

THE ISSUES OF WATER RESOURCES USE IN TRANSBOUNDARY RIVERS OF THE REPUBLIC OF KAZAKHSTAN, THE PEOPLE'S REPUBLIC OF CHINA AND THE RUSSIAN FEDERATION

1. Water resources of Kazakhstan: brief overview

Kazakhstan is located in the centre of the Eurasian continent with population of 17million people. It is the largest landlocked country with an area of 2.7 mln. km² and the ninth largest country in the world.

The total annual river water discharge of all basins in Kazakhstan makes 100.5 km³, of which – 56.5 km³ originates in the country itself, with the rest 44.0 km³ coming from the neighboring countries. The specific water supply makes 5900m³ per person /year. For comparison, in Europe this figure is estimated at 4200 m³/year, in Uzbekistan 1700m³/year.

Kazakhstan has eight large river basins, seven of which are transboundary (Fig. 1). Thus, water resources in terms of quantity and quality, largely depends on the water use regime in the neighboring (upstream) countries. The growing water deficiency is typical for all river basins of Kazakhstan which closely linked with climatic, economic and demographic trends. Over the last 25 years, the annual runoff decreased by 14.5 km³, of which 10.0 km³ falls to the neighboring countries.

The irrigated agriculture was the country's main water consumer 20-25km³ (until 1992) along with environmental costs - 30-35km³. During the period of 1992-2004, the irrigated areas in Kazakhstan reduced from 2.2 to 1.0 mln. hectares due to the outdated irrigation systems built in 1960-70s of the last century. The irrigation systems are characterized by low efficiency (50-55%) of agricultural water use. This leads to the lowering of water productivity: 2.0-2.5 m³ of irrigation water per 1 kg output. Whereas, in countries with highly developed irrigation infrastructure, it makes 0.2-0.6 m³ of water per 1 kg output.

Primary constraints include: weak legal framework for water resources management, imperfect water management practices (in 1992, the Ministry of Water Economy was abolished). During the period of transition economy and privatization processes in Kazakhstan, numerous small farmer associations were established, which were unable to maintain irrigation systems in due the necessary technical requirements and with consideration of water-saving techniques at a high technological level of irrigated agriculture management.

It should be noted that in 2012-2013, considerable improvements were made. The Ministry of Environment and Water Resources was established; Laws on 'Land Reclamation' and 'Dam Safety' have been prepared and currently are being under consideration; the Republic's Water Code has undergone considerable amendments; Kazakhstan is the party to the Ramsar Convention with more than 10 delta and lake systems.

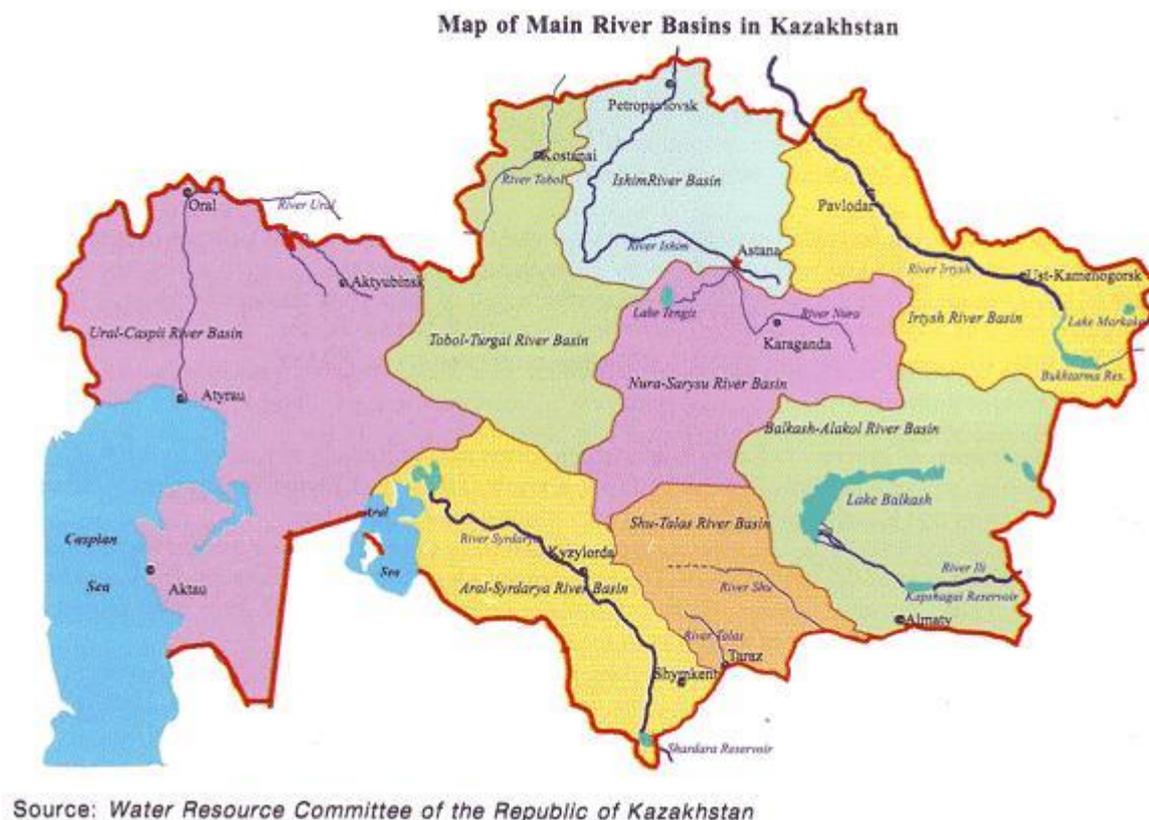
A comprehensive Program on the use and protection of water resources and an Irrigated Agriculture Development Program have been prepared. The latter envisage restoring the

irrigated land areas up to 2.0 mln. hectares, improving water use efficiency at 80% and increase its productivity two times.

It is also envisaged to provide the guaranteed environmental flows in the volume of 34.1km³/year, and up to 24.5 km³/year is intended for irrigation, industry and domestic purposes in the Kazakhstani part of transboundary river basins taking into account the projected increase in water use by upstream countries up to 2030.

Projects on integrated water resources management applicable to the country's all river basins have been developed (with some being under finalization).

Fig.1 Main river basins in Kazakhstan



2. Water allocation issues between Kazakhstan, China and Russia on Ili and Irtysh river basins

Kazakhstan shares 24 transboundary rivers with China and 6 rivers with Russia (Irtysh, Ishim, Tobol, Ural, 'Bolshoy' and 'Malyi' Uzen').

According to the projections of Kazakhstani experts (from the Scientific-Research institute of Water Economy, Kazgyprovodkhoz, Committee on Water Resources) performed in 2005-2010, issues of water supply and ecological balance support in the Irtysh and Ili river basins should be considered in compliance with the additional growth of water intake from these rivers by the People's Republic of China.

The growing tendency of water intake by China from both river basins is observed due to rapid population growth (especially upon adoption of the decision by the Government of China on the development of its northern territories), population migration from Central regions to

Xinjiang Uyghur Autonomous Region (XUAR), along with industry, oilfields and irrigation development.

The situation with current water consumption cannot be improved in China without utilizing resources of Irtysh or Ili rivers since the country has virtually no other sources of water.

At present, the irrigated area of XUAR makes 6.5 mln. hectares, including in the Ili and Irtysh river basins 4.2 mln. hectares and this tends to further increase.

The China's Government aims at accelerating the development of the Western China, where the construction of two channels was completed three years ago. Water has already been transferred via these channels from the upper reaches of the Irtysh River (Black Irtysh in China) to the plants of Karamay oil basin and for irrigated agriculture. If China continues large scaled utilization of Irtysh and Ili waters flowing on its territory, the annual runoff in both rivers basin is expected to reduce by 22%.

2.1 Irtysh/Ertis River Basin

The Irtysh River originates in China, runs through the border with Kazakhstan and Russia and flows into the Ob' River.

Currently, the area of irrigated lands in the Irtysh River basin in China makes about 570 thousand hectares and tends to further increase. The total water intake from the Irtysh River on Chinese territory taking into account the Irtysh-Karamay-Urumqi channel may increase from 3.2 km³ to 7.0 km³/year. Thus, almost the entire runoff of Black Irtysh River which equals to 7.8 km³/year will be used on Chinese territory.

The increased water withdrawal from the Black Irtysh River in China with more than 3 km³ causes new realities of water supply in the Irtysh river basin for Kazakhstan and Russia. If necessary measures are not taken, we will come across with the following possible consequences due to lowering runoff in the Black Irtysh:

- fall of Zaysan Lake level; division between Bukhtarma reservoir and the lake Zaysan with reduced regulatory capacity;
- deterioration in fisheries, environmental conditions in the basin and flooding flood plain;
- significant reduction in electricity generation at Irtysh cascade HPP;
- deterioration in navigation on the Irtysh river on the territories of Kazakhstan and Russia (Omsk oblast').

The following calculations were made for developing appropriate measures to tackle the problems:

The total annual water discharge of Irtysh River amounts 33.5 km³/year – with 7.8 km³ flowing from China to Kazakhstan and the rest 25.7 km³ originating in Kazakhstan. Currently, China utilizes 3.2 km³/year out of this volume.

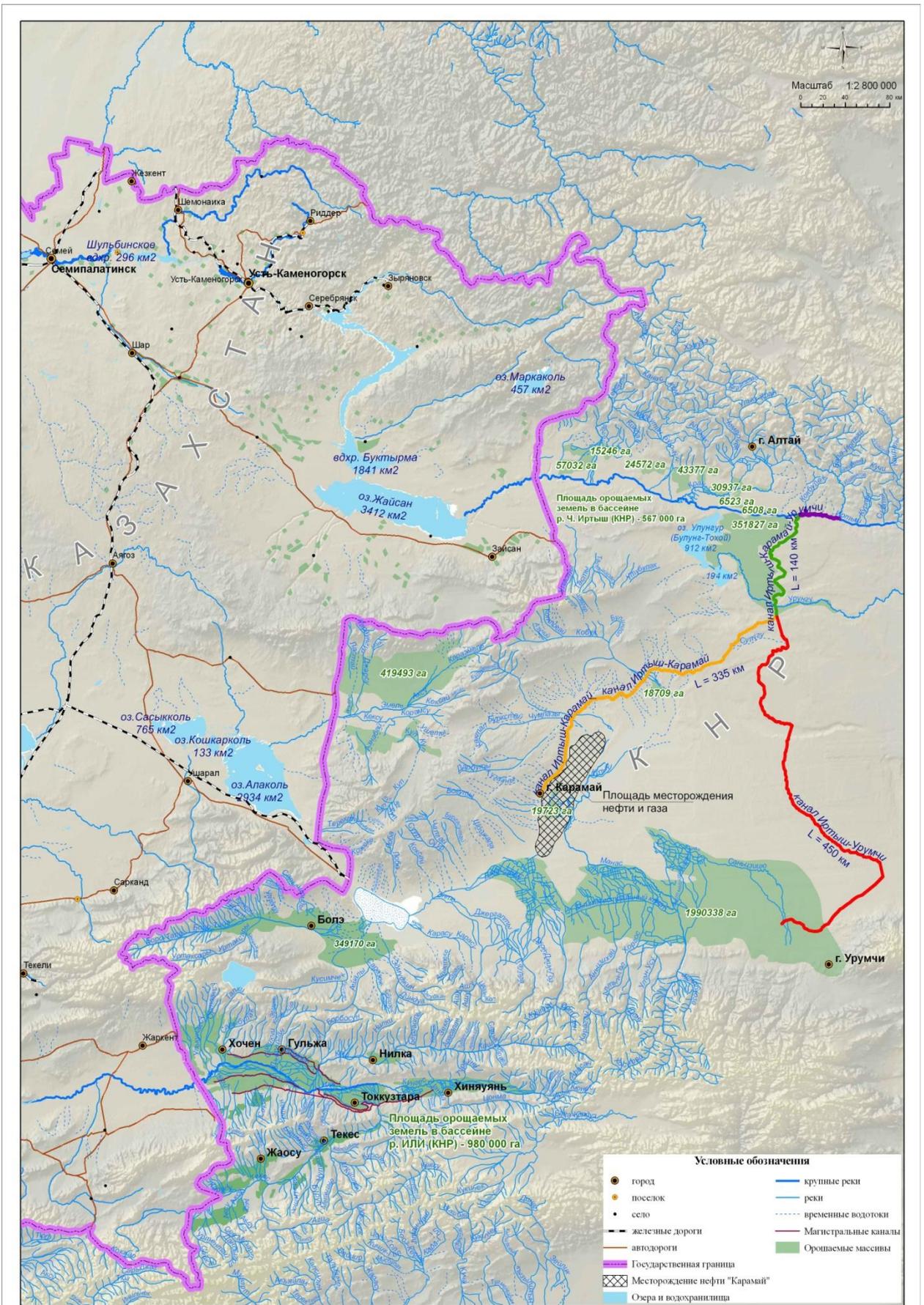
Under the agreement between Kazakhstan and Russia, Kazakhstan releases on a mandatory basis - 8.8 km³/year of Irtysh river runoff. According to our prognosis: if by 2030, China withdraws almost the entire runoff of Black Irtysh River (7.0-7.8 km³/ year), Kazakhstan will

freely dispose the Irtysh River in the volume of: $33,5 - 7.8 - 8.8 = 16.9 \text{ km}^3$. In other words, given the possible extensive water intake by China, there will be enough water for Kazakhstan to cover its own needs.

Measures taken by Kazakhstan and Russia to cover water resources deficit in the Irtysh river basin include:

1. At present, the Irtysh river basin has available water resources, which composed of natural runoff of Ulba and Uba rivers. The average annual value is estimated at $5.6 \text{ km}^3/\text{year}$. It is envisaged to build the II phase of Shulbinsky reservoir for full runoff regulation of these two rivers and to cover water deficit in the region. Besides, it will help to compensate electricity lost on Bukhtarma HPP.
2. Moreover, it is envisaged to use the Irtysh waters to cover the needs of water-deficient basins of central Kazakhstan and Astana city (the capital of RK). Starting from 2015 (phase I), part of the Irtysh waters will be transferred at a volume of $1.0 \text{ km}^3/\text{year}$ with gradual increase, and by 2030 water supply to reach – $2.5 \text{ km}^3/\text{year}$ in the Nura and Yesil river basins.
3. It is envisaged to reconstruct irrigation systems of Irtysh floodplain in Pavlodar region in order to reduce the water cost during spring floods.
4. It is envisaged to reduce runoff losses through introduction of water-saving technologies, thorough cleaning and reuse of industrial wastewater, reducing inefficient irrigation of farmlands, reconstruction of irrigation systems in the Zaysan lake basin, etc.
5. Given the future realities, the irrigation development Program for the Irtysh river basin has been developed (under consideration by the Government of Kazakhstan).
6. Construction of Krasnogorsk barrage on the Irtysh River (Omsk, Russian Federation) in order to support the necessary river water levels (currently under implementation).
7. Transferring the part of the Russian Federation's Ob and Katun' rivers runoff into the Irtysh river on Kazakh territory (beyond 2040, the project is under completion).

Fig. 2 Map of the Irtysh River Basin



2.2 Ili River Basin

The Ili River (known as 'Ile' river in Kazakhstan) has its source in the central Tien Shan, at the confluence of the Kunes and Tekes rivers. The basin of the 1.439-km long, is shared by Kazakhstan and China, of which 815 km (56.6%) forms on Kazakh territory, where it is considered as one of the largest rivers. The river ends its route flowing into the Lake Balkhash, providing a strong desalination effect.

The total annual river water discharge of Balkhash-Alakol river basin, including the Ili River makes 27.8 km³/year, of which 11.4 km³/year flows from China. By present, China utilizes 3.0 km³/year out of this runoff volume. Given the development of irrigated agriculture, this figure is expected to grow up to 5.0 - 7.0 km³/year by 2030.

Thus, Kazakhstan will remain with: 27.8 - 5.0 (7.0) = 22.8 (20.8) km³/year. To maintain the Ili river delta systems and conserve the Lake Balkhash, approx. 14.6-14.8 km³ of water/year is required. While, for industry and irrigation needs, the following volume of water will be left: 22.8 (20.8) - 14.8 = 8.0 (6.0) km³, which is quite enough to irrigate lands 400.0 thous. hectares, including the industry needs for Almaty and Taldykurgan oblasts (with introduction of water-saving technologies and using an optimum crop composition).

The main consumer of Ili river runoff is the Lake Balkhash (the Aral Sea tragedy cannot be tolerated) and natural depositional systems of Ili's lower reaches. In this regard, it was proposed to develop a special law of the Republic of Kazakhstan "On Balkhash".

3. Legal framework for cooperation between Kazakhstan, Russia and China on use and protection of transboundary rivers

3.1 Kazakhstan – China

In recent years, between Kazakhstan and China, as well as Kazakhstan and Russia a solid legal framework for relations concerning the use and protection of transboundary watercourses has been established. It should be noted that all parties adhere to certain agreements and protocols agreements. The most important agreements are listed below:

Agreement between the Government of the Republic of Kazakhstan and the Government of the People's Republic of China Concerning Cooperation in Use and Protection of Transboundary Rivers was signed 12.09.2001.

The parties under the Agreement recognize the need "... to follow the generally accepted principles and norms of international law, in the spirit of mutual understanding, mutual concessions and friendly consultations."

In particular, Article 2 of the Agreement declares the need: "...to adhere to the principles of fairness and rationality, as well as work closely in the spirit of honesty, good neighborliness and friendship".

Article 3 declares the need "...to take appropriate measures and efforts to prevent or mitigate possible serious damages as a result of ... disasters, accidents ..." etc.

The Article 4 envisage the opportunity "... to use and protect effectively water resources of transboundary rivers taking into account the mutual interests". The collaboration is

acknowledged for establishing unified methods of monitoring, measurement, analysis and evaluation of water quantity and quality; as well as exploring future changes in water content and water quality of transboundary rivers.

To implement this and other agreements, a **Kazakh-Chinese Joint Commission was established on use and protection of transboundary rivers** (31.10.2003).

Agreement between the Ministry of Agriculture of Kazakhstan and the Ministry of Water Resources of China on the development of research cooperation, as well as an Agreement between the Ministry of Agriculture of the Republic of Kazakhstan and Ministry of Water Resources of People's Republic China on emergency notification of the Parties of natural disasters on transboundary rivers was signed in 2006 and 2005 accordingly.

To address modern common problems and challenges, the countries signed new bilateral agreements with consideration of the necessary environmental requirements.

1. *Agreement between the Government of Kazakhstan and the Government of China on the protection of water quality in transboundary rivers* (signed 22.02.2011).
2. *Agreement between the Government of Kazakhstan and the Government of China in the field of environmental protection* (signed 13.06.2011).

In compliance with the latter Agreement, a **Kazakh-Chinese Commission on cooperation in the field of environmental protection** was established. To address the environmental issues, 5 joint intergovernmental programs were approved:

- The research program for the impact of climate change on water resources.
- The research program for glaciers resources changes and implications on water resources.
- The work program for analyzing the ecological status of the Ili River deltas and the Lake Balkhash.
- The work program for the impact of human activities on ecosystems of Ili and Irtysh/Ertis river basins.
- The work program for water-saving technologies in irrigated agriculture.

These programs are executed by joint working group specialists of Kazakhstan and China in accordance with the approved plans and procedures.

The "Joint Declaration on further development of comprehensive strategic partnership, including on transboundary water issues between RK and China", signed by the Heads of both states on 7 September 2013 gave a new impetus to cooperation.

Thus, a strong bilateral cooperation and partnership between the two states in the field of joint use and protection of shared water resources is carried out on 24 transboundary rivers (incl., 6 in the Irtysh river basin, 7 in the Ili river basin, and 3 in the Emel river basin, etc) have been established.

It should be noted that in accordance with these agreements a number of hydro schemes and gauging stations have already been built (some being under construction) on transboundary

rivers, where water allocation works on an equal footing 50/50%, regardless of the population number in coastal zones – i.e. in compliance with hydrographic principle of water allocation.

There is a constant exchange of hydrological data between the states; unified measurement standards are being developed. In other words, a transparent database for shared river basins has already been established. Another evidence of joint actions - is the coordinated management of hydro schemes, reconstruction of some old facilities, construction of mud dams, etc. Much attention is paid to the assessment of water resources in the Kazakh-Chinese transboundary river basins - Irtysh, Ili and Emel.

It should be noted that China has been introducing rapidly drip irrigation techniques instead of the outdated ones. The irrigated areas in Xinjiang region have already reached 2.0 million hectares with a total efficiency coefficient of irrigation systems 92%!

3.2 Kazakhstan-Russia

Since 1992, numerous treaties and agreements were signed and implemented in the framework of transboundary water cooperation between Russia and Kazakhstan. The *Agreement between the Government of the Russian Federation and Government of the Republic of Kazakhstan on joint use and protection of transboundary waters* signed September 7, 2010 is in the heart of such agreements.

The Kazakhstan-Russian Commission on joint use and protection of transboundary waters is also functioning under the guidance of two co-chairs on a permanent basis.

For instance, to address the problem with shallowing of the Irtysh River, the Krasnogorsk hydroscheme near the Omsk city of Russia is currently being under implementation for lifting water from the Irtysh river bed at 4 meters, which will enable navigation during the dry-years period. In addition, regular database exchange on hydrological and ecological regimes on the Irtysh River has been established between the countries.

Concluding remarks

1. The neighboring states recognizing the need in a mutually acceptable mechanism on use, management and protection of shared transboundary waters taking into account the interests of all states, have already established a set of cooperation and negotiation system based on mutual understanding and political goodwill in the spirit of friendship and good neighborliness.
2. Measures taken by the riparian countries in the Ili and Irtysh river basins run ahead of new problems and challenges, the nature of which has already been predicted, predetermined and examined to a long-term period (2030 - 2040).