WATER AS A SOURCE OF FUTURE DEVELOPMENT OF KAZAKHSTAN

I'EAU COMME SOURCE DE DEVELOPPEMENT FUTUR DU KAZAKHSTAN

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Abstract

The issue of water availability in the river basins of Central and Northern Kazakhstan is considered. The necessity to re-distribute river flow from river basins with sufficient water supply to river basins with low water availability is justified. Reduction of river flow takes place due to economic growth, increase of population, global climate change. The issues of cooperation of Kazakhstan with Russia and China in joint use of Transboundary Rivers are treated.

Constatations et conclusions

Pйnurie des ressources en eau dans le centre et nord du Kazakhstan est actuellement le principal facteur limitant pour le dйveloppement de presque tous les secteurs de l'йconomie et la sphиre sociale. Cette rйgion du Kazakhstan est riche en ressources minйrales, donnant d'йnormes opportunitйs de croissance a grande йchelle du potentiel йconomique du pays. Toutefois, bon nombre de ses ressources ne sont pas utilisйes en raison de la raretй des ressources en eau, l'йconomie ne rezoit pas le bon dйveloppement, les faibles rendements se dйgradent les йcosystиmes aquatiques naturels. Pour relever avec succиs ces questions, il est nйcessaire non seulement l'utilisation rationnelle et йconomique des ressources des eaux intйrieures, mais aussi la poursuite du dйveloppement de la coopйration bilatйrale de l'eau entre le Kazakhstan et la Russie et le dйbut des constituants de relations hydriques entre la Russie, le Kazakhstan et la Chine.

More attention is recently paid by the political leadership of Kazakhstan, scientific organizations, design institutions as well as society to such comprehensive and indispensible natural resource as freshwater. The possibilities of potential development of economy, social sphere, and environment of a particular region and the country as whole will be assessed according to the evaluation of freshwater availability in the coming years.

In many countries, water deficit and deterioration of water quality have led to serious challenges related to drop in the living standards, and negative economic development prospects. More than billion people do not have an access to drinking water of acceptable quality, and 2.5 billion people do not have an access to sewerage systems. This is the reason why the United Nations declared the period 2005-2015 as the International Decade for Action “Water for Life”. This UN directive suggests that during this period every country should implement national action plans for integrated water resources management and water supply, which should be considered as an important component of sustainable development of national security of the state.

Irrigation is one of the major consumers of freshwater. Irrigation makes a huge contribution to the world food security. For example, 1.0 ths m^3 of water is required for the production of daily human ration of 2800 calories. It is not coincidence that irrigation accounts for 70% of the world water withdrawal from water sources. Water use for industrial needs increases at a fast rate. According to recent investigations by specialists, the global climate change will expand the water shortage by 20% leading to deterioration of living conditions of 2 to 5 billion people in more than 45 countries.

Legal regulation of the issues of joint use of Transboundary Rivers and watersheds that do not coincide with the existing administrative boundaries is essential for sustainable water use. At present, the number of international river basins is 261, and 145 countries use water resources from these river basins. Many regions and countries in river downstream parts depend on upstream water users. Equitable and sustainable management of shared water resources requires the presence of institutions that would provide holistic approach to addressing this problem and find effective methods for its solution. Experience shows that conflicts tend to give way to cooperation at joint use of transboundary river basins.

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Because of its geographical position, Kazakhstan is largely dependent on water supply related to the water inflow from the neighboring countries, i.e. China, Uzbekistan, Kyrgyzstan and Russia. About 44% of the surface runoff in Kazakhstan is formed in the territories of the abovementioned countries. Cooperation with the neighboring countries in the region is carried out both on a multilateral (Syr Darya river), and bilateral (Irtysh, Ili, Zhaik, Tobol, Esil, Shu, Talas rivers) basis.

It is the exacerbation of the issues of water availability in regions of the country that has led to adoption of the Governmental Water Management Program of Kazakhstan. Capital investments in the water sector of the national economy have significantly grown. However, shortage of water resources continues to expand. The whole territory of Kazakhstan is conditionally divided into eight river basins. This gives an idea of the status and dynamics of water resources in a particular river system, both in quantitative and qualitative terms. For example, the Zhaik-Caspian basin covers an area of three provinces: Mangistau, Atyrau and West Kazakhstan.

At first sight, there are no evident problems associated particularly with water deficit in Kazakhstan, but its implied shortage has an impact on the economic outlooks of some regions. For instance, it is impossible to develop cattle-breeding efficiently if good fodder base is absent, viz. there are no irrigated lands.

According to the accepted international classification, regions with water availability of 1.7 ths m^3 a year per one capita are ranked as the regions suffering water shortage. Everything seems fine, 6.2 ths m^3 of water per one capita, if you divide the total annual surface flow by the number of the people living in the country. In the context of separate river basins, water availability below the national average index is in the Nura-Sarysy basin (Karagandy and Akmoly provinces) – 11 ths m^3; Esil – 1.4 ths m^3 (Astana, Akmola, North-Kazakhstan provinces); Tobol-Torgay (Kostanay, Aktobe provinces) – 21 ths m^3; Shu-Talas – 3.9 ths m^3 (Zhambyl province); and Zhaik-Caspian – 4.7 ths m^3 of water. The sole river basin that has unused river flow is the Ertis river basin (East Kazakhstan, Pavlodar provinces), where available water supply is 16.7 ths m^3 per capita.

By analyzing the international experience, Kazakhstan water specialists, hydrologists, and geographers have concluded that it is long past time to redistribute water resources within the country, i.e. redistribute from river basins with good water supply to regions with extremely low water availability. Certainly, solution of these tasks will cover the expenses for the development of river flow redistribution infrastructure, as evidenced by international experience, in particular of Russia, USA, Canada, China, India, and other countries.

The canal named after K. Satpayev has been operating for more than 40 years in Kazakhstan, through which water from the Ertis river, located in the eastern part of the country, is supplied to Central Kazakhstan (Karaganda, Temirtau, Ekibastuz cities and the republic's capital city Astana). The canal length is 458 km; static water height is 418 m pumped by means of 22 pumping stations. Design water supply is 1960 mln m^3 of water per year. In this respect we have vast positive experience of inter-basin water transfer.

Even in the 70s of the past century, a Kazakh scientist, academician Shafik Chokin studied in detail and offered his own versions of water supply to the central and northern regions of the country by using the potential of the Irtysh-Karaganda canal (hereinafter the canal named after Satpayev) along with construction of a separate branch to feed the Esil river with water.

In his letter, dated October 1996, to the President Nursultan Nazarbayev he wrote: "As you know, acute deficit of water resources is a major obstacle to the development of almost all the sectors of the economy and social sphere of the northern provinces of the Republic. The region is very rich in mineral resources, giving great opportunities for large-scale growth of the economic potential of the Republic. However, water resources are not used on many factors, existing enterprises do not develop properly, and crop production is low".

At the moment, the Governmental Program on Forced Industrial-Innovation Development of Kazakhstan is implemented. It proposes to develop industrial production in Central and Northern Kazakhstan. However, this process will be extremely difficult without sufficient supply of water resources. Today this idea can be realized by construction of the “Astana” canal as the initial stage of raising water availability in Northern and Central Kazakhstan, and in the southern regions of the country at later stages.

The Ertis river basin is the sole river basin in Kazakhstan where certain reserves of water are available. Natural average annual flow of the Ertis river currently comes to 33.7 km^3 of water per year, including 9.8 km^3 of water inflow from China. With intensive development of the economy of western China, the Chinese

party in this river basin may use up to 5.4 km^3 of water per year as early as in the near future, and up to 7.0 km^3 at a later stage.

The river runoff to be divided at the border with Russia currently comes to 23.3 km^3, and after 2050 it will reduce down to 20.9 km^3. If this flow is divided with the Russian Federation on an equal basis, the share of Russia and Kazakhstan will be 11.65 and 10.15 km^3 respectively. The usable flow will reduce from the current 7.5 km^3 (down to 4.5 km^3 of water in 2050 year with the economic development of the Kazakhstan part of the Ertis river basin, increase of water supply to Karaganda–Temirtau industrial area through the canal named after Satpayev and allowing for environmental and transport water releases along the river. Therefore, it is vital now for Kazakhstan to use this water for its own needs, instead of letting it irretrievably inflow to the Arctic Ocean.

As was mentioned above, water shortage is the main deterrent factor of economic growth and improvement of welfare in the Northern and Central economic regions of Kazakhstan. Further increase of total water consumption is conditioned by the following circumstances:

- growth of municipal service and industrial needs from 173 mln m^3 in 2012 to 350 mln m^3 in 2040;
- using new irrigated area in connection with the development of irrigated fodder production with expanding from 3.5 ths ha in 2012 up to 100 ths ha in 2040, which will require additional 450 mln m^3 of water;
- appearance of new water consumers: Orlovskyi and Boshakol Mining and Concentration Complexes in the Kostanay and Akmoly provinces;
- growth of water consumption by the Astana Thermal Power Plant by 100 mln m^3 due to the development and rise of the installed capacity to 720 MW;
- construction of new group water pipelines in the districts with no available water resources, where water supply comes to 25-30 mln m^3;
- growth of water consumption in the volume of more than 200 mln m^3 for creation of food and green belts around Astana.

According to the calculations, unless water in the volume of more than 200 mln m^3 is diverted, water supply in Astana and adjacent territories will reduce to **0.84 ths m^3/year** per capita by 2040, i.e. **twice as low as the critical quantity**. The calculations of water balances for future, up to the level of 2050, taking into account further development of the region have shown that water deficit in amount of 0.86 km^3 will occur by 2020, and will continuously grow.

With additional water supply of up to 1.0 km^3/year, water availability in the region with come to 1482.0 m^3/year per capita, which will allow increasing the guaranteed water supply to municipal service and industry and using unstable, highly variable local runoff for the production of irrigated fodders.

In order to solve this problem, it is proposed to use the available reserves of the Satpayev canal, which is designed for the transportation of water at 2.2 km^3/year; now this watercourse is used only 30%. It will allow using the existing route of the Satpayev canal for supply of another 1.0 km^3/year to Astana and suburban zone, and replenish the reservoirs on the Esil river in dry years. Thus, the earlier implemented and time-tested technical solution to improve water supply to the population of Central Kazakhstan will follow up in view of the changes caused first by the construction and rapid growth of the new capital of Kazakhstan and hence by the development of the Akmola and North Kazakhstan regions.

Inter-basin water transfer from the Ertis river to the Esil river is supposed to be carred out by the “Astana“ canal. Maximum carrying capacity of the canal is 50 m^3/s; the volume of inter-basin water transfer is 1 km^3. Three canal options were considered: «Northern», «Central», and «Southern».

Northern option: water will be supplied by an open canal 279 km long and a 184-km section consisting of a cascade of 5 reservoirs with pumping stations lifting water to the total height of 100 m. The total length of the canal route is 279 km. Construction of five reservoirs with a total capacity of 2.7 km^3 and total flooded area of 416.4 km^2 on the Selety river will necessitate moving residential settlements with the population of five thousand people.

Central option: It is planned to lay a canal 354 km long and with maximum carrying capacity of 50 m^3/s. Two reservoirs with the total capacity of about 1 km^3 are planned to be constructed on the channel route. The dead lift (geodesic height) is 140 m; design head of 8 pumping stations at the main canal comes to 160 m.

Construction of 90 hydraulic structures is planned at the canal. The possibility of further increase of the canal carrying capacity up to 160 m^3/s is provided for with this option. In future, the canal will allow providing gravity water supply to the southern regions of Kazakhstan as well as towards the Western Balkash.

Southern option. According to this option, water will be supplied from the existing Satpayev canal by a closed reinforced concrete conduit of rectangular section with water pumping by one pumping station to the height of 33 m. In the head part, the conduit has maximum carrying capacity 50 m^3/s; further, half of the flow, 25 m^3/s, will be delivered to the existing Astana reservoir. The ending part of the conduit with the a discharge of 25 m^3/s will transport water to the Astana city.

After analysis of the considered routes the Northern option is excluded from further calculations as disadvantageous in connection with significant flooded area, demolition and relocation of settlements, line structures, infrastructure, etc. Thus, to supply up to 1.0 km^3/year of water to the Astana city, adjacent territory and Esil river by using own water resources is possible by two main options: «Southern» and «Central». The final decision should be made after a feasibility study is carried out.

In the long term, after 2050, water shortage in all river basins of Kazakhstan is expected to come to 12-13 km^3 (including 5 km^3 in the Balkhash lake basin and 4 km^3 in the Syrdarya river basin). This deficit can be met only by transferring freshwater to the Ertis river from outside of the Republic of Kazakhstan.

In reality it is possible to carry out from the basins of Siberian rivers in the Russian Federation, viz. Ob and Yenisei. Such water redistribution is beneficial for Kazakhstan and Russia, as water supply to Central and Northern Kazakhstan, Omsk and Kurgan provinces of the Russian Federation, which now suffer from acute water shortage, will rise.

It is necessary to continue further strengthening of the bilateral water relations between Kazakhstan and Russia and start establishing trilateral water relations between Russia, Kazakhstan and China for successful addressing these and other issues of shared use of transboundary river water.

Today, water security is an integral part of the national security; this is why the Government, Presidential Administration and Security Council of the Republic of Kazakhstan pay close attention to water problems. Several expert and working groups have been established within these governmental bodies and work with the aim of comprehensive and careful examining and taking an appropriate decision with regards to this urgent problem.