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Mechanism of Trans boundary Water Resources Management for Central Asia Countries

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Water resources are integral part of the natural resource potential of the country. Trans boundary water interests of the Republic of Kazakhstan are priority to ensure water security, where the key problem remains the continuing uncertainty of the status of trans Boundary Rivers. Urgency of the problem of trans Boundary Rivers' water management is becoming increasingly important due to their revaluation. Kazakhstan, as a water-scarce state of the Central Asian region, needs to look for ways to improve its water balance, since the problem of water volume reducing, reflecting on economic indicators, on addressing protection of ecosystems, social guarantees of water supply, is connected to a greater extent with the inconsistency of border states' interests, differences in the approaches and methods of trans boundary rivers' water management. Thus, water resources are not only a component of the environment, but also the main component of the control mechanism, implementation of which will be available for long-term cross-border cooperation of states in order to converge the interests of the joint regulation of water use and consumption, development of their legal basis, its legislative consolidation, direct exposure corresponding to the level of technical and technological support.

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1. Introduction

Accounting and use of transboundary water resources available on the territory of Kazakhstan from abroad have an important role in water resources management. Republic of Kazákhstan, much of which is desert or semi-desert,

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is one of the countries with weak security of water resources, characterized by large sparse of river networks with constant water flow and large density of ephemeral streams. About 44% of the surface water resources of the country comes from the states of the Central Asian region, the Russian Federation and China, forming trans boundary water basins (Table 1) (UNDP in Kazakhstan, 2004, p. 132; Concept of Kazakhstan's transition, 2013, №577).

Table 1. Water inflow from trans boundary rivers

River basin	Average annual volume of water inflow from transboundary rivers in Kazakhstan, billion m^3				Basic moments
	2010	2020	2030	2050	
Irtysh basin (Irtysh River)	5	3	0	-100%	▪ Agreement on the division of river water reserves is not signed*; ▪ China expands its activities in the region; ▪ Channel to the oil fields in Karamai; ▪ Inflow reduction worsens the ecological state of the river due to the increase pollutants concentration
Balkhash Alakol basin (Ili River)	12	11	9	7 (39%)	▪ China is actively increasing water withdrawals; ▪ Planned expansion of irrigated areas (mainly cotton fields)*; ▪ Construction of hydroelectric power plants and dams; ▪ Creating urban settlements and population displacement; ▪ Volume of water inflow and, consequently, water quality of Lake Balkhash and the Ili River are closely linked to economic activity in China
Aral-Syrdarya basin (Syr Darya River)	15	14	13 (-21%)	12	▪ Conflict between use of hydropower, agriculture and preservation of the natural river regime lead to water scarcity, environmental degradation and flood risk; ▪ Saving the Aral Sea is provided with the support of international organizations; ▪ Water quality becomes another parameter of water use optimization and change the mode of reservoirs' operation;
Ural-Caspian Basin (Ural River)	7	5	4 (-80%)	1	▪ Under the agreement, the river water supply is divided between countries in the proportion of 50/50; ▪ Low water flow in dry years is greatly reduced and may drop to 0, which leads to disastrous consequences for agriculture, fisheries and ecology

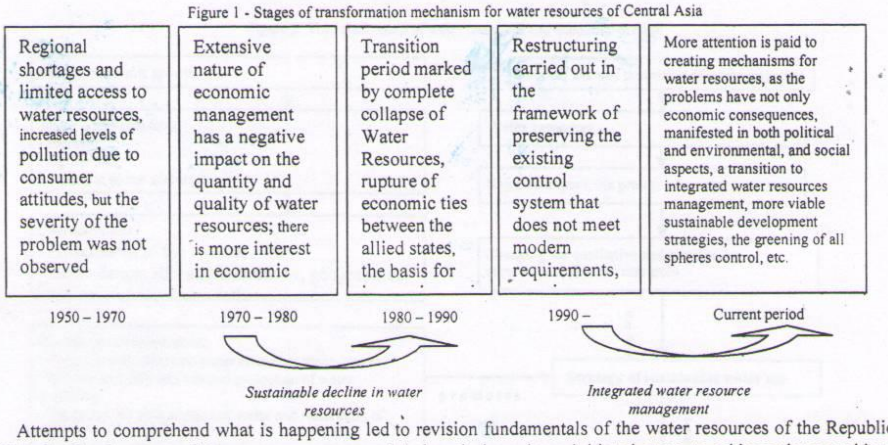
2. Problem

If these rivers were considered earlier as a common resource of development, whose distinction was held for the convenience of administration, and now the interests of states vary and consist in the development of hydropower, irrigation, drinking water supply, transport, communications, etc. Addressing the joint use of water resources of Transboundary Rivers is carried out on the interstate level, involving basin states for the rational use and protection of water resources (UNDP in Kazakhstan, 2004, p. 133).

Development of water resources of Central Asian countries can be divided into three stages of mechanism's transformation for water resources (Fig.1). Perhaps the last stage will be the most protracted, as it is necessary to overcome the recession in the water sector, to realize the causes and consequences of the recession and purposefully go to the sustainable use of water by reducing the volume of inefficient water use. Search of productive, mutually collective decisions may not be straightforward and this process will inevitably pass through the acceleration and deceleration phases, even through the crisis. In any case, this experience will be valuable; it can lead to a rethinking of more rational decisions in the field of water resources management (Grigoriev, 1994, p. 12- 27).

Concepts of infinity and sustainability of water resources, characteristic for initial stages, have transformed in the absence of complexity in water use, extensive economic management based on involvement and use of water resources. For a long time lack of construction materials, low prevalence of advanced technologies, shortage of skilled labor, investments were compensated by the additional involvement of natural resource potential in the economic turnover. 80s were marked by the collapse of the water sector, although as such established mechanism of its work in this area was not. Economic links' gap following the collapse of the Soviet Union has exacerbated the situation. At this time the crisis manifested most strongly in the water sector of the country, especially as it was accompanied by a simultaneous and the general crisis in the economy, the consequences of which have negative economic, political, and, above all, became apparent negative environmental and social character.

Figure 1 - Stages of transformation mechanism for water resources of Central Asia



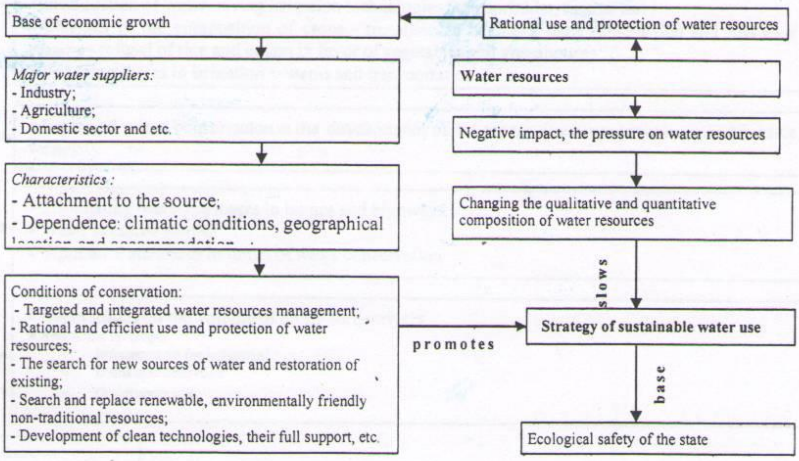
Attempts to comprehend what is happening led to revision fundamentals of the water resources of the Republic. With the development of these processes on a global scale have been initiated steps to address these problems through integrated management. Integrated water resources management is a process that ensures coordinated development of water, land and related resources, and management of these resources in order to maximize economic and social welfare equally without affecting the sustainability of the most important ecosystems. The global movement towards IWRM in practice means changing management practices, involvement in the decision making process of stakeholders, including the public, having specific or professional interests in the field of environment and social welfare. Within the framework of IWRM it is achieved most effectively, meets the conditions of sovereignty and economic independence of the Union republics and is accompanied by the process of "greening" the entire structure of government organizations.

3. Result

Meanwhile, there is a direct relationship of water resources and economic growth of the state (Fig. 2), in which adherence to the principles of sustainable water management strategy meets the requirements and is the basis of ecological security of the country.

As a result of rapidly growing demand for water and sustainable reduction of water supplies by 2030 is expected shortage of water in the amount of 14 billion m^3 by 2050, the deficit will be 20 billion m^3 (70% of water demand), unless drastic action is taken and development will be on the current trajectory. In the absence of pre-emptive actions, such water shortage can lead to: reduction of the environmental water flow and then degradation of lake and river ecosystems and fisheries, especially in the Lake Balkhash, in the delta of the Ili River, marsh systems of Central Kazakhstan, Northern Aral Sea, etc.; rationing water consumption for economic purposes, especially in agriculture, as well as hydropower industry, industry, possible water shortages in settlements; higher costs because of the need for water supply commissioning of new water sources (reuse, pipelines) and the transfer of water between basins (Concept of Kazakhstan's transition, 2013, №577).

Figure 2. The relationship of water resources and economic growth



Thus, water resources, which are the basis for economic growth of the state, cannot be considered unlimited. Saving negative trends will lead to irreversible consequences that will affect the economic and environmental security.

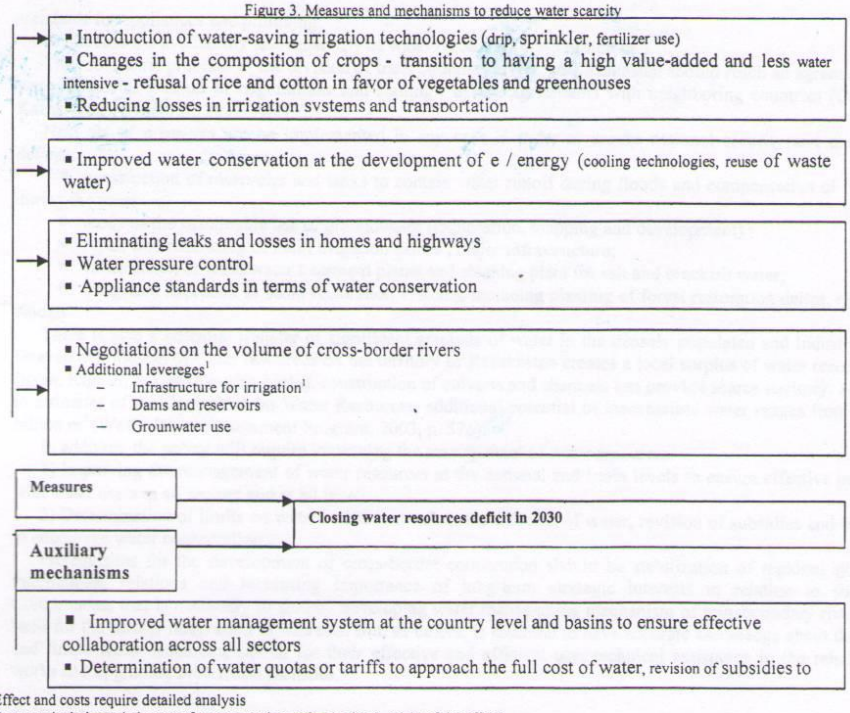
To represent the real value of water resources and their conservation needs a control mechanism (Table 2), which shall consist of the following components and be supplemented and specified in economic, legal and social aspects.

Table 2. Components of the mechanism of water resources management

Constituent components	Description of components
Water balance	Methods and tools for water balance calculation of the river basin, including hydrological and hydrogeological assessment of water resources
Engineering	Assessment to ensure the necessary infrastructure, its feasibility description, availability of water facilities, their capacities and sizes
Institutional and legal	Evaluation of the organizational structure of water management, its development and improvement of the legal and legally enforceable
Social and healthcare	Evaluation of the social structure, demographic processes, ensure quality drinking water, level of anthropogenic load and resource security
Environment and water quality	Environmental assessment and methods for reducing the negative impact, control water quality and its standard compliance and the level of achievement
Economic and financial	Introduction of market mechanisms of water management, methods of valuation, supply formation adequate to demand, market development services, etc.
Foreign experience	Study and use of the best examples of national and international water management in relation to the conditions of individual regions

According to the description of components can be covered list of problematic issues. Efficiency of their solving is observed at the interaction of national (domestic) and international (cross-border, regional) levels of government. Implementation mechanism will require use of a wide array of economic, organizational and legal measures, which may be possible with the development of advanced legal and regulatory right software (United Nations Special Program, 2004, p. 125

Figure 3. Measures and mechanisms to reduce water scarcity



1 Effect and costs require detailed analysis
2 Does not include capital costs of energy-saving technologies (~ 40 % of the effect)

1. To achieve water savings in agriculture (6.5-7 billion m^3 in 2030) is necessary to implement initiatives in 3 directions:

1) introduction of modern methods of irrigation and other modern water-saving technologies (would save 1.5 billion m^3) on 15 % of acreage in 2030, reducing irrigation by flooding from 80% to 5% of irrigated areas, increasing the area of covered ground to 1,700 ha in 2030;

2) transition to crops with higher added value and less water intensive (will save 3.5 billion m^3 in 2030): gradual reduction of rice and cotton acreages by 20-30% and replacing them with less demanding in terms of water resources vegetables, oilseeds and forage crops by 2030;

3) reduction of water losses during transportation three times (will save 1.8 billion m^3 in 2030): restoration of large infrastructure projects, definition of ownership and responsibility for their maintenance; measurement and data collection from all final and intermediate water users. Metres must be made a prerequisite for the provision of any state support for agriculture.

2. Improving water use efficiency in industry by 25% (saves 1.5-2 billion m^3 in 2030):

1) reduction of water consumption in existing enterprises through: introduction technologies of energy efficiency and water saving in the energy, mining and metallurgical industries (will reduce consumption by 20%), wastewater reuse and water recycling (expected to rise by 4% in the next 17 years);

2) raising the standards of the fence and water purification industries .

3. Improving water use efficiency in public services by 10% (will save up to 0.1 billion m^3): removal of leaks in homes and public networks, control of water pressure in the distribution networks, improving water conservation

standards for appliances and plumbing.

4. Increase the availability and reliability of water resources (4.5-5 billion m^3).

The most acute problem of the division of trans boundary rivers, so Kazakhstan should reach an agreement on all water bodies as a result of negotiations and signing / update agreements with neighboring countries (Concept of Kazakhstan's transition, 2013, №577).

Next set of measures are be implemented in any case in order to ensure national security and close future deficits:

- construction of reservoirs and tanks to contain water runoff during floods and compensation of variability during the year;
- study of the sustainable use of groundwater (exploration, mapping and development) ;
- repair and rebuilding of main irrigation canals , major infrastructure;
- construction of wastewater treatment plants and cleaning plant for salt and brackish water;
- integrated approach to basin restoration systems, including planting of forest restoration deltas, removal of sludge .

There is also a potential transfer of significant amounts of water in the densely populated and industrial areas. Uneven distribution of water resources on the territory of Kazakhstan creates a local surplus of water resources (eg, Irtysh, Kigach, in Ural-Caspian basin), construction of culverts and channels can provide scarce territory. According to estimates of the Committee on Water Resources, additional potential of inaccessible water ranges from 10 to 14 billion m^3 (World Water Assessment Program, 2003, p. 576).

In addition, the policy will require improving the management of water resources:

1) Improving the management of water resources at the national and basin levels to ensure effective interaction with water users in all sectors and at all levels;

2) Determination of limits on water tariffs that reflect the full cost of water, revision of subsidies and incentives to encourage water conservation .

Prerequisites for the development of cross-border cooperation should be stabilization of regional systems of international relations and increasing importance of long-term strategic interests in relation to short-term. Compromise, that is necessary to find by developing water management mechanism of transboundary rivers, is the basis for the further integration of interests. But, as before, is essential to have accurate knowledge about the current and future water resources, search for their effective and efficient use, technical assistance in the rehabilitation works and upgrading production facilities.

4. Conclusion

Kazakhstan, geographically located in the heart of Asia, is one of the water-scarce countries, due to the fact that demand for water will only increase, it is needed to actually see the future. Water resources management should be carried out in two directions: first, establishing and maintaining stable relations over water resources with neighboring countries, and secondly, develop its water policy based on rational use and protection of inland water resources.

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