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## Water and environmental problems of transboundary cooperation in continental Asia

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It is apparent that in the third millennium water becomes one of major resources that hampers potential development of many regions or causes inter-regional and inter-ethnic conflicts.

In this paper, we suggest dwell on three issues of transboundary cooperation in the field of water management

### I. Problems of water supply and water distribution in continental Asia

By and large, Asia refers to the areas of water and environmental risk. Here, water resources are unevenly distributed: water resources are sufficient in the North (Asiatic Russia), whereas in Central and Southeastern Asia they are limited. This results in frequent epidemics and even water-related conflicts sometimes.

Pressing water-ecological situation is typical for almost all Asia countries, but it manifests itself differently in the "upper" and "lower" parts of the basins. Leaving aside the issue of "saving the Aral Sea", a significant deterioration of current water and economic situation has become obvious since the time of the USSR disintegration, the countries of which previously shared common transboundary basins and water infrastructure.

Unsolved problems of water allocation aggravates water shortage in the regions. Most of the water formed in the mountain regions of Tajikistan and Kyrgyzstan is consumed by Kazakhstan, Turkmenistan and Uzbekistan; still, there are no effective mechanisms for regulating the amount and mode of water use. For instance, 75.2% of the Syr Darya water falls on Kyrgyzstan, 2.7% of the Syr Darya and 74% of the Amu Darya on Tajikistan and 15.2 and 8.5%, respectively, on Uzbekistan [1]. Note that the "mountain" countries use less than 10% of total flow to cover their own needs; they seek compensation from partners, especially Uzbekistan with its 37.4% of the irrigated lands and about 45% of population of the post-Soviet Asian countries (PSAC).

Current imbalance in PSAC appears in water sector through growing competition in hydropower production and agriculture. It also creates a situation of "suspended disaster". With poor hydrocarbon resources, Tajikistan and Kyrgyzstan see the solution of the problems in the

construction of large hydroelectric power plants (HPP, i.e. Rogun in Tajikistan, the Kambartat and Verhnenarynsk cascade in Kyrgyzstan). In water use, the so-called "plain" states stick to agricultural priorities. The situation is escalated, and implicit and explicit conflicts arise because of the construction of the unique Rogun dam (its height exceeds 300 m) in Tajikistan, promotion of the idea of building small HPPs and the expansion of irrigation systems in Uzbekistan. [2]

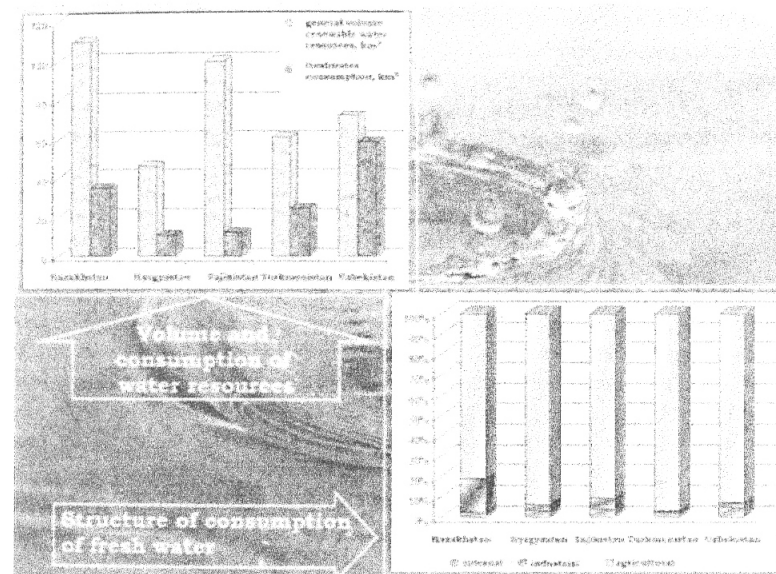


Fig. 1. Volume and consumption of water resources

The positive thing is cooperation of these countries with international organizations, though some "asymmetry" in the presence of representatives from Tajikistan and Kyrgyzstan at a conference in Tashkent, and on the contrary - the ones from PSAC in Dushanbe and Bishkek does exist. All this makes a productive discussion of water management, water-ecological and energy problems hardly feasible. Each country has its own arguments, but, in our opinion, the only way out is institutional one, namely through the development and strict observance of international agreements regulating water use and water resources allocation in the transboundary basin of the Aral Sea [3].

## II. China's role in current water-ecological balance of Asia

At present, China acts both as a "hydrodonor" and as a "hydropump" of the region where rivers Brahmaputra (Matsang-Tsangpo in Tibet), Indus (Sindhu is called in Tibet), Mekong (Lancang-Dzachu in China), Hongha - "Red River" (Lishehe-Yuantszyan in the PRC), etc. originate. The growing economy of China requires more resources, including water ones.

The development of neighboring countries largely depends on the economic and geopolitical behavior of China that shows interest in river energy development in the Aral Sea basin. China is ready to back the construction of both large and small diversion HPPs, which being environmentally and seismically friendly would contribute to local development of Tajikistan and Kyrgyzstan. Options for financing the construction of HPPs on rivers outflowing from the Kyrgyz Tien Shan Mountains and then flowing in China are also discussed [4,5].

Interests of Kazakhstan and China meet in the context of "Aral" problem, i.e. when the hydroelectric plants of "mountain" states supported by China infringe upon the interests of partners from the "plain" countries. In addition, Kazakhstan is a "secondary" user of water resources of 23 transboundary rivers outflowing from China. Nowadays, the most tense situation is observed in the Irtysh basin. In 1999-2005, Xinjiang province withdrew 1.12 km<sup>3</sup> from Kara-Irtysh or 11.4% of upstream flow of R. Irtysh, in 2010-2011 it was about 3.0 km<sup>3</sup> (over 30%), and in the near future it will reach about 4 km<sup>3</sup> or 40% of total water flow [6]. At present, there is moderate water shortage in R.Kara-Irtysh but soon it may become critical making a negative effect on the downstream territories of Kazakhstan and Russia.

In Kazakhstan and China, the problem of legal status and environmental safety of transboundary rivers remains unsolved; there are no mechanisms for controlling water intake in China. Moreover, China refuses to sign the UN treaty "On the Water" ratified by Russia and Kazakhstan in 1993. In 2001, the Agreement between and by the governments of Kazakhstan and China on "Cooperation on transboundary rivers conservation" was signed (12.09.2001, Astana). To do that, a joint commission on the conservancy of transboundary water resources was established, and some agreements between Kazakhstan and China were reached [7,8]. Being a good performer, China is very cautious in taking any commitments. Kazakhstan actively participates in various international debates, but mostly as a "third party", not vested to make decisions. Often, Kazakhstan fulfills its commitments inadequately.

Water interests of Russia and China meet in the basins of rivers Irtysh and Amur, where the issues of water allocation and water quality are topical.

## III. Water management problems (actual and potential) in the transboundary Irtysh basin, a site of our direct interests

The Irtysh basin covers the territory of four states. Unfortunately, Russia receives the Irtysh water after China and Kazakhstan and does not participate in coordination of water-related issues. China opposes the Russia's participation in R.Irtysh negotiations.

To solve the problems of transboundary cooperation, the Russian-Kazakhstan commission for joint use and protection of transboundary waters (including working groups for the basins of rivers Ishim, Irtysh, Tobol, Ural, Bolshoy and Maly Uzeni) were established [10].

We believe that in this situation, one should proceed from reality: China will not take less water than now, most likely its water intake will be increased. Kazakhstan also cannot reduce the amount of river flow not having extra sources of surface fresh water. Therefore, the situation with transboundary rivers flowing through China and Kazakhstan (and running through the Russian territory), will remain complicated despite the agreements reached [9,10].

The involved countries make the proposals how to solve these problems. For instance, Kazakhstan considers the following projects:

1. water replenishment of R.Irtysh;
2. dilution of industrial effluents.

The first project implies the diversion of runoff of R.Tikhaya flowing through Kazakhstan and Russia and entering R. Katun. This project, discussed for more than 20 years already, is very ambitious and intricate. It is planned to construct the hydraulic pressure tunnel of 4.5 km long and of 3 m wide from the Katun basin (Altai Republic of the Russian Federation) to the Bukhtarma basin (East Kazakhstan). Water transfer of 2 km<sup>3</sup> /yr is projected. In place of water level drop (605 m), the Belokatunskaya HPP and a reservoir with the capacity of 1.25 bln km<sup>3</sup> is built. [11]

The second project deals with turning rivers Ak-Kaba and Kara-Kaba outflowing from the ridges of Katonkaragay region in Kazakhstan then running through the Chinese territory and falling into the Black Irtysh. It is proposed to turn rivers at the boundary and to direct their flow to the Black Irtysh in Kazakhstan by means of a 20-km tunnel. Thus, "the problem of water scarcity" will be solved but for a while.

To solve its own water-related problems, the Russian side suggests some water projects for consideration. The first is aimed at the construction (nearby Omsk city) of a channel type dam and the reservoir to store water and then uniformly feed R.Irtysh. Alternatively, the creation of a series of underwater man-made rapids to provide rise in water level by reducing the river speed was proposed [12]. Currently, the project on the construction of the Krasnogorsk hydroelectric complex at a 1813 km from the Irtysh mouth and 1 km upstream the oil refinery is being realized. According to the project, the reservoir will ensure the maintenance of the water level of R.Irtysh near Omsk city, especially in low-water years. Spillway dam will allow to maintain the reservoir level at any point of reference. The influence zone of a low-head dam should extend up to 60-65 kilometers upstream R.Irtysh, 23 km – R.Om'. The maximal level rise will be marked near the dam (3 m), while the minimal (1 m) in the opposite side of the reservoir. In the vicinity of city Omsk, water level in R. Irtysh is expected to be 1.5 - 1.8 m higher as compared to the current, extremely low one [13]. Probably, the realization of this project would solve water problems in Omsk, but hardly preserve the river ecosystem and provide sustainable water supply in the basin, since the demand for water in Kazakhstan [14] and China [15] increases and effective institutions of regulation are absent.

Finally, it may be said that

1. The territory of continental Asia is characterized by a great natural diversity; it is differentiated by territorial distribution, quality and demand for water resources. Lowland areas with high population density and economic potential face acute shortage of water resources, especially drinking water.

2. Transboundary rivers are the key areas of international cooperation where manifestation of problems is most prominent. The international community, particularly in Europe, North America, etc. has gained a positive experience in dealing with such problems. In Asian countries, the institutional forms of cross-border cooperation have not developed yet. Still, China, Tajikistan, Kyrgyzstan and some other countries have not signed neither the Helsinki Agreement of 1992 and 1996, nor other water-related legal acts.

3. Implementation of the methodology for strategic water management focused on the rational use of water and preservation of aquatic ecosystems for future generations can serve the basis for the integrated management of water complexes in transboundary basins of contiguous countries.

4. Operational management of water facilities should be carried out in accordance with Common Schemes for Conservation of Transboundary

Water Objects, the coordination of annual water management plans for all major hydraulic structures and daily schedules of water discharge.

5. Water resources conservation is an essential factor for sustainable development of almost all Asian countries that must be considered when working out the strategies for their development, including international cooperation.

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## The Role of Institutional Factors in Facilitating Trans-boundary Cooperation: Methodology Notes

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Recent years have changed geopolitical priorities of the Russian Federation in favor of substantial strengthening of its eastern vector. This process is logically determined by the growing economic potential of Asia Pacific, and also by the ambitions and capacities of other Asian countries. These changes in the geopolitical priorities have already resulted in the increased scale of interaction of Russia with its neighbors in Asia, and most probably this trend will continue in the near future. According to the Russian laws, an interregional collaboration should become a significant component of such an interaction. In this context, it is worth to mention that in many cases a fundamental background, still underestimated, exists for the expanding cooperation between many border territories since they belong to the internally and naturally integrated trans-boundary complexes.

The factor of trans-boundary nature of some geographic and socio-economic systems which is determined by the integrity of their natural structures and/or the unity of their socio-economic and cultural development is getting a new and important dimension in the current epoch of globalization. This factor can substantially impact the existence and future development of such specific spaces which are divided by the state borders. The phenomenon of the trans-boundary character provides natural and socio-economic objects with some new qualities. On one hand, the trans-boundary character of the natural objects may be interpreted as a background for the development of mechanisms of international and interregional cooperation. On another hand, it provokes new challenges anthropogenic on their nature.

One of the major results of the trans-boundary cooperation is represented by the fact of the existence of the trans-boundary regions. We believe that as compared with the border territories which can be interpreted as phenomena determined by the state border, and trans-boundary territories which exist in the framework of the integrated geo- and ecosystems, trans-

boundary regions wherever they exist are the outputs of the political will and political design. The key factor when trans-boundary regions are shaped is a joint participation of the international actors in setting up the development strategies of the adjacent territories and a mutual aspiration to cooperate. Although trans-boundary regions are in a way, artificial phenomena which are developed in accordance with the schemes designed by the trans-boundary communities, step by step they receive real economic content and are functioning on the basis of specific institutional mechanisms.

In the meantime it should not be neglected that such kind of mechanisms requires some peculiar conditions to mature and cannot be created anywhere. Thus, from the theoretical point of view profound analysis of this complicated mixture of natural and civilizational trans-boundary factors can only be done by the means of an interdisciplinary research as the basic precondition for setting up the appropriate institutional structures.

The second aspect which is at least equally important is a study of the existing institutional framework for the trans-boundary cooperation. After classical approach of Thorstein Veblen, the institutional framework is understood here as forms of organization and means of development of the trans-boundary interactions. It incorporates the combination of laws, rules, codes of behavior, types of socio-economic relations and links. In other words, these are ways of social life in connection with the material surrounding of the existing society. In this sense the social institutes can be divided into formal, including instruments, means, regulating methods in some specific spheres of social life, such as laws, rules and regulations, and informal which are also impacting and structuring the actions provided by the formal social institutes. Respectively, the process of the institutionalization can be interpreted as a creation of mechanisms, systems and ways which provides for regulating certain spheres of the social life. This process should always be considered from the historical retrospectives since it has some specific phases in its development.

Although these are the formal institutes, primarily the legislation and the administrative system of institutions represented by the existing governing bodies which are mostly in the focus of those analysts who study international cooperation in the trans-boundary regions, the informal institutes should not be neglected as they deeply impact the formal ones. In some cases this is a merging of business structures and the public administration that makes formal institutes operate in a negative sense. The typical example of that is a development of forestry in Siberia and on the Far East. The wealth of forests on the East of Russia and proximity to the

Chinese border with its higher demanding economics requiring timber in the constantly growing quantities in the situation of mismanagement of this industry in the Russian Federation led to the depletion of the natural capital of the forests' ecosystems. There are a lot of publications illustrating the decisive role of the social institutions for the "resource curse" in Russia that is specifically addressed to oil and gas. On this reason we would support those experts who underline that the existing institutes in Russia are rather barriers and obstacles than stimuli for the regional development. This thesis can easily be illustrated with numerous and vivid examples from the recent economic performance of the East of Russia. In the context of these processes specific attention should be addressed to the environmental consequences of the interaction of factors of the first (the amount of natural deposits and the geographical location) and the second (social institutions) nature (after P. Krugman) in the eastern trans-boundary territories.

For further analysis the classification scheme of the World Bank can be suggested as a good methodology instrument. It is based on outlining three dimensions of the regional development which are characterized by the factors of the market accessibility, such as a density, a distance and a disunity. In the framework of such an approach the equalization of territories against basic indicators of the living standards, or their economic pulling up to the levels of the leading regions is presented as the process of the regional integration. Such factors and trends as agglomeration, migration, regional specialization and trade are interpreted as the key drivers of changes in the regions, both positive and negative. The authors of this concept have designed so called "empirical rule of the economic integration" which is based on the proper selection of instruments the governments and authorities have at their disposal and may use in a view of the three dimensions of the regional development.

At first it incorporates the formation of the social institutes which are neutral in terms of their territorial dimension. These are laws and regulations connected with the land, labor force, international trade, as well as such institutes which are dealing with education, health, water supply and sewerage systems, etc. which are to be funded from the state budgets. Secondly, these are such measures which may connect and integrate the territories. These are predominantly the infrastructural measures such as the construction of roads and airports, communication systems, etc. which provide for the movement of people, goods and ideas and make it easier and faster at all levels. Thirdly, these are measures which stimulate the development of specific territories, such as regional programs focused on

poverty prevention, tax privileges and other preferences for concrete territories.

Without making conclusions on sufficiency of these measures it is worth to note that their appropriateness is well supported by a broad spectrum of examples. It is pointed out by the World Bank experts that the final success is conditioned by the utilization of all three kinds of means of regional growth since each of these instruments is designed to solve specific tasks at its own level. Most of the strategic development programs for the eastern regions of Russia contain predominantly the measures which stimulate the development of specific territories and thus belong to the third category of instruments of governing. Meanwhile, there is a lack of attention given to the measures which are to be neutral in a territorial respect. Such measures are seen as absolutely necessary for Russia in order to guarantee implementation of legislation, specifically, environment protection laws, providing equal access to resources including the land resources, for creating favorable conditions for business to all business actors and not to specific companies which operate at some specific territories, protecting population and business from violence and other arbitrary actions.

It should be pointed out that measures of the second group, first of all the development of infrastructure, are not always neutral to the regions. Rather often they are oriented at providing some privileges or favorable business conditions to some concrete companies and/or consortiums (e.g. the highway and gas pipeline "Altai", East Siberian and Far Eastern (VSTO) gas pipeline, railroad Naryn – Lugokan in Zabaikalskiy krai, etc.). In other words they are focused on providing support to certain industries. Accepting significance of such projects we would like to underline that they do not embrace the whole scope of the tasks connected with the infrastructural development. The major objective of the institutes regulating territorial development is a securing of acceptable living standards equal to the average ones in the country. It is specifically acute at the moment for the eastern regions of Russia since the existing disparity is leading to the increasing population outflow from the region. In this context the effectiveness of such an institute as a private-public partnership, although understanding its importance and significance, should not be overestimated when setting up machinery for the solution of the key strategic tasks.

At the moment there are the indications that some demand for the improvement of the institutional infrastructure is demonstrated by the regional administrations, although it is still weak enough. The matter is that improvement of the institutions will certainly result in decreasing of the administrative rent. It is a reason why this process is always connected with

the resistance to the institutional modernization. This issue formulates an important aspect of the research, and a study of the trans-boundary links and interactions and trans-boundary demand for the natural resources will be an important direction of such a research. It is well known that the resource orientation of the economic development is contributing to the decreasing rent in the resource sectors of the economy and to the increasing rent in the processing and innovative industries. This is why there is a risk that such advanced industries may be extruded from the economics of the trans-boundary territories, if the existing dynamics and the deepening of the raw materials industries orientation in the border regions will not be overcome. We believe that it applies not only to the eastern trans-boundary territories of Russia but to the western ones as well, as recent detailed familiarization of one of the authors with the economic processes in the trans-boundary Russian-Finnish Karelia region indicates. This is clear that the trans-boundary location may entail some negative consequences for the economic performance if remains unregulated. On the opposite side if the situation is duly conceptualized it provides with much more possibilities for effective utilization of the factor of border and trans-boundary location when generating joint operational strategies allowing transformation of the trans-boundary territories into real trans-boundary regions.

The analysis of the basic trends of the formal and informal institutionalization in the framework of the ongoing processes of socio-economic and socio-cultural interactions of the border territories at the interregional levels is seen as specifically important. In particular, it refers to the international experience of creating institutes of interregional cooperation in such trans-boundary territories as Euroregions. The issue is actualized by the fact that this model directly refers to the equalizing living standards of the population living across both sides of the state borders.

We assume that these methodological requirements should be a platform for planning and evaluating the development institutes, for example, such as Siberia and Far East Development Corporation. Modernization of the social institutes should be a basic precondition for the modernization of the economy as a whole. It does not mean, however, that it should go ahead of the economic modernization: the two processes may develop in parallel. But it is really important to understand whether the institutes of modernization are going on in a right way, and correctly assess the consequences of their development.

Thus, the analysis of the institutional basis of the trans-boundary interactions of the Russian regions with their neighbors including those of them which cooperate in the framework of the trans-boundary river basins

has both theoretical and practical meanings. The key theoretical task is to identify whether the current processes are leading to transformation of the trans-boundary territories into trans-boundary regions or their status will most probably remain unchanged. The practical task is to elaborate appropriate recommendations leading to the optimization of the institutional structures in the framework of the concept of the trans-boundary regions. For some territories such as, for example, the Big Altai region, the perspective of institutionalization of the multilateral international and interregional dialogue should also be duly considered.

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