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## INTEGRATED WATER RESOURCES MANAGEMENT IN THE REPUBLIC OF KAZAKHSTAN: PROBLEMS AND PROSPECTS

The article analyzes the state of Kazakhstan's water resources, shows that in recent years the flow of Trans Boundary Rivers has been decreasing. As a result, in the coming years, with the growth of the country's economic potential, based on the development of rich mineral resources, fuel, energy and land resources, there will be a serious problem with water supply. The scarcity and irrational use of freshwater resources pose a serious threat to the sustainable development and protection of the country's environment. The regulation of water use is of great importance in solving this problem. It is necessary to ensure the implementation of the Program for the rational use and protection of water resources in the context of large river basins by introducing new technologies for water supply and sanitation. The system of integrated water resources management should become the basis of the country's interstate and interstate water management policy. At present, the countries of Central Asia are moving towards the introduction of the principles of sustainable development into strategic documents and public administration practices. Integrated water resources management is one of the tools for the transition to sustainable development. This article is a review of progress made in the planning and implementation of integrated water resources management. The article summarizes the problems, successes, and directions for further integration in the field of water resources management. It also examines the successes and enormous difficulties still facing the regions, in particular, the issues of trans boundary waters, where states have different views and priorities for water use.

**Key words:** integrated water resources management; Trans Boundary Rivers; water supply; sustainable development; protection of watercourses.

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### Қазақстан Республикасының су ресурстары біріктірілуінің басқарылуы: мәселелері және келешегі

Берілген мақалада Қазақстанның су ресурстарының ахуалы туралы талдау жасалынды және трансшекаралық өзендердің ағымы соңғы жылдары азайғаны жөнінде мәліметтер келтірілген. Осының нәтижесінде келешекте минералды-шикізат, отын-энергетикалық және жер ресурстарын игеру негізінде елдің экономикалық әлеуетінің дамуы барысында сумен қамтамасыз ету күрделі мәселесі туындайды. Тұщы су ресурстарының тапшылығы және тиімсіз пайдалануы елдің тұрақты дамуына және қоршаған ортаға қауіпін келтіреді. Бұл мәселені шешу барысында су пайдалануды реттеудің үлкен мәні бар. Сумен қамтамасыз ету және су тартудың жаңа техно-

логияларын енгізу жолымен ірі өзендер бассейнінің тілімінде су ресурстарын тиімді пайдалану және қорғау Бағдарламасын іске асыру қамтамасыз етілуі керек. Елдің мемлекетшілік және мемлекетаралық су шаруашылығының саясатының негізі болып су ресурстары біріктірілуін басқару жүйесі болу керек. Қазіргі таңда Орталық Азия мемлекеттері стратегиялық құжаттарға және мемлекеттік басқару тәжірибелеріне тұрақты даму принциптерін бірыңғай енгізу жолында тұр. Су ресурстары біріктірілуінің басқарылуы тұрақты дамуға көшудің құралдарының бірі болып табылады. Берілген мақалада су ресурстарын кешенді басқару тәжірибесінде жоспарлануы және пайдалану саласындағы жетістіктерге шолу жасалған. Мақалада су ресурстарын басқару саласындағы кезекті біріктірулердің мәселелері, жетістіктері және бағыттары жиынтықталған. Сонымен бірге, мемлекеттердің суды пайдалану мәселесінде әр түрлі көзқарастарының және басым бағыттарының әр түрлі болуына байланысты мемлекетіміздің кейбір аймақтарында трансшекаралық суларды басқару қиыншылықтары да қарастырылған.

**Түйін сөздер:** су ресурстары біріктірілуін басқару, трансшекаралық өзендер, суды қамтамасыз ету, тұрақты даму, су ағымдарын қорғау.

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### Интегрированное управление водными ресурсами Республики Казахстан: проблемы и перспективы

В статье проведен анализ состояния водных ресурсов Казахстана, показано, что в последние годы все больше сокращается сток трансграничных рек. В результате чего уже в ближайшие годы при росте экономического потенциала страны, основанного на освоении богатых минерально-сырьевых, топливно-энергетических и земельных ресурсов, возникнет серьезная проблема с водообеспечением. Нехватка и нерациональное использование ресурсов пресной воды создают серьезную угрозу устойчивому развитию и охране окружающей среды страны. Огромное значение в решении данной проблемы имеет регулирование водопользования. Необходимо обеспечить реализацию Программы рационального использования и охраны водных ресурсов в разрезе бассейнов крупных рек путем внедрения новых технологий водообеспечения и водоотведения. Основой внутригосударственной и межгосударственной водохозяйственной политики страны должна стать система интегрированного управления водными ресурсами. В настоящее время страны Центральной Азии переходят к внедрению принципов устойчивого развития в стратегические документы и практику государственного управления. Интегрированное управление водными ресурсами является одним из инструментов перехода к устойчивому развитию. Данная статья является обзором прогресса, достигнутого в области планирования и применения на практике комплексного управления водными ресурсами. В статье обобщены проблемы, успехи и направления дальнейшей интеграции в сфере управления водными ресурсами. В ней также рассматриваются успехи и огромные трудности, все еще стоящие перед регионами, в частности, вопросы трансграничных вод, где государства имеют различные взгляды и приоритеты водопользования.

**Ключевые слова:** интегрированное управление водными ресурсами, трансграничные реки, водообеспечение, устойчивое развитие, охрана водотоков.

The issues of protection and rational use of water resources in the republic are more relevant than ever. Water supply is one of the strategic state tasks. The state of water resources largely determines the level of economic development. In Kazakhstan, water is one of the determining factors in the development and distribution of productive forces. The republic is rich in land resources, which are the main reserve for the growth of arable land in the country. The scarcity of water due to its uneven distribution across

the territory affects the development of agricultural production and industry (Mal'kovskij, 2016). Water resource of the republic are used in various sectors of the economy, but the most significant consumer of fresh water both at the present level and in the future is agriculture – irrigation, provision of water to the rural population and livestock. It accounts for about 85% of the total water consumption; the remaining 15% goes to industry and water supply to the urban population.

The analysis of the country's water resources state showed that total freshwater reserves are estimated at 524 km<sup>3</sup>, including 80 km<sup>3</sup> in glaciers, 190 km<sup>3</sup> in lakes. Reserves of groundwater make up 15.6 km<sup>3</sup>, including: for domestic and drinking water supply – 5,6; for household, drinking and industrial-technical water supply – 0,8; for domestic and drinking water supply together with irrigation of land – 0,08; for domestic, drinking, industrial, technical and irrigation of land – 0,006 (Vodnye resursy Respubliki Kazakhstan, 2018).

Having a vast territory, multi-sectoral economic complex, the republic suffers from insufficient and uneven water resources. There are eight river basins on the territory of Kazakhstan, the largest of which are Yertis, Balkhash-Alakol, Aral-Syrdarya and Zhayik-Caspian (total more than 90% of water resources).

If the water needs for one km<sup>2</sup> of the country's territory, the existing security is on average 20,53

thousand m<sup>3</sup>. The indicator of water availability per inhabitant of Kazakhstan is 18,79 km<sup>3</sup> per a day. At the same time, the situation with water supply in the republic varies considerably by region. Most are provided with own resources both surface and underground waters – the Ertis river basin, the Balkash-Alakol basin. The Nura-Sarysu, Ertis, Tobol-Torgai basins are deficient in groundwater. Significant territories of Esil, Zhayik-Caspian, Aral-Syrdarya, Tobol-Torgai and Nura-Sarysu basins are deficient in both surface and underground waters.

According to Kazhydromet, the surface water resources of Kazakhstan in the average water year are 108,5 km<sup>3</sup>. Of these, 56,5 km<sup>3</sup> are formed on the territory of the republic (Table 1). At the same time, from the territory of China an average of 19,9; Uzbekistan – 13,7; Russia – 7,4; Kyrgyzstan – 3.0 km<sup>3</sup>/year (Nacional'nyj doklad, 2015).

**Table 1** – The volume of water resources of the rivers of Kazakhstan, billion m<sup>3</sup>

Years	Total	The River runoff forming in the territory of the Republic of Kazakhstan	The River runoff coming from neighboring states
2010	143 600	77 200	66 400
2011	101 800	57 300	44 500
2012	92 700	49 200	43 500
2013	121 100	75 000	46 100
2014	109 800	63 500	46 300
2015	107 400	67 700	39 700

It should be noted that in 2015, environmental protection releases were carried out for m<sup>3</sup>. The admissions were conducted in order to ensure the preservation of the natural state of the water body, the elimination of degradation and desertification processes in the lower reaches of the Shiderty River of the Pavlodar region, to fill and replenish the lake systems and improve the ecological condition of the Kyzylorda region, the lakes of the Tengiz-Korgalzhyn state reserve of the Akmola region.

In accordance with existing treaties with neighboring countries, with the exception of the People's Republic of China, with which there is no agreement on water allocation, the following

amounts of runoff of Trans Boundary Rivers should enter the territory of Kazakhstan in the average water year:

The SyrDarya River — 12 km<sup>3</sup>;

The Zhayik River – 7,79 km<sup>3</sup>;

The Ile River – 12 km<sup>3</sup>,

The Kara Ertis River — 9,8 km<sup>3</sup> (based on average long-term data);

The Shu River – 2,79 km<sup>3</sup>,

The Talas River– 0,81 km<sup>3</sup>.

The actual flow of Trans boundary Rivers into Kazakhstan is shown in Figure 1. There is a decrease in the flow of water along Trans Boundary Rivers from China (Informacionnyj bjulleten', 2013, 2014, and 2015).

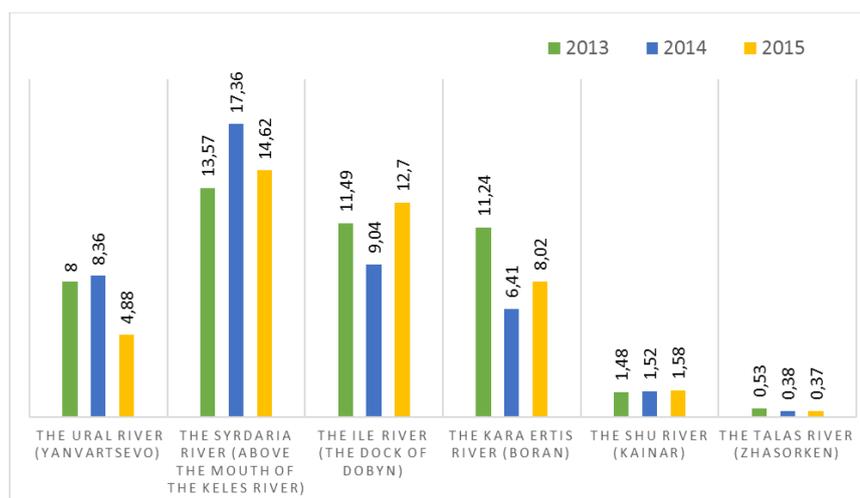


Figure 1 – The volumes of trans boundary rivers flow entering the territory of Kazakhstan from neighboring countries, km<sup>3</sup>

That is, Kazakhstan's water supply from its own resources is the lowest after Turkmenistan in this indicator among the republics of the post-Soviet space, and taking into account the transit flow of 42.50 thousand m<sup>3</sup>/km<sup>2</sup> takes the last place. According to the specialists of the republic's water economy, in the coming years, with the growth of the country's economic potential, based on the development of rich mineral resources, fuel, energy and land resources, there will be a serious problem with water supply. In this situation, the issue of coordinated use of the waters of Trans boundary Rivers with neighboring countries on the principles of international law and cooperation is of particular importance for Kazakhstan. A special place in the policy of the state should be the issues of interaction with neighboring countries in the joint use and protection of trans boundary water resources. The process of settling all the contradictions between the countries of Central Asia can be objectively resolved upon accession to the UN Convention on the Protection and Use of Trans boundary Watercourses and International Lakes of September 18, 1992.

It should be noted that the Convention on the Law of the Use of International Watercourses, adopted by the UN General Assembly on May 21, 1997, obliges to consider «ensuring the use of trans boundary waters in a reasonable and equitable way, with special regard to their trans boundary character in carrying out activities that have or can have a trans boundary impact». The UN decisions emphasize that «watercourse States cooperate on the basis of sovereign equality, territorial integrity, mutual benefit and good faith» (Tehnicheskaja tematiceskaja publikacija, 2014).

At the same time, Kazakhstan is experiencing a shortage of fresh water not only because of its geographic location, but also because of irrational water management and inefficient water management. Water supply of economic sectors is carried out by 85% due to surface water. Almost 98.7% of the water intake in Kazakhstan is provided by 6 industries: agriculture – 65%; production of electricity, gas – 24%; state management (activity of the State Water Supply Administration) – 5.3%; metallurgy – 3.2%; the mining industry – 1.2% (Informacionno-analiticheskij obzor, 2007).

The analysis of water losses during transportation shows that 99.3% of the total losses in the country fall on 3 sectors: agriculture – 75.9%; production of electricity, gas – 10.8%; state administration – 12.5%. Losses of other industries do not exceed 0.7% of the total amount and cannot influence the overall situation. Intensive and sometimes irrational development of irrigated agriculture, as well as regulation of runoff in arid climate conditions led to a water deficit in the basins of small and large rivers such as Ili, Syrdarya, Ishim, and others.

In general, the loss of water according to the Committee on Statistics, there is an increase in water losses by 85 million m<sup>3</sup> (water losses for 2015 were 2940 million m<sup>3</sup>, for 2014 – 2,855 million m<sup>3</sup>).

According to the Committee on Water Resources of the Ministry of Agriculture – the authorized body for the use and protection of the water fund of the Republic of Kazakhstan, the following measures were taken to reduce water losses during transportation: reconstruction of canals, improving the efficiency of canals and improving the water infrastructure, etc.

In addition, pollution and depletion of surface water continues. This is due to consumption of clean water for household needs, after which water is discharged into the reservoirs of untreated or insufficiently treated sewage. Wear of 34% of city drainage networks and the majority of sewage treatment plants was 70% (Kudajbergenuly, 2005; Turmaganbetov, 2011).

The quality of the waters of almost all water bodies of the republic remains unsatisfactory. The areas of foci of groundwater pollution range from one to hundreds of square kilometers. In Kazakhstan with a population of more than 18,338,704 people, 46% live in rural areas, and only 60% of them have the opportunity to use centralized water supply (Jelektronnyj Schetchik naselenija, 2017). The rest use water from local sources (wells, springs, rivers and ponds) or imported. In general, about 20% of the population consume poor quality drinking water.

The most unsuccessful in the ecological respect is the basin of the main waterway of Kazakhstan – the Irtysh River. Its waters are contaminated with heavy metals (copper, zinc, cadmium, lead, arsenic, etc.) that enter the river with sewage. The main sources of accumulation of chemical elements in water systems and their constituent parts of bottom sediments in the territory of the Irtysh basin are:

- Naked surfaces of mine workings, their dumps,
- Storage;
- Product storage of concentrating factories;
- Dumping products and industrial effluents of metallurgical, chemical-metallurgical, chemical, machine-building, heat-power enterprises and enterprises of the construction industry;
- Industrial emissions into the atmosphere, deposited subsequently on the earth's surface;
- Chemicals widely used in agriculture in the region. (Abubakirova, 2011).

One of the most urgent problems not only for Kazakhstan, but also for the entire world community remains the problem of the Aral Sea. The processes of desertification, soil salinization, impoverishment of the plant and animal world, climate change, and the incidence of the population have increased dramatically. The ecological situation in the Aral region has led to the impossibility of developing traditional economic directions and caused a number of social problems. In turn, the ecological situation in the Caspian region is determined by an increase in the level of the Caspian Sea and anthropogenic impact on marine coastal ecosystems. A rise in sea level, according to experts' forecasts, will lead to an extension of the coastline to 2,400-2,700 km, and 1.2-2.2 million hectares will be added to the flooded

areas. The greatest danger of flooding is exposed to oil fields on the northern and north-eastern coast of the Caspian Sea (out of 43 oil fields under threat of flooding, 32 in Atyrau and 11 in Mangistau oblasts). The Caspian Sea is the largest sturgeon habitat in the world; therefore, the Caspian problem is not only an interstate but also a global problem. The implementation of environmental programs is complicated by its growing importance as the largest oil and gas-bearing region (Bolgov, 2007; Izmajlova, 2015).

The scarcity and irrational use of freshwater resources pose a serious threat to the sustainable development and protection of the country's environment. The regulation of water use is of great importance in solving this problem. The management of water resources in the republic is based on the basin principle.

The legal basis for water use in the Republic of Kazakhstan was established by the Water Code of March 31, 1993. Its main task is to regulate water relations for the purpose of rational water use, protection of water resources from pollution, contamination and depletion, as well as preventing harmful impacts on the soil (Vodnyj kodeks RK, 2018).

This is stated in the document of the state program "Ecology of Kazakhstan for 2010-2020", it is explained that the problem of sustainable water supply in Kazakhstan is due to the limited availability of water resources, a high degree of pollution and the uneven distribution of water reserves throughout the country. Despite the scarcity of groundwater, at present only 0.2-12% of the total volume of explored reserves is used. To solve the problem of water resources deficit and pollution, the program "Ecology of Kazakhstan" provides for the work on forecasting and updating of groundwater resources (Gosudarstvennaja programma, 2014).

Thus, the analysis of the state of the country's water resources has shown that the main water losses fall on agricultural irrigation and industry. This is due to losses during transportation of water, lack of a closed cycle of water use at enterprises, an increase in the amount of sewage discharged into water bodies, water pollution by various types of waste, relatively low use of groundwater resources, etc. (Ljubel', 2013)

It is worth mentioning the main problems in water resources management, which are the following:

1) *Underdevelopment of the organizational environment and sectoral disunity.* The issues of coordination of water resources management do not find solutions in the developed strategies for the development of economic sectors. To implement a

unified water management policy, the authorized body in the field of use and protection of the water fund has insufficient powers, which negatively affects the long-term planning of the development of the water sector, ensuring compliance with the balances of water use interests in combination with their protection, and involving the public in the decision-making process.

2) *Inefficiency of mechanisms for implementing existing legislation.* The current legal framework for the water sector includes, generally, general provisions that do not cover the whole range of problems of cooperation and intersectional interaction and do not contain detailed mechanisms for preparation and decision-making. At an insufficient level, obligations under international treaties are being fulfilled.

3) *Limited use of modern management tools.* Legal, economic and scientific-methodological instruments of water use are not being improved, which does not promote stimulation of water users for careful and effective use of water and prevention of pollution of water bodies. The level of public influence on the process of making managerial decisions remains low.

4) *Ignoring the ecosystem restrictions.* The development of the water sector of the economy is carried out without taking into account social, economic and, especially, environmental requirements. Ignoring environmental requirements in water management activities led to the emergence of a crisis in virtually all river basins in Kazakhstan. The problems of degradation of forests, pastures, glacier reductions, intensive erosion in catchment areas are declared, but are not grounds for modeling basin development scenarios and management decisions. Despite the significant dependence of the development of the country's economy on the state of the water fund, there is no economic assessment of aquatic ecosystems and the goods and services they provide to society. One of the reasons for the degradation of ecosystems is the imperfection of the water quality management system in Kazakhstan's river basins. Monitoring of water quality characteristics is carried out by the Republican State Enterprise Kazgidromet (background monitoring of surface waters), regional environmental protection departments (monitoring the quality of industrial wastewater), territorial departments of sanitary and epidemiological supervision (monitoring of drinking water quality), territorial offices of the Committee of Geology and subsoil use (groundwater quality monitoring). Most of the information of these organizations is inaccessible and insufficient for

planning and decision-making on water quality improvement, access for the public is limited.

5) *Imperfection of the system for preventing and eliminating the harmful effects of water.* In this sphere, there is an interdepartmental dispersion of responsibility (Ministry of Emergency Situations, Ministry of Agriculture, Ministry of Environmental Protection, local executive bodies, business entities) and there is no integrated approach to prevent and eliminate the effects of harmful water impacts. At present, there is no systematic approach to addressing the harmful effects of water. There is no systematic database on these phenomena, regularities in many of their types have not been studied, their risks and the extent of possible damage associated with them have not been assessed. Specialized design and production units responsible for providing protection against harmful effects of water are abolished, and new ones are not created. Therefore, this problem is quite urgent.

6) *Operation of water infrastructure.* The actual wear of water management systems and facilities is more than 60%. The reliability and safety of strategically important facilities has been reduced. In the most disastrous state, there are dams of large hydro units, the breakthrough of which may cause catastrophic floods. Low efficiency of distribution networks, large losses of water, rise of ground waters and salinization of adjoining lands are noted.

7) *Weakness of civil society and non-governmental organizations.* The practice of development of water user associations and rural consumers' cooperatives of water users shows that they are still at the stage of formation and practically do not participate in the planning, distribution and management of water resources. Virtually do not participate in the development of decisions and delineation of responsibility for repair and modernization of water infrastructure, as well as ensuring the safety of territories and the population from the harmful effects of water.

8) *Underdevelopment of the national information system.* The access of stakeholders to socio-economic and environmental information is not ensured, and the objectivity of decisions taken at all levels of government is reduced. The system of training and raising the level of skills of higher and middle-level personnel in the water sector of the economy requires improvement. The existing gaps in the standards of education cause a lack of qualified specialists and training facilities.

9) *Problems of trans boundary water management and international cooperation.* Serious problems in the management of trans boundary water bodies are the insufficient regulation of the issues

of joint use of trans boundary rivers, the absence of an intergovernmental system for monitoring the state of water resources and the exchange of reliable data on the use of water resources, mutual notification of emergencies at water management facilities of trans boundary rivers. There is no legal and methodological framework regulating the use of joint natural resources; as well as consistency in the assessment and reimbursement of trans boundary environmental damage. Attempts to resolve the problems of trans boundary pollution on a bilateral basis have not yet led to practical results – a reduction in the level of pollution of trans boundary rivers. All this, combined with the high degree of trans boundary nature of the formation of the republic's water resources and the increase in pollution of water bodies, are serious challenges to sustainable water use of the population and economic sectors and environmental security of the country.

It should be noted that the level of fulfillment of obligations under international treaties is not high enough. The problem is not so much a lack of financing as in the absence of procedures and methodologies for planning cross-sectorial actions that take into account Kazakhstan's obligations under conventions and agreements.

The above problems of the water sector of the economy of the Republic of Kazakhstan can have extraordinary negative economic and social consequences, damaging the environment, the resource potential and the health of the population. The most prominent consequences of the imperfection of the water management system in Kazakhstan are well known:

- Ecological catastrophe of the Aral Sea;
- Low population availability of safe drinking water;
- Environmental problems of the oil and gas sector, in connection with possible technogenic catastrophes in oil production on the shelf of the Caspian Sea;
- Water scarcity and water pollution, salinization (desertification) of agricultural lands;
- Unsatisfactory quality of most aquatic ecosystems in the republic;
- Risks and possible damage from man-made disasters due to physical deterioration of hydraulic structures.

It is expected that the listed problems – the consequences will be aggravated in the future due to global warming, agglomeration of farms, development of production.

Thus, in order to achieve sustainable socio-economic development, appropriate changes

and new approaches are needed in the use and management of water resources.

To solve the problems of water crisis both internationally and domestically, scientists have proposed a system of integrated water resources management (IWRM). This system was developed by European countries, when the water crisis of the state developed into a continental problem. Since most rivers in Europe are trans boundary, so the pollution of one affects the state of several rivers at once. To unite the interests of the parties, it is primarily necessary to recognize water as a commodity for which it is necessary to pay. Then a supranational structure should be created that would regulate the solution of water supply problems for the region as a whole. However, before selling water as a commodity, it is necessary to create a solid interstate legal framework. When countries approve the “polluter pays” principle, you can sell water depending on the quality.

The transition to IWRM in the country is based on the international experience of the countries of the European Union, the United States, Japan, etc.

At the present, Kazakhstan has begun reassessing the regulatory and regulatory framework in the direction of developing the principles of integrated water management. The Republic of Kazakhstan is the first country in Central Asia to start reforming the system of surface water quality standards. As a result, the mechanism for “ecological regulation of water use”, including elements of ecosystem monitoring, reporting, planning, stakeholder interaction, etc., was laid down in a legislative framework. (Duhovnyj, 2011)

The IWRM process includes a number of key principles that determine its practical essence. In a generalized form, the key principles of integrated water resources management are as follows:

1. Water management is carried out within hydrographic boundaries in accordance with the morphology of a particular basin.
2. The management provides for the registration and involvement of all types of water (surface, underground, return) taking into account climatic features.
3. Close coordination of water use and all participating bodies horizontally between sectors and vertically between levels of the hierarchy of water use.
4. Public participation not only in management, but also in financing, in maintenance, planning and development.
5. Information support, openness and transparency of the water management system.

6. Priority of natural requirements in the activities of water management bodies.

7. Presence of incentives for water conservation and combating unproductive water losses from water management bodies and water users (Nacional'nye dialogi, 2013).

It is important to note that IWRM is a process that is based on taking into account all existing water resources (surface, groundwater and return water) within the hydrographic boundaries and represents the interests of different industries and levels of the hierarchy of water use. IWRM includes all interested parties in decision-making and promotes the rational use of water in the interests of environmental safety and sustainable welfare of society.

The IWRM assumes participation in the management not only of the state (government), but also of regional and local (administrative) authorities, as well as the private sector and civil society. The logic of inclusion is that different forms of partnership (contractual) relations with the private sector are usually supervised by state structures of different levels, and the requirements and interests of civil society should constitute the goal and task of the entire public administration system.

It is necessary to conclude basic agreements on Trans Boundary Rivers and the division of responsibilities of the parties in matters of general water use. With the joint (cooperative) use of this potential, attempts to pressurize or provoke some advantages (geographic or territorial) are doomed to failure in the end. In our opinion, it is at the border with the countries of Central Asia that it makes sense to apply IWRM and a water monitoring and evaluation system. IWRM should become the basis of interstate and interstate water policy, and ensure a balanced solution of socio-economic problems and problems of restoration and preservation of the water and resource potential of the river basin. The regulatory role of the state in all this is fundamental, and the economic activities of industrial, agricultural and other enterprises should include environmental priorities.

To implement integrated water resources management in the Republic of Kazakhstan, it is necessary:

- Ensure implementation of the Program for the rational use and protection of water resources in the context of large river basins by introducing new technologies for water supply and sanitation;
- Ensure implementation of the Akbulak branch program and other water-supply programs;
- To restore and conserve aquatic ecosystems in the main river basins;

- Establish a unified information system for monitoring water use;

- Improve existing regulatory and legal acts in the field of rational use and protection of water resources;

- Develop concepts for projects to reduce water scarcity;

- Exclude discharges to untreated sewage water sources;

- Ensure water saving in agriculture;

- Increase the efficiency of water use in industry by 25%;

- Increase the efficiency of water use in the communal sector by 10%.

The Republic of Kazakhstan has all the prerequisites for transition to IWRM, but it is necessary to carry out a large number of institutional, legislative and information measures to ensure the development of the process. Certain conditions have been created, in particular, a key role in the management of water resources has been assigned to the authorized body in the use and protection of the water fund and its regional basin authorities, but effective work requires a significant increase in their institutional capacity. International cooperation is developing, but in order to fulfill Kazakhstan's obligations under international treaties, it is first of all necessary to solve the problems of water resources management at the national level.

Work on the implementation of the IWRM principle has already begun, much more needs to be done to create legal and institutional conditions for IWRM and to implement these mechanisms in practice. The need for coordination between different sectors in water use is reflected in national legislation. The bodies and mechanisms responsible for horizontal coordination are usually taken into account in national legislation, but the effectiveness of their functioning remains a problem. One of the prerequisites for ensuring fruitful vertical and horizontal coordination is the achievement of institutional stability. Ensuring continuity of reforms, financial sustainability and a favorable labor situation remains a recurring problem. Economic instruments (including charges for water abstraction, pollution charges, and tariffs for water supply and sanitation services) can stimulate the effective use of water and ensure the optimal distribution of water where it creates the greatest value for local communities, which should contribute to (green) growth. Such tools can reduce the need for expanding water supplies and the need to invest in new infrastructure, thereby saving limited financial resources. They can also generate revenues for

service providers. Such instruments are generally referred to in regulatory legal acts, but they can be effective only if properly designed and effectively implemented. This requires strengthening capacity in monitoring water use and ensuring water-related regulation.

Thus, the introduction of IWRM principles at the national and regional levels will contribute to

water conservation, strengthening interstate cooperation in the use of water and energy resources. Based on the principles of the unity of water resources. Development and implementation of key IWRM tools will ensure reliable and viable national and regional water resources management in the context of current and future climate change. (OECD Water Studies, 2012)

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