazakhstan in the long-term development program of Kazakhstan has identified the tourism industry as a priority, because. it ensures the inflow of foreign currency, helps to increase employment and contributes to the development of the country's infrastructure - road transport, trade, public utilities, cultural, medical services.

Of the ten priority areas identified in the Concept for the Development of Tourism in the Republic of Kazakhstan, five are located on the territory of the basin. At the same time, it is necessary to provide measures to protect natural and cultural heritage monuments from excessive recreational load. The priority task is to optimize the existing network of specially protected natural areas (SPNA) based on the basin approach. Its decision should be based on the "Scheme for the development and location of protected areas", formed taking into account the proposals of public organizations and local authorities.

2.5. Measures to increase the capacity of stakeholders to effectively manage the ecosystem of Lake Balkash

Water resources form the basis for life in the Balkash Lake basin. The basin is rich in surface and underground water resources. They, combined with favorable climatic conditions, led to the formation and development of productive forces and intensive agricultural production in the region.

The existing system of water resources management in the region has a very complex structure with weak interaction between management entities. The lack of common goals and programs to support living conditions and environmental protection, the disunity of sectors and entities in the management of common water resources, the difficulty in attracting large investments with the diverse interests, responsibilities and powers of ministries, as well as 4 areas - this is far from a complete list problems of the existing basin management system.

Linked into a single natural complex and technological processes, basin management objects: irrigated lands, pastures, reservoirs and irrigation systems, reservoirs, Kapshagay and Moinak hydroelectric power stations are in different

management schemes. Concerted action requires complex and not always feasible procedures.

Water resources are managed by several entities: water allocation - by basin inspections, management of reservoirs and irrigation networks - by enterprises providing water supply services to consumers, irrigated lands - by agricultural producers, hydroelectric power - in the system of energy companies that are not interested in irrigation and environmental regimes releases.

The main consumer of water is irrigated lands. Farmers receive it at low rates, which does not stimulate their interest in saving water and introducing water-saving technologies.

As a result of the complexity of planning and managing multi-sectoral activities throughout the basin, no work is being done to save and involve additional water resources in circulation, and the development of energy and hydropower is not carried out. The region, having a powerful resource potential for hydro and thermal energy, is poor in electricity supplied from outside at a high cost.

The area of irrigated land for 10 years, even after huge investments, has halved. The same situation with the watering of pastures, which led to a reduction in the number of sheep by 3 times. In the presence of significant resources and favorable climatic conditions, the region retains the lowest level of income in the republic, high unemployment, poverty, and diseases.

The economic development of the lake basin was carried out without taking into account the ecological capacity of the basin ecosystem and was accompanied by the construction of artificial reservoirs: on the Ile River - the Kapshagai reservoir (with a total capacity of 28.1 km3), on the Chilik River - the Bartogai reservoir (0.32 km3) with the Big Almaty Canal, which provides transfer of waters of the Chilik River in the interfluve Chilik - Chemolgan in the amount of up to 0.4 km3, Kurta (0.115 km3), etc.

Rice irrigation systems were created on the Akdala array on an area of 31.7 thousand hectares with a water consumption of up to 1.3 km3, on the Shingeldinskiy irrigation array with an area of 15.3 thousand hectares with a total water intake of 0.166 km3 per year. The artificial hydrographic network is represented by a system of irrigation and discharge channels.

The basin of Lake Balkash has large reserves of fresh groundwater. Their total predicted operating resources are 17.5 cubic meters. km. Their use is still insignificant and the region has reserves in providing water.

Water consumption in the basin by business entities and the population is now 3.729 km3. Housing and communal services consume 243.97 million m3 per year, industry 219.14, agriculture 3238.67, fisheries 26.9 million m3.

Ecosystem conservation.

Preservation of the ecosystem is the main condition for the conservation and maintenance of life in the basin. In this regard, it is necessary to assess the capacity of the basin ecosystem, determine the ecological limits for economic activity, followed by the development of a set of measures for their conservation and restoration.

The level of Lake Balkash is one of the main indicators of the state of the basin ecosystem. Institute "Kazgiprovodhoz" on the basis of mathematical modeling and developments of the Institute of Geography of the National Academy of Sciences of the Republic of Kazakhstan determined the optimal levels of Lake Balkash 341-342 m of the Baltic System (BS), which ensure the viable functioning of the Lake-Delta ecosystem.

To maintain the optimal hydrological regime of the lake with a level of at least 341 m, it is planned to develop a strategy for the integrated management of water resources in the basin, develop and refine water use limits and standards, improve mechanisms for monitoring and stimulating water conservation.

In public utilitiesit is necessary to carry out reconstruction, technical re-equipment and construction of facilities and water supply networks, sewerage and treatment facilities of cities and towns in the basin, reconstruction, expansion and improvement of technologies for the operation of treatment facilities of industrial enterprises and communal facilities of the basin.

With regard to the lake basin, it is necessary to analyze and evaluate existing or planned investment projects in the Republic of Kazakhstan in the field of achieving the Millennium Development Goals and the Sustainable Development Goals on water and sanitation, develop a list of investment projects to be included in the long-term basin development program.

Improving the efficiency of water use in industry. The basis of the basin's industry is copper-bearing and polymetallic ores. On their basis JSC “Corporation “Kazakhmys” and Tekeli lead-zinc plant operate. Other industries include a lead battery plant in Taldykorgan, sugar refineries and others. A special position is occupied by the metropolis of Almaty. Many branches of industry are developed here: mechanical engineering, metalworking, light industry, food and meat and dairy industries, production of household appliances and appliances, and other types of industrial products.

In general, for existing industrial enterprises, increasing the efficiency of water use by 25% by 2030 will reduce water consumption through the introduction of energy efficiency technologies (leading to water savings per unit of natural

product) and water conservation, wastewater reuse and water recycling. In addition, it is necessary to work on improving water treatment standards for industrial enterprises.

In order to streamline the processes of safe accumulation, storage, processing and use of industrial toxic waste, it is necessary to build plants for the processing of solid household and liquid industrial waste, for which it is necessary:

- conducting a thorough audit of all large solid waste dumps and determining measures for their reclamation;
- updating standards for the processing and storage of MSW using new technologies such as anaerobics, composting or biogas;
- improvement of the regulatory legal framework to control the collection, transportation, processing, disposal and storage of solid waste;
- improving the collection, processing and provision of statistical information for monitoring the achievement of targets in the field of solid waste management.

Capacity Building in Agricultureinvolves solving the following problems:

- preparation of proposals to reduce irrigation and water disposal rates for agricultural crops in the basin based on modern new water-saving technologies;
- assessing the impact of the ecological state of the basin on the safety and quality of agricultural products;
- preparation of proposals to improve the efficiency of fish protection devices at water intakes;
- preparation of proposals for the development and placement of enterprises for the processing of agricultural products in the lake basin.

Issues of transboundary cooperation in the field of transboundary rivers. Reducing the risk of disruption of the water balance of the basin depends on the issues of transboundary cooperation and the signing of a mutually acceptable agreement with China, especially on the river. Ile. It is proposed to study the possibilities of interaction and increase the interest of the PRC in preserving the ecosystem of the Balkash Lake basin.

Development of sustainable economic activity. Along with other types of economic activity, it is necessary to pay more attention to preferential support for industries that provide both economic and environmental benefits. These include sectors, the development of which is due to the growth of environmental benefits and resources (tourism, fishing, muskrat breeding), and sectors of environmental business (waste processing, involvement of renewable energy sources, forestry).

The state needs to provide support, stimulation of strong and competitive export-oriented industries. This is the production and export of cheap electricity,

processing and production of environmentally friendly agricultural products, fine-wool sheep breeding and fur farming. Intersectoral relations will be formed on the basis of an integrated basin approach and mutually beneficial actions.

With regard to the development of the basic industry - non-ferrous metallurgy, it is necessary to assess the impact of industry on ecosystems and human health, the consequences of the development of new deposits of copper ore in the Balkash region, the development of the gold industry and the increase in the capacity of the Akbakay GOK, the expansion of the production of rolled products in the form of strips, sheets and strips, copper rod at JSC ZOTsM (Factory for the processing of non-ferrous metals).

3. PROPOSALS TO IMPROVE LEGAL, INSTITUTIONAL MECHANISMS IN THE FIELD OF WATER RESOURCES MANAGEMENTLAKE BALKASH AND INFORMATION SUPPORT

Water resources management in Kazakhstan is a dynamic process of planning, organizing, controlling the use and protection of water resources, which is part of the general state administration, and is carried out on the basis of the Water Code of the Republic of Kazakhstan.

Management in the field of use and protection of water resources should be understood as a set of actions taken by the competent authorities, authorized persons, public associations and citizens aimed at ensuring compliance with the requirements of the legislation on the possession, use, disposal of water resources and their protection, as well as the protection of rights and legitimate interests water users.

State management in the field of use and protection of water resources at the republican level is carried out by the authorized body - the Committee for Water Resources of the Ministry of Ecology, Geology and Natural Resources of the Republic of Kazakhstan and its basin water management departments. In recent years, it has been repeatedly reorganized, and structural changes have had a negative impact on the personnel potential, the preservation of the archive and material base. There is a loss of personnel, design and scientific and technical potential, while the preparation and development of a qualified design engineer or researcher takes 15-20 years.

Strengthening (creation) of the basin link, improvement of its organizational structure is of great importance in improving water resources management. Basin organizations carry out the functions of coordinating complex measures in the management of hydro resources between the relevant sectors and various departments at the regional and basin levels. In this regard, these bodies should be

endowed with sufficient powers to solve the problems of rational use and protection of the water sector.

Integrated use and protection of waters is one of the important principles of basin water resources management. The country's water legislation provides for the development of schemes for the integrated use and protection of waters, as well as basin management plans, which are the basis for the implementation of water management activities within the boundaries of river basins.

Sustainability of water resources management and water services requires improved technical capacity to collect data, analyze and disseminate information on their status. Therefore, an important condition for effective management at the basin level is the creation of a unified interstate information system for hydrometeorological data and monitoring of transboundary watercourses. River basin management should be aimed at a balanced development of surface and groundwater, in this regard, the role of planning the use and protection of water resources at all levels of management: local, national and interstate is increasing.

4. GOALS AND OBJECTIVES OF THE ROADMAP IMPLEMENTATION

For the sustainable development of Kazakhstani society, as well as of all mankind, it is necessary to preserve water resources. It includes their use and protection so that resources are available and meet the requirements placed on them by both current generations of people and future ones.

The goals of preserving and restoring the ecosystem of Lake Balkash are determined by the importance of achieving sustainable development goals (SDGs), strategic and program documents of the Republic of Kazakhstan, and the need to preserve the uniqueness of the lake for future generations.

1. The 2030 Agenda reaffirms the commitment of all Member States to “conserve and sustainably use the oceans and seas, freshwater resources, and forests, mountains and drylands and protect biodiversity, ecosystems and wildlife and flora” and “to resolve problem of water scarcity and pollution. To this end, the 2030 Agenda has a dedicated sustainable development goal on water (Goal 6: Ensure the availability and sustainable management of water and sanitation for all).

The achievement of target 6.6 “Water-related ecosystems” is of great importance. Target 6.6 aims to halt the degradation and deterioration of these ecosystems and help restore those that have already deteriorated. Target 6.6 aims to protect and restore water-related ecosystems through indicator 6.6.1, which serves to understand how and why these ecosystems change over time. Global indicator 6.6.1. "Dynamics of change in the area of water-related ecosystems" considers the spatial scale of water-related ecosystems, the amount of water in

ecosystems and the quality of water in ecosystems. These ecosystems include Lake Balkash.

2. Decree of the President of the Republic of Kazakhstan dated May 30, 2013 No. 577 approved the Concept for the transition of the Republic of Kazakhstan to a "green economy" (hereinafter referred to as the Concept). The concept of one of the main goals sets the goal "Conservation, rational use and reproduction of fish, forest resources, wildlife resources, objects of the natural reserve fund." One of the priority tasks for the transition to a "green economy" is to increase the efficiency of the use of resources (water, land, biological, etc.) and their management.

The concept states that the water resources of the Republic of Kazakhstan are a unique and vulnerable system, which is much more exposed to external risks than in other countries. In this regard, the Concept sets the task of transitioning to the efficient and careful use of water resources, based on the target aimed at closing the water deficit at the level of each basin by 2030. The target indicators set the task of solving problems with the provision of drinking water to the population by 2020, agriculture by 2040 and solving the problem of water supply once and for all by 2050.

The concept pays great attention to environmental protection and ecosystem development. In particular, paragraph 3.7 "Conservation and effective management of ecosystems" states that the integrated management of natural ecosystems should be carried out in accordance with the principles of sustainable development in order to increase their significance and economic potential.

3.In 2018, the Strategic Plan for the Development of the Republic of Kazakhstan until 2025 was adopted (Decree of the President No. 636 of February 15, 2018). The strategic plan stipulates that in order to improve the quality of life of the population and create more equal conditions in each region, basic social services, including affordable quality education and health care, ensure the safety of citizens, increase the availability of water, as well as the quality of the environment. There is a specific Initiative 5.15 “Ensuring access to drinking water.

Policy 6 "Green" economy and environmental protection of the Strategic Plan sets objective 5 "Improving the efficiency of use and protection of water resources". According to this task, in order to improve the efficiency of the use and protection of the country's water resources, systemic measures for water saving in agriculture, industry and the public sector will be developed and implemented.

4. The national project "Zhasyl Kazakhstan" for 2021-2025 was developed with the aim of

creating a favorable living environment for the population and improving the environmental situation, including: improving the quality of atmospheric air, efficient handling of production and consumption waste, efficient and careful use

of water, conservation of the ecosystems of Lake Balkash and the North Aral Sea, conservation of biological diversity by increasing the number of rare and endangered species of animals, and ichthyofauna, as well as the creation of specially protected natural areas, an increase in the area of green spaces, inculcation of respect for nature and wildlife, as well as the modernization of the ecological consciousness of the population.

In the project, one of the tasks is to preserve the ecosystems of the country's water bodies and, in particular, an indicator has been set - the inflow into Lake Balkash is at least 12 km3 / year.

5. The Republic of Kazakhstan is a party to international conventions aimed at regulating relations in aquatic ecosystems. Among them:

UN Convention on the Law of the Non-Navigational Uses of International Watercourses(adopted May 21, 1997 in New York). The Convention establishes the basic legal principles underlying the management of the non-navigational use of transboundary waters.

Since 2001, Kazakhstan has been a party to the United Nations Economic Commission for Europe Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention). The Convention serves as a mechanism for strengthening national measures and international cooperation aimed at achieving environmentally sound management and protection of transboundary surface and groundwaters.

Kazakhstan joined the Ramsar Convention**about wetlands**(adoptedFebruary 2, 1971). Ramsar Conventionrepresents the first global international treaty dedicated entirely to one type of ecosystem or habitat.

Thus, the restoration of the ecosystem of Lake Balkash is an important strategic direction in Kazakhstan. The solution of this problem cannot be achieved without coordinated actions of the parties concerned to improve legislation, address issues of the ecosystem approach to management in the Ile-Balkhash water basin.

The purpose of the Roadmap isin the preservation and improvement of the ecological situation and the environment in the Balkash Lake basin.

Tasks

For achievementThe goal is to solve the following tasks:

1. Preservation of the basin ecosystem and stabilization of the hydrological regime of Lake Balkash.
2. Strengthening the efficiency and rational use of water resources.
3. Strengthening transboundary water cooperation.
4. Development of sustainable economic activity.

5. Development of human potential.

To solve these problems, an Action Plan until 2025 was developed, as a result of which it is planned to restore the ecosystem of Lake Balkash (Appendix 1).

5. MAIN DIRECTIONS, WAYS TO ACHIEVEMENT THE GOALS OF THE ROADMAP AND RELEVANT MEASURES

5.1. Preservation of the ecosystem of the basin, and stabilization of the hydrological regime of Lake Balkash

Preservation of the ecosystem is the main condition for the conservation and maintenance of life in the basin. Therefore, it is necessary to assess the capacity of the basin ecosystem, determine the ecological limits for economic activity, followed by the development of limits and standards for nature management, mechanisms to support a favorable state of the environment.

The level of Lake Balkash is one of the main indicators of the state of the basin ecosystem. Based on mathematical modeling and developments of the Institute of Geography of the National Academy of Sciences of the Republic of Kazakhstan, the PC “Institute Kazgiprovodkhoz” determined that the optimal levels of Lake Balkash are 341-342 m of the Baltic System (BS), which ensure the viable functioning of the Lake-Delta ecosystem.

In this regard, in order to maintain the optimal hydrological regime of the lake with a level of at least 341 m, it is necessary to ensure constant observations using stationary hydrological posts, including their installation in the areas of the cities of Balkash and Priozersk, as well as with. Ulken, develop a strategy for the integrated use and protection of waters, integrated management of water resources in the basin, develop and clarify limits and standards for water use, as well as improve mechanisms for monitoring and stimulating water conservation.

Preservation and restoration of ecosystems of the river delta. Ile. Delta River Ile is part of the Lake-Delta ecosystem, and acts as a natural counter-regulator of water flow to the Balkash. To preserve the ecosystems of the lake, first of all, it is necessary to restore the natural hydrological regime of the river. Ile. To this end, it is proposed to study the state of ecosystems, develop a set of measures for their conservation and restoration.

It is necessary to assess the possibilities of building the Kerbulak counter-regulator with a useful volume of 20 million m3 and a hydroelectric power station. According to preliminary estimates, the Kerbulak HPP can eliminate the uneven water releases from the Kapshagay HPP, which is destructive for ecosystems, and will allow additional electricity generation. At the same time, this can create favorable conditions for biota, reduce damage and the threat of flooding of settlements.

In addition, in order to restore the ecosystems of the delta, it is proposed to develop and implement a set of hydrotechnical and reclamation measures, including the creation of at least 10 lake systems with an area of 123.6 thousand hectares, including muskrat breeding - 17.0 thousand hectares, for the development of aquaculture - 56.4 thousand hectares.

Involvement in circulation of additional water resources. The basin has certain reserves of water resources that can be used to stabilize the water balance in case of its disturbance under the influence of external factors. Up to 4 km3 of water accumulates per year in the zone of river runoff dispersion, where swamps, hollows, and small rivers form on the surface.

Collector-drainage and waste water, after additional analysis and appropriate preparation, can be used for irrigation. Moreover, collector-drainage systems will not only provide additional volumes of water, but will also improve the conditions of the natural environment, ennobling saline and wetlands.

Groundwater is a large reserve for increasing the water supply of the lake with fresh water. Due to their use, the load on surface water resources can be significantly reduced, the ecological situation of the river will improve. Ile and Lake Balkash.

Improving the quality of surface waters should be based on the protection of water sources from pollution and water protection measures. Protection of water resources and water sources of the basin from pollution as a result of economic activity must be carried out in three main areas: protection of small rivers, protection of the coastal zone and the water area of Lake Balkash.

To protect the waters of small rivers, it is proposed that cities and settlements develop a set of measures to prevent river pollution with a tightening of the control system for their implementation. It is advisable to draw up and refine the schemes of small rivers, with a set of measures for their protection.

The protection of the waters of the Kapshagai reservoir involves the implementation of major measures, such as the reconstruction and expansion of treatment facilities and sewerage systems of cities, the use of wastewater for irrigation of crops, compliance with the requirements of water protection strips and zones along the perimeter of the reservoir, the creation of forest parks in places of recreation of the reservoir. It is especially important to carry out similar work on water protection belts and areas around the lake. It is also important to establish the balance holder of the Kapshagai reservoir at the state level. It is necessary to develop and approve the relevant Decree of the Government of the Republic of Kazakhstan with the development of the Operation Rules.

Issues of protection of Lake Balkash and the delta of the river. Ile are closely related to the quality of conservation activities in the basin. The task is to develop and implement measures to reduce harmful emissions and discharges, and, above all, industrial enterprises in the lake basin.

To provide the population of the basin with high-quality drinking water, it is necessary to develop and implement the State Program for the Development of Regions for 2021-2026, which includes measures to rationally provide the population with high-quality drinking water and sanitation services.

To preserve and restore the ecosystem of Lake Balkash, it is also necessary to implement the following activities:

- assessment of the economic capacity of the aquatic ecosystem of the Balkash Lake basin, assessment of the resource and energy potential of the basin; assessment of ecological and demographic potentials;
- study of the possibilities of building the Kerbulak hydroelectric complex;
- development of the delta Ile and other watercourses flowing into Lake Balkash;
- organization of glacio-hydrophysical monitoring of geosystems in the runoff formation zone;
- improvement of the transboundary hydrological and hydrometeorological post on the river. Ile;
- liquidation of sites of historical contamination, including PCB-containing equipment at the Darial-U radar station.

5.2 Strengthening the efficiency and rational use of water resources

At present, many plans have been adopted in all areas - in the economy, in agriculture, etc. - for many years to come and it may turn out that there are plans, but there will be no water for their implementation.According to forecasts, by 2040 Kazakhstan may face a significant shortage of water resources in the amount of 50% of the need. Accordingly, when planning, it is extremely important to accurately assess the state of water resources, but it is impossible to perform this procedure, due to the fact that there is no:

one. The principle of water resources management.

2. The principle of determining the allowable withdrawal of river runoff from a watercourse, including on transboundary rivers.

3. Scientific substantiations of the ecological runoff of rivers.

4. inclusion of river and lake ecosystems into full members of the water management balance.

5. Surface water quality management.

6. Revision of the "Rules for the establishment of water protection zones and strips", laying the reactive nature of flood control.

In addition, the ongoing practice of water demand management. There is no modern methodology for compiling the “Scheme for the Integrated Use and Protection of Water Resources” (SKIOVR). Meanwhile, SKIOVR is the tactics and strategy for using water resources. The old "Schemes" are outdated and do not meet modern requirements.

The problem of water security in the conditions of limited and vulnerable water resources is considered as a threat to the national security of the state.

At the same time, the existing water resources monitoring system does not provide reliable data on what resources the Republic of Kazakhstan has. Existing data (100.5 km3) do not fully reflect the current situation due to the insufficient number of hydrological posts. It is necessary to take measures to improve the efficiency and rational use of water resources in agriculture, industry, and the public sector.

The total volume of water withdrawal for communal, industrial and agricultural needs is on average about 20 km3. Of this volume, agriculture accounts for the bulk of consumption - 68%, industry - 27% and utilities - 5%. The total return of water is 3.7 km3, with industrial return water accounting for more than 90%. Losses during water transportation are on average: about 60% for agricultural consumers; about 40% for industrial consumers and 50% for utilities from the volume of water consumption.

While maintaining the current situation of water use in the municipal and agricultural sectors, a moderate increase in efficiency in industry, by 2040, water intake is expected to increase to 29.7 km3 (including losses) per year and consumption to 24.6 km3 per year.

The water resources of the Balkash-Alakol basin are 27.8 km3.

In agriculture

Water withdrawal for agriculture is 13.4 km3 per year, of which 3.8 km3 per year is used for regular irrigation on an area of 1.4 million hectares, and the remaining 0.8 km3 per year is distributed between firth irrigation, hayfields and irrigation of pastures, 8.8 km3 per year are losses during transportation.

High water losses in agriculture are explained by the low efficiency of irrigation systems. At the same time, the return of water due to the unsatisfactory level of operation and their technical condition is less than 1% of the total volume of water intake.

The use of water-saving technologies for water supply and irrigation (drip, sprinkling, discrete) in agriculture is less than 7% of the used irrigated land, or 95.8 thousand hectares.

Water withdrawal in the Balkash-Alakol basin for the needs of agriculture is 3.4 km3.3.3 km3 per year used for regular irrigation on an area of 0.625 million hectares

In industry

The volume of water withdrawal for the needs of industry is 5.3 km3 per year, of which 4.2 km3 per year is consumption, and 1.1 km3 per year is losses during transportation. The volume of non-returnable consumption is 1.9 km3 per year, or about a third of the total water withdrawal. At the same time, only about 20% of industrial enterprises use recycling water supply technologies.

By 2040, industry's non-returnable water consumption is expected to increase to 2.6 km3 per year (by 1.1% per year on average), driven by a 4% per year increase in production and subject to an annual increase in industrial water use efficiency of 0.5% per year for existing capacities, as well as an improvement in the efficiency of new facilities compared to existing ones by 30%. Growth is provided mainly by the following industries: extraction and processing of gas, oil, mining, food industry.

Water withdrawal in the Balkash-Alakol basin for the needs of industry is 0.326 km3.

In public utilities

The volume of water abstraction for household needs is 0.9 km3 per year, of which consumption in cities is 55%, in rural areas - 11%, and losses during supply - about a third of the total water intake. Water withdrawal in the Balkash-Alakol basin for domestic needs is 0.24 km3.

The average consumption of water per capita for household needs, compared with countries with a similar level of GDP per capita, remains low at 51 m3 per year, while in Brazil, Turkey, Russia and Mexico 80 - 100 m3 per year. The low level of consumption is largely due to insufficient coverage of water supply and sanitation networks.

Surface water bodies of the republic are intensively polluted by enterprises of the mining, metallurgical and chemical industries, agriculture, and public utilities. Polluting industries annually discharge about 50% of water without treatment, which means 1.5-2 km3 of untreated wastewater per year. Due to the lag in the availability of wastewater systems in Kazakhstan, only 29% of wastewater from settlements undergoes secondary treatment before being discharged (in the UK - 94%, Israel and Singapore - 100%). Groundwater is also subject to pollution in areas where production and consumption waste is located.

Serving almost all sectors of the economy, the water industry is significantly dependent on natural, social and other factors, the consideration of which determines decisions on the creation of water use systems, their development and functioning.[8].

To create conditions for the sustainable development of water-intensive sectors of the economy, to meet the needs of the population in water and an environmentally acceptable environment, the country's water management system needs to develop ahead of schedule. At the same time, decisions are made at the state level, and they must be really effective, requiring an analysis of scenarios for the development of various industries in conjunction with the natural environment, deep structural and technological changes in the industry.

Ensuring the country's water security and the development of water management should take into account modern priorities: the value of human capital, the competence of specialists, the qualification development system, reliable information on the volume and quality of water, the level of technological development in the world, achievements in the methodology of long-term planning and forecasting, effective action plans for environmental protection.

The environmental aspect of water security is associated with the quality of water in supply sources, and in recent years - with the quality of natural waters in general, since not only the population and the economy, but also natural objects suffer from poor water quality; among them are aquatic biocenosis, as well as riverine tugai and irrigated lands.

On the consumer properties of water, as well as on the ecological state of the river basin. Ile is influenced by a number of factors, of which the following should be especially noted:

- the consequences of changes in the level regime of lakes associated with the construction of the Kapshagai HPP; in the delta zone of the river. Ile, in the area of the main spawning grounds of carp, shallow lakes and bays with an area of \u200b\u200babout 300 thousand hectares have dried up;
- increased water intake from water bodies for irrigation needs;
- pollution of water bodies with sewage and air emissions from industrial enterprises, as well as heavy metals and various pesticides that affect the reproductive functions of fish;

With the complete absence of sewerage and household waste disposal enterprises, rural settlements (auls and villages) have become one of the main and

[8]Danilov-Danilyan V.I., Pryazhinskaya V.G. Scenarios for sustainable regional water use under climate change // Problems of Forecasting. - 2007. - No. 2.

dangerous sources of pollution of river valleys and water resources, especially groundwater.

To solve the issue under consideration, it is necessary to carry out research and calculations to ensure monitoring of the state of the lake and its basins.

Currently, there are practically no reliable data on water consumption, especially taking into account savings and losses during its organization in the Balkash Lake basin in the territory of the Republic of Kazakhstan. Such information is essential to assess the possibility of preserving Lake Balkash at a level of at least 341.5 m BS.

To enhance the efficiency and rational use of water resources in the Balkash Lake basin, it is necessary to implement measures aimed at:

- introduction of water-saving technologies in agriculture;
- transfer of enterprises to recycling water supply;
- automation of water intake metering systems;
- reduction of water consumption and other aspects of rational use of water resources.

5.3 Strengthening transboundary water cooperation

Reducing the risk of disruption of the water balance of the basin also largely depends on the systematic solution of issues of transboundary water relations. In this regard, it is proposed to explore the possibilities of interaction and increase the interest of the PRC in preserving the ecosystem of the basin.

Consider the prospects for combining individual agreements between the Republic of Kazakhstan and the PRC into a common long-term framework agreement on multilateral cooperation.

At the same time, it would be expedient to integrate the Agreement with the PRC into international and global programs of a higher status. It would be expedient to evaluate possible options for submitting jointly with the PRC a joint application to the GEF, the UN programs, SPECA, ESCAP for the development of a pilot project of a model area for the sustainable development of the basin in arid conditions.

It is also necessary to consider the possibility of submitting the project to the Shanghai Cooperation Organization, SVDMA, NATO's Partnership for Peace program as a pilot project to develop new mechanisms for secure and sustainable development.

It is necessary to work out possible areas of cooperation with third countries to resolve cross-border issues. Kazakhstan is one of the centers of stability in Central Asia, which makes it an important partner in the international program to combat terrorism.

It is proposed to consider the possibility of granting preferential treatment for investments of other guarantor countries in environmental and other sectors, the creation of a water protection association of enterprises with foreign participation. Consolidated large international capital, dependent on the quality of the ecological resources of the basin, can become a guarantor for preventing the degradation of its ecosystems.

To study the possibilities of creating a regional insurance fund for safe and sustainable development to support projects for the preservation of the hydrological regime, international tourism, and the organization of transport infrastructure. Such a fund can accumulate funds for insurance against political, military and environmental risks in the Central Asian region.

5.4 Development of sustainable economic activity

Sustainable economic activity should be based on "green" technologies. At the same time, attention should be focused on supporting industries that provide both economic and environmental benefits. These include sectors whose development is driven by the growth of environmental benefits and resources

(tourism, fishing, muskrat breeding, the development of geoparks and specially protected natural areas, including "safari parks"), and sectors of environmental business (waste recycling, involvement of renewable energy sources, forestry , in particular, the creation of plantations of saxaul, torangyl and other tree plantations that provide economic and environmental benefits).

The state needs to provide support, stimulation of strong and competitive export-oriented industries. This is the production and export of cheap electricity, processing and production of environmentally friendly agricultural products, fine-wool sheep breeding and fur farming. Intersectoral relations should be formed on the basis of an integrated basin approach and mutually beneficial actions.

Taking into account the prospective development of productive forces in the basin, it is necessary to focus more on the production of relatively cheap and environmentally friendly electricity. Therefore, along with the construction of the Kerbulak HPP for 50 MW and other small hydroelectric power plants, it is necessary to consider the development of solar and wind power plants, which will ensure the sustainability of power supply to the population and economic sectors. Together with the existing capacities, all this will allow entering the energy market of Central Asia.

The development of solar and wind power plants can be realized as a commercial direction, if there is a trading market for greenhouse gas emissions under the Kyoto Protocol and the Paris Agreement. All these measures can provide significant tax and foreign exchange revenues for the development of the Balkash Lake basin.

It is promising to convert CHPPs and boiler houses using coal to gas and liquid fuels. The program should provide for an assessment of the energy saving potential in various sectors of the economy, transportation and energy consumption, and the implementation of regional energy saving projects.

With regard to the development of the basic industry - non-ferrous metallurgy, it is necessary to assess its impact on the ecosystem and human health. Similar work should be carried out, including in the areas of development of new deposits of copper ore in the Balkash region.

There is a huge potential for agricultural development in the Balkash Lake basin. In modern conditions, the agrarian and related segments of the food sector of the economy, the market institutions emerging in this chain should be considered together as a single object of the state's agro-industrial policy. Through the introduction of corporate governance, the problem of employment, small, family and household business can be solved, since the investor will benefit from the widespread use of efficient technologies.

With an appropriate management system, it will be profitable to invest in such activities as the distribution of seeds, planting material, young animals of new breeds of domestic animals, the fight against harmful insects and animals, the distribution of know-how and licenses. By increasing employment, it will be possible to reduce rice cultivation, which will significantly increase river flow and improve water quality.

It is planned to restore irrigated lands withdrawn from circulation on an area of 210.9 thousand hectares and grow wheat, beets, corn, vegetables and fruits on them. At the same time, it is possible to significantly increase the yield of these crops. As the economy develops, it will be necessary to consider the issues of expanding the areas of watered pastures and restoring the forage base in deltas and river valleys.

Stabilization of the hydrological regime and improvement of water quality will contribute to the restoration of spawning grounds and the development of fish farming and aquaculture in general. Commercial cultivation of sturgeons in lakes and pond farms, development of a subprogram for the conservation of the gene pool of valuable fish species in the Balkash itself is planned.

The development of sustainable transport involves the restructuring of the road network through the reconstruction of local, republican and international roads. Air transport can be developed through the expansion of the Almaty airport, the development and expansion of the service system for the basin areas by local aviation from the base airports of Boroldai, Taldykorgan, Balkash, Ayagoz.

It is necessary to study the possibilities for the development of passenger water transport along the river. Ile (length of navigable routes 330 km). And also to provide for the possibility of building a regulator lock on the dam of the Kapshagay reservoir for the passage of low-level barges for the transport of goods from the city of Balkash to the border of China (length 815 km), thereby increasing the cargo turnover and the interest of the neighboring state in maintaining the regime of the transboundary river. Ile.

Socio-economic development also implies the transformation of sustainable tourism into a profitable sector of the region's economy by creating a highly profitable tourism industry, including "safaris" on wild ungulates, capable of producing and selling a high-quality, competitive product in the international tourism market. The Government of the Republic of Kazakhstan in the long-term development program of Kazakhstan has identified the tourism industry as a priority, because. it ensures the inflow of foreign currency, helps to increase employment and contributes to the development of the country's infrastructure - road transport, trade, public utilities, cultural, medical services. Of the ten priority

areas identified in the Concept for the Development of Tourism in the Republic of Kazakhstan, five are located on the territory of the basin.

The priority task is to optimize the existing network of specially protected natural areas (SPNA) based on the basin approach. Its decision should be based on the "Scheme for the development and location of protected areas", formed taking into account the proposals of public organizations and local authorities. It is necessary to provide for short-term, medium-term and long-term actions (organization of new nature reserves, geoparks, "safari parks" and other natural complexes).

For the development of sustainable economic activity, it is also necessary to implement the following measures:

- assessment of the potential of the Balkash aquatic system, including the river network;
- revaluation of fixed assets of the productive forces of the region, primarily, areas adjacent to Lake Balkash;
- determination of liabilities and assets of financial and credit funds of the potential of the Balkash aquatic system and the entire water basin;
- development of pricing policy in the water sector;
- development and implementation of a model for sustainable land use and biodiversity conservation in the face of increasing desertification;
- development and implementation of pilot water-saving technologies in agriculture and water supply and sanitation of rural settlements;
- creation of a geopark, development of a network of protected areas and ecological tourism;
- planting forest plantations with the creation of green belts around settlements and water bodies;
- providing the population living in the Balkash Lake basin with water disposal systems and improving the quality of wastewater treatment;
- development of transport infrastructure; involvement of renewable energy sources, Dzhungar WPP, small hydropower plants and other energy sources.

5.5 Improving legal, institutional and information support

In order to preserve and improve the quality of the natural environment of Lake Balkash and its entire basin, it is necessary to develop and adopt a separate section in the Water Code of the Republic of Kazakhstan, which will provide the legislative framework for the implementation of the goal and the solution of

priority tasks for the conservation of Lake Balkash. The Water Code should fix the system of program objectives, the basin management model, the system of measures for the protection of water resources and river basins, the environment and economic incentives for rational nature management, the procedure for the activities of economic entities, priority activities and restrictions that take into account the possibilities of water and ecological capacity of the territory.

Basin inspections play an important role in the issue of institutional support. To improve approaches in the field of water security, it is necessary to strengthen the role of basin inspections. In order to strengthen the role of the Interdepartmental Water Council, include the chairmen of the Basin Councils in its composition.

A successful solution to the problems of transition to a sustainable, environmentally safe development of the region can be achieved with the availability of modern information, scientific and technical support. Therefore, it is envisaged to create an effective geographic information system (GIS) of the basin that supports the decision-making process and reflects the economic, environmental and social aspects of development. Basin GIS will be the basis for the formation of basin agreements and programs for environmental protection and the transition of the region to sustainable development.

The creation of GIS is possible, in turn, on the basis of a unified basin monitoring system for socio-economic and environmental objects. Integrated monitoring should include both ground-based and aerospace methods.

Promoting the priorities of the basin sustainable development program, information technology, public relations, involving NGOs in the implementation of the program and projects, creating conditions for the interest of the basin residents in the final results should take an important place in the implementation of the program activities.

It is necessary to analyze and correlate the development goals of the Balkash Lake basin with the obligations of Kazakhstan under international Conventions and Agreements. These are: "Transforming Our World: The 2030 Agenda for Sustainable Development"; “Paris Agreement on Climate Change on the Implementation of the Framework Agreement on Climate Change (2015); “Convention on climate change (implementation of priority projects for energy saving)” (1992), “Convention on biodiversity” (regional projects for the formation of bioreserves) (1992); "Convention to Combat Desertification" (1994), "Convention for the Protection of the Ozone Layer" (1985).

In October 2000, Kazakhstan ratified 5 more conventions. Four of them are the Convention on the Transboundary Effects of Industrial Accidents, the Convention on Environmental Impact Assessment in a Transboundary Context, the

Convention on the Protection and Use of Transboundary Watercourses and International Lakes, the Convention on Long-range Transboundary Air Pollution, are aimed at solving problems of a transboundary nature and, therefore, are of great importance for the Balkash Lake basin.

The above and other programs should be analyzed in order to integrate them and achieve a synergistic effect in saving resources, time, using methods and models, forming a common database and administration system.

When implementing the program for the sustainable development of the lake basin, an important role is given to scientific support. A Scientific and Technical Council for the implementation of this Program should be created from among well-known Kazakh scientists and experts.

In addition, work on coordination, evaluation of the effectiveness of the activities of this Program should be carried out through a specially created Regional Coordination Center, whose specialists will act as coordinators in the areas of the program and support information exchange, development of databases, development of indicative plans and recommendations for making management decisions.

It is envisaged to hold regular round tables, training seminars and conferences to assess the implementation of the planned actions for the implementation of the Program. The assessments should be based on sustainable development indicators (UNCSD, OECD, World Bank, etc.) adapted to the Sustainable Development Goals and the situation in the Basin.

5.6 Human Development

In modern society, a person is a key resource for socio-economic development, including in the water management industry. The human factor as an object of investment is becoming more important than fixed capital and technology, since it is the basis of the innovative economy that is emerging in the modern world.

Regarding the water management sphere, it is necessary to create conditions for increasing the level of knowledge, developing skills, abilities and capabilities of specialists at all levels of management. For example, for the utilities sector, training centers for public water management should be established, a network of educational institutions for the management and leading technical specialists of public water utilities with training courses aimed at developing important capabilities, awareness and a service-oriented culture.

Since water is used in all sectors of the economy, including industry, similarly, training centers should be created for specialists from all sectors using water resources, as well as for specialists from basin inspectorates and operating

organizations with the participation of international experts conducting field trips and seminars for developing important capabilities and sharing best practices.

There is a need to strengthen task forces on transboundary interaction/negotiations and invest in the development of the skills of their participants in order to develop detailed master schemes for water balance at the river basin level, including scarcity forecasting and modern flow modeling.

In order to train qualified personnel for the water sector and improve the skills of workers, it is necessary to create a separate institute that would graduate 150-200 water specialists per year (including hydraulic engineers, hydrologists, hydrogeologists, specialists in hydromelioration, agricultural water supply and wastewater treatment, economists in the field of water resources). In addition, it is very important to strengthen the technical and technological base of the educational institution. In the future, on the basis of a specialized higher educational institution, it is necessary to organize various training centers, retraining and advanced training courses.

It is necessary to provide scientific support for the implementation of the Program with the involvement of the leading institutions of the country and the world for the implementation of research and development work.

In addition, it is necessary in the field of education:

- create in the regions a network of advisory training and information centers for training water users and introducing advanced technologies for the use and protection of water;
- introduce a new classifier of undergraduate specialties "Hydrotechnical construction and construction", "Hydrotechnical reclamation", "Agricultural water supply and irrigation of pastures", "Wastewater treatment technology", etc., respectively, by allocating 200 grants for them;
- increase the number of grants for water specialties under the Bolashak program.

At the same time, in order to attract young professionals to the water sector, it is necessary to provide them with social support measures (a one-time lifting allowance, a loan for the purchase of housing), an increase in wages in those segments of the water sector where such support is really justified (for example, in rural areas) .

The training of personnel for technical and vocational education cannot develop autonomously today, without close ties with the employer. Employers must formulate requirements for both the quantity and quality of training, and educational institutions should conduct training in accordance with these requirements.

In general, the provision of water management with qualified personnel should be based on:

— the national system of qualifications and vocational education;
— analysis of the regional industry demand for personnel;
— formation of the legal framework for the vocational education system;
— creation of sectoral clusters of the personnel training system;
— organization of sustainable legal and economic partnership mechanisms at all stages of personnel training;
— formation of a system of image policy for vocational education;
— phased creation of independent industry certification centers based on employers' associations;
— improving the system of innovative education in vocational education and training;
— assistance in stimulating the improvement of the qualification level of specialists to the requirements of the labor market.

Economic growth contributes to poverty reduction when accompanied by an increase in employment and the provision of public resources for social and human development. In this regard, priority areas are measures to increase employment, such as increasing the productivity of small-scale agriculture, promoting the creation of micro-enterprises and the informal sector.

The priorities of the program are aligned with the goals of the Strategic Development Plans of the Republic of Kazakhstan until 2030 and 2050. This is the development of human potential, including issues of protecting the health of the population of the region, spiritual development, issues of environmental culture, upbringing, education, training of youth. It is necessary to bring to the fore the creation of such a system of vocational education that would provide environmental education and upbringing of the new generation.

It is supposed to develop and develop special social and humanitarian subprograms, such as “Health of the population”, “Drinking water”, “Family and society”, “Ecology of culture”, etc., which will be part of nationwide programs, but focused on specific conditions and support local organizations.

It is necessary to implement the mechanisms for the implementation of the Aarhus Convention on access to information and participation in the decision-making process in the field of environmental protection through the legislative and regulatory framework. The program should provide support for wide access of the population to information resources and the international Internet.

An important condition for the successful implementation of reforms in the social sphere aimed at human development is the effectiveness of the management system and personnel management potential.

Non-governmental organizations, the private sector and other interested groups should be actively involved in the development and implementation of projects.

The population, non-governmental organizations and other social groups should act as guarantors of the successful implementation of the Program. Non-governmental coordination of the implementation of the Program should be entrusted to NGOs, participating in the formation of the Program itself, its implementation and assessment of the compliance of the actions taken with the strategy, and with the mechanisms identified in the Program. This should be facilitated by legislative or other measures that establish the rights of non-governmental organizations and other groups to participate in the advisory bodies and processes for basin management.

The goals of the program cannot be achieved without the active involvement of local authorities in the formation and implementation of policies that ensure the balanced development of natural, human and industrial capital. A prerequisite for obtaining a mutual assessment of values and needs, reaching agreement on the proposed principles of basin management is the establishment of a dialogue between citizens, public organizations, private enterprises and local authorities.

6.RESOURCES REQUIRED

Funds from the republican and local budgets, funds from industrial enterprises located in the Balkash Lake basin, external loans and grants, as well as private investments can be attracted to implement the Roadmap activities. The use and share of different funding sources will be different for different areas of the Program implementation.

1. Investments in the infrastructure of the republican level will be mainly carried out from the state budget.

2. To finance the communal water management sector, funds will be attracted to modernize the water disposal systems within the framework of the Nurly Zhol Program, the state program for the development of regions and other similar programs.

3. Financing of measures to increase the volume of available resources (transboundary negotiations and groundwater) will be carried out from the state budget.

4. Irrigation systems can be financed both from the state budget, grants, and with the involvement of private capital in various forms of ownership.

5. Levers for efficient water consumption, especially self-sustaining ones (implementation of efficient land cultivation technologies, water-saving technologies in industry), should be financed mainly by the consumers themselves.

6. The use of private capital is one of the most modern forms of project financing, since it allows not only to reduce the burden on the state budget and share risks, but also to attract the skills of the private sector to improve the efficiency of capital investments and operating costs.

LIST OF USED SOURCES

[one]Lake Balkhash. Britannica Online Encyclopedia. Retrieved 29 January 2009.archivedAugust 18, 2011

[2] Propastin. P. A simple model for monitoring the water level in Lake Balkhash and discharges of the Ili River: Application of remote sensing. Lake reserve. Res. Manag. 2008.

[3] Luo, L.; Gao, YQ Current status of policies and laws for sustainable development strategies. J. South. Agric. 2011, 42.1579-1582.

Piven E.N. Modern climate changes in the glacial-nival zone of South-Eastern Kazakhstan (according to regime observations)//Terra. 2007. Issue. 2, #1.

[4][1]Namazbayeva Z. I., Dyusembayeva N. K., Mukasheva M. A., Sadykov K. I. Risk factors in violation of the reproductive function of the organism under the influence of the territorial-industrial complex // Hygiene and Sanitation. -2010. - No. 1. Page 51-54.

[5]Information Bulletin on the State of the Environment of the Balkash Lake Basin and the Alakol-Sasykkol System, 2018

[6]Information bulletin on the state of the environment of the Karaganda region. issue 9, 1st half of 2021

[7]Smolyar V. A., Mustafaev S. T. Hydrogeology of the Balkash lake basin. Almaty. Gylym: 2007.

[eight]Danilov-Danilyan V.I., Pryazhinskaya V.G. Scenarios for sustainable regional water use under climate change // Problems of Forecasting. - 2007. - No. 2.

9] National project "Zhasyl Kazakhstan" for 2021-2025 - Decree of the Government of the Republic of Kazakhstan. —10/13/2021

[10] Annual data on the regime and resources of surface waters on land. Issue 7. Basin of the rivers of Lake Balkhash and Lake Alakol. — Nur-Sultan. 2020.- 352 p.

[11] The state program of infrastructure development "Nurly Zhol" for 2020-2025. - Decree of the Government of the Republic of Kazakhstan No. 1055. —31.12.2019

APPENDIX 1

ACTION PLAN FOR THE IMPLEMENTATION OF THE ROAD MAP FOR THE PROTECTION AND RESTORATION OF THE WATER ECOSYSTEM OF LAKE BALKASH

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
Goal: Stabilization and improvement of the environment in the Balkash Lake Basin											
1.	**Indicator 1:** Maintaining the level of Lake Balkash, not lower than the level according to the Baltic system	m	*[9]	*	MEGNR, IOI, MOA	341.5	341.5	341.5	*	*	*
2.	**Indicator 2:** Reducing fresh water intake from Lake Balkash through the introduction of water-saving technologies	million m3	*	*	MIIR, MEGNR, MIO	169.7	168	166.32	*	*	*
3.	**Indicator 3:** Improving the quality of surface waters of Lake Balkash	pollution level (KIPV)	*	*	MEGNR, MA, IOI	High pollution (4)	Moderate pollution (3.1)	Moderate pollution (1.1)	*	*	*
Task 1 "Preservation of the ecosystem of the basin and stabilization of the hydrological regime of Lake Balkash"											
4.	Restoration of previously existing 4 meteorological stations and organization of new posts in the area of Priozersk, Ulken village	things	*	*	MEGNR	2 (Priozersk, Ulken village)	2	2	*	*	*

[9]According to the Order of the Minister of National Economy of the Republic of Kazakhstan dated February 19, 2018 No. 64, cells with the indication "*" are not filled

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
5.	Restoration of the previously existing 16 hydrological and hydrochemical posts of Lake Balkash and the organization of new posts, including in the years. Balkash, Priozersk and the village of Ulken	things	*	*	MEGNR	5 (including in the city of Balkhash, the city of Priozersk, the village of Ulken)	5	6	*	*	*
6.	Installation of water protection zones and strips along the entire coastline of Lake Balkash	%	*	*	MIO	80	90	100	*	*	*
7.	Restoration and modernization of hydrometeorological stations, hydrometric and hydrochemical posts	*	Refurbished and upgraded stations	2022-2025	MEGNR	3	2	2	7	-[10]	Republican budget
8.	Drawing up and approval of the Rules for the operation of the Kapshagai reservoir and	*	Approved project for the operation of both hydroelectri	2022-2023	MEGNR, HPPs		+			-	Private investment

[10]According to the Order of the Minister of National Economy of the Republic of Kazakhstan dated February 19, 2018 No. 64, columns 7-11 indicate the required funding amounts. As part of the development of this draft Program, such economic calculations were not carried out. Where it is necessary to indicate the period for the implementation of planned activities, it is indicated with a "+" sign

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
			c facilities with HPPs								
9.	Construction of the Kerbulak counter-regulator to eliminate intra-day fluctuations of the river. Silt when discharged from the Kapshagai reservoir	*	Operating HPP	2022-2025	MEGNR, MNE	+	+	+		-	Republican budget
10.	Inspection of the deltaic territories of rivers flowing into Lake Balkash (possible through the Platform SDG 6.6.1. Explorer). Drawing up an action plan for the conservation of deltas	*	Report on the results of the survey and the Action Plan for the conservation of river deltas	2022-2023	MEGNR, IOI, MON		+			-	Republican budget
11.	Conducting a study in the area of surface runoff formation in the area of glaciers and snowfields in order to assess the quantity and quality of water resources	*	Reporting information	2022	MEGNR, MON	+				-	Republican budget
12.	Planting trees and shrubs in the basins of the main rivers of Lake Balkash and around settlements, especially in the northern and western shores	*	Event reports with documentary evidence	2022-2025	MEGNR RK, LEB	+	+	+	+	-	All sources

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
	of Lake Balkash										
Objective 2 "Strengthening the efficiency and rational use of water resources"											
13.	Implementation of water-saving irrigation technologies in agriculture: drip sprinkling	thousand hectares	*	*	MOA, LIO	14.1 9.2	18.2 12.5	21.5 15.2	*	*	*
14.	Automated accounting system for the management of water resources, water management facilities (digitalization), water intake at head water intakes with online data transfer to the basin inspection and the Republican information system	% of the total number of water withdrawals (50 units)	*Automated complexes of water resources management	*2022-2023	MEGNR, MIO,Ministry of Agriculture of the Republic of Kazakhstan	thirty	60	100	*	*	Republican budget, PPP funds *
15.	Reconstruction and modernization of water facilities of all forms of state ownership	*	Updated water facilities	2022-2025	MEGNR, MA, MIIR	+	+	+		-	Republican budget
16.	Transfer of enterprises and thermal power plants, state district power plants, thermal power plants to recycling water supply	*	Lack of return water from industrial enterprises and thermal power plants	2022-2023	MEGNR, MNE, enterprises		+			-	Private investment and PPP
17.	Development of production	*	Reporting	2022-2025	MEGNR, local	+	+	+		-	Republican

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
	of water metering and monitoring devices in Kazakhstan		information		authorities, private business						budget, support institutions, private investment
Task 3 "Strengthening transboundary water cooperation"											
18.	Strengthening transboundary cooperation with stakeholders on water allocation in order to increase the confidence of countries	number of meetings	*	*	MEGNR	6	6	6	*	*	*
19.	Creation of automated systems for monitoring and recording transboundary waters	*	Operating hydrometric posts in the amount of 25 posts	2023-2025	MEGNR		+	+		-	Republican budget
Objective 4 "Development of sustainable economic activity"											
20.	Increasing the coverage of sewerage services in the city of Balkash and rural settlements near Lake Balkash	%	*	*	MEGNR, MIIR, IOI	8.8%	nine%	fifteen%	*	*	*
21.	Elimination of spontaneous dumps in the basin of Lake Balkash	%	*	*	MEGNR, MIO	fifty	80	100	*	*	*
22.	Coverage of waste collection and disposal services in the Balkash Lake	%	*	*	MEGNR, MIO	75	85	100	*	*	*

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
	Basin										
23.	Development of a methodology for determining tariffs for water resources and services for the delivery of water to water consumers	*	Methodological guidance, approved in the prescribed manner	2022	MEGNR, MA, MIIR, CREAM	+				Not required	-
24.	Updating the Schemes for the Integrated Use and Protection of WaterResources of Rivers (SKIOVR) of the Balkash Lake Basin	*	Approved SKIOVR of the rivers of the Balkash Lake basin	2023	MEGNR, specialized design institutes		+			-	Republican budget
25.	Inspection of drainage networks of cities and towns. Study of the hydrogeology of the territories of wastewater reservoirs and assessment of their impact on groundwater	*	Report on the results of the survey and action plan to neutralize the sources of pollution by underground	2022-2023	MEGNR RK, local authorities, industrial enterprises	+				-	Republican budget, private investments
26.	Reconstruction (rehabilitation) of networks of tailings, sewage tanks, sewer networks and treatment facilities of cities	*	Reporting information	2022-2025	MEGNR, MIIR, IOI	+	+	+		-	Republican and local budgets

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
	and towns around Lake Balkash										
27.	Conducting a study of the development opportunities for small hydropower plants, CHP plants using biogas, solar and wind farms, and other renewable energy sources	*	Reporting information	2022	ME, MEGNR, MIO					-	Republican budget
Objective 5 "Development of human potential"											
28.	Development of advanced training and retraining courses	*	Reporting information	2022-2025	MEGNR, MIO	+	+	+		-	Republican budget, private investments
29.	Increasing the potential of basin inspection specialists and the material and technical base (instruments, equipment) increasing the salaries of specialists	*	Reporting information	2022-2025	MEGNR, MNE	+	+	+		-	Republican budget
30.	Holding meetings of the Basin Councils	*	Reporting information	2022-2025	MEGNR	+	+	+		-	-
31.	Conclusion of a tripartite basin agreement (water users, local authorities, basin inspectorates)	*	Reporting information	constantly	MEGNR	+	+	+		-	-
32.	Holding an annual Forum	*	Reporting	2022-2025	MEGNR,	+		+			Internationa

No.	Name	unit of measurement	Completion Form	Deadlines	Responsible for execution	including by years				Estimated cost	Sources of financing
						2022	2023	2025	Total		
	with the involvement of stakeholders dedicated to the conservation of the Balkash Lake basin		information		stakeholders						l organizations, private investments