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WATER FOR DEVELOPMENT IN CENTRAL ASIA

Dear colleagues,

Rational and provident use of water resources, especially freshwater resources, is of primary importance throughout the world. These problems are important in Central Asia as well, where water resources are one of limiting factors for economic growth in the countries. The problem of future development is in the center of interests of all the countries in the region, and it relates to major strategic decisions of the states. Here, it is necessary to determine how the economy in the whole region would be developed, what role would be given to agriculture, particularly to irrigated farming in future development, in what direction the irrigated farming would be improved, what water policy would be pursued by Central Asian states in view of that, what position would be taken by each state to strengthen interstate cooperation.

Central Asia is located in the center of Eurasia, on an area of 3,882,000 km^2 with population of over 53 million (2004). It borders upon the Ob (Irtysh) river basin in the east, Caspian Sea basin in the west, Tobol and Ishim river basins in the north, and Aral Sea basin in the south.

The analysis of global water availability dynamics shows that from year to year water deficiency is growing in many regions leading to environmental instability and social tension. Such situation has arisen first of all in the Middle East and Northern Africa where water resources per capita amount to 1000–1240 m^3 a year, and about 500 m^3 in some countries as opposed to 18700 m^3 in South America and 23000 m^3 in Latin America.

The table below shows this indicator for river basins in Central Asia (by N. Kipshakbayev).

River Basin	m^3/person/year
Aral Sea	2,580
Balkhash-Alakol	2,950
Irtysh	7,070
Ishim	520
Kura-Sarysu	680
Tobol-Torgai	650
Chu-Talas	3,740
Caspian Sea	1,120

Taking climate aridity, water consumption structure, and the ongoing environmental crisis into account, the most stressed situation is in the Aral Sea basin.

Water resources in the Aral Sea basin are formed of renewable surface and groundwater, as well as of anthropogenic return water. Average annual summary river flow in the basin is about 116 billion m^3 a year, of which 79 billion m^3 accounts for Amudarya and 37 billion m^3 for Syrdarya. Annual surface water flow varies, depending on water availability in year, within:

from 58.6 to 109.9 km^3 for Amudarya;

from 23.6 to 51.1 km^3 for Syrdarya .

Total regional groundwater supplies are estimated at 43.5 km^3, including 25.1 km^3 in the Amudarya basin and 18.4 km^3 in the Syrdarya basin. Total established available volume amounts to about 17 km^3, and actual withdrawal is about 11 km^3.

Return water is not only an additional reserve for use, but also a source of environmental pollution. About 95% of total return water is collector-drainage water. Over 51% of total return water is disposed to rivers, about 33% to depressions, and 16% is reused for irrigation.

As a result of return water disposal to depressions, hundreds of water bodies formed. Among them, there are Aydar-Arnasai depression with a capacity of more than 20 km^3, Sarykamysh with a capacity of about 100 km^3, Dengizkul, Solyonoye, Sudochie and many other water bodies containing up to few million cubic meters of water. These water bodies do not have flowage, and so their water quality is deteriorating year by year.

Rapid growth in population and intensive widening of irrigated lands in the recent decades led to significant increase in water use and withdrawal from water sources.

The main parameters of water and land resources use in the Aral Sea basin are given in the table below.

Parameter	**Unit**	**1960**	**1970**	**1980**	**1990**	**2000**
Population	million people	14.1	20.0	26.8	33.6	41.5
Irrigated area	th. ha	4510	5150	6920	7600	7990
Total water withdrawal	km^3 a year	60.61	94.56	120.69	116.27	105.0

The table below shows the dynamics of water resources use in the Aral Sea basin states (million m3).

Country	**1960**	**1970**	**1980**	**1990**	**2000**
Kazakhstan	9750	12850	14200	11320	8235
Kyrgyzstan	2210	2980	4080	5155	3291
Tajikistan	9000	11170	10750	9259	12521
Turkmenistan	8070	17270	23000	23338	18075
Uzbekistan	30780	48060	64910	69611	62833
Total the Aral Sea basin	**60610**	**94560**	**120690**	**116271**	**104955**
including:					
Amudarya	***30970***	***53220***	***66950***	***69247***	***66079***
Syrdarya	***29640***	***41340***	***53740***	***47024***	***38876***

Annual increase in river water withdrawal led to drying-up of the Aral Sea, environmental degradation midstream and downstream the rivers. Some of large rivers almost completely lost their environmental significance. Tributaries of the Syrdarya river such as Chirchik, Keles, Karadarya, as well as some of the Amudarya tributaries practically lost

connection with major rivers. At the same time, considerable disposal of collector-drainage water from irrigated lands resulted in rise in river water salinity. This went in parallel with changes in river deltas with substantial shrinkage in areas of freshwater lakes and increase in number of man-made saline water bodies.

Great quantities of untreated or poorly treated industrial and domestic wastewater are discharged into streams and water bodies that has led to noticeable deterioration of their water quality. Many rivers have lost ability to self-purification.

The situation is becoming complicated also by that there is no coordinated and efficient system for monitoring over water quality and assessment of pollution impacts on human health and the environment in the region. It is well known that water quality management should be based on volumetric data from monitoring. However, at present, regional organizations are dealing with this issue, and at that they are acting without coordination, and there is no system of information content

The environmental situation in flow formation zone is unsatisfactory as well. Over the past decades, the upper reaches in the basin lost about 50% of forests. The intensification of erosion processes leads to negative changes in hydrological regime of rivers, reduction in agricultural productivity, and acceleration of reservoir sedimentation. Mudflows and landslides occur too.

How to approach to solving tasks to determine future development? Studies conducted under the GEF and WARMAP Projects showed that each country has its views and prospects for irrigation development, which often do not meet capabilities of the region and conflict with the interests of other countries in the basin. Kyrgyzstan and Tajikistan consider that their interests were infringed in the previous schemes of integrated water resources use and protection for river basins, and in this connection in the future they have right to enlarge irrigated areas to a great extent, especially Tajikistan, where area of irrigated lands amount to less than 0.1 ha per capita. Regardless of great irrigated area per capita in Turkmenistan and Uzbekistan, these countries are also planning expanding irrigated lands. Hydropower development planned by upstream countries is the second significant growth direction, very important for these countries in view of shortage of carbonate raw stuff supplies and resources there. However, now the transition of individual tributaries with high-capacity reservoirs of long-term and seasonal regulation from the previous irrigation regime to power regime led to some temporary water deficit in summer and water excess in winter. In case of constructing additional hydropower plants in the basin and exporting energy generated by them beyond the region (China, Pakistan and others), it may cause quite complicated situation with water supply to other sectors and basin states.

The research conducted by the joint project “Strategic Planning of IWRM in Central Asia” revealed the principal impact of certain destabilizing factors existing in the region upon the strategy and direction of the future development:

- population growth and prevalence of rural population (more than 60% all the countries except Kazakhstan where this percentage is less than 30%);
- possible growth in water withdrawal from Amudarya in Afghanistan is several times larger than at present;
- changes in water resources admissible to use in the future, which are expected, according to different predictions, to be from 4 to 30% in the next years under the influence of climate change. Glacier shrinkage represents a special hazard in future that after 2030 may sharply reduce ice component of natural runoff;
- growing environmental requirements of the basin states, especially downstream owing to the construction of a set of water bodies here as well as the improvement of environmental awareness of population.

Future economic development of the six basin states under these conditions will depend on their respect and attitude to mutual interests, their aspiration for joint coordinated solving of future tasks through cooperation and political will, aspiration of the governments to develop a water conservation concept for their development and implement respective water, economic and social policies. The concept should include:

- Analyzing availability and actual use of various water sources, giving a special attention to return water use. For example, Israel uses 25% of municipal sewage through treating and transporting it via special pipelines to place of consumption. In our region, the percentage of used return water does not exceed 15% of its total volume. Meanwhile, step-by-step construction of water-management systems provides great opportunities for such use both directly and in combination with fresh water. The same reserves are available in use of weakly saline groundwater.
- Continually reducing specific water use in all water use sectors, with focus on approaching to potential water productivity, which can be achieved by implementing a water requirement management policy in addition to introducing IWRM. Today, specific water use for production unit in Central Asia is larger by two times than in Jordan and Israel, and by 30-40% than even in India and Egypt. A good example is given in the region by Turkmen water organizations, which over the last 8 years have increased the irrigated area by 20% not increasing total water withdrawal.
- Matching the main directions of water use development in the region, including jointly constructing hydraulic structures of interstate importance, areas of planned irrigation development, measures for reducing non-productive water losses in transboundary water bodies.

Joint management of both surface river water and return water is of particular importance since the management is important for maintenance of sustainable water supply in the region, both in terms of quality and quantity. Improving the accuracy of water supply from transboundary sources through applying the SCADA at all transboundary waterworks and organizing satellite-based collection and transmission of information from transboundary gauging stations may enable to reduce organizational losses at basin level and ensure stable water supply at the upper level of water hierarchy, where water losses are measured in cubic kilometers.

The first-priority step in this direction should be completion and approval of regional and national water strategies not completed under the GEF project “Improvement of water resources and environment management in the Aral Sea basin”, adoption and signing by the states of a set of Agreements establishing rules for development and interactions of the countries as concerns transboundary waters, and approval of the Principal Action Plan.

Solving complicated environmental problems in the Aral Sea basin should be based on an ecosystem approach, at which the vital requirements of people and economy should be considered from common agreed positions on meeting environmental requirements.

The recognition of water requirements of the environment objects and possible increase in water withdrawal outside Central Asia will lead to rise in the existing water deficit in the Aral Sea basin. Problems of water supply sustainability in the basin states may be solved only by water conservation in all sectors of water use, and involving all water resources including collector-drainage, industrial and domestic sewage in use.

Water supply should be aimed at achieving peak level of water productivity in al sectors of water use. It will be possible, first of all, by universally introducing integrated water resources management and taking a series of measures to control non-productive water losses.

Using advanced world experience, the counties in the region should provide maximum use of municipal and industrial wastewater, take effective measures to reduce quantity and use collector-drainage water in place of their formation.

Respecting the aspiration of each state for meeting their water demand for future development, and based on the principle of using their own water resources and share of water from transboundary water sources at own discretion, the development of economy, including irrigated farming, should be based within common limits and supplies of water resources in each country. This may mainly occur as water is released following water conservation, modernization of water use sectors, attraction of additional water sources and so on.

Taking into account the considerable share of irrigated farming in water use and relatively low engineering performance standard of irrigation systems, it is necessary to place emphasis on improving irrigation water productivity. It especially relates to selecting less water-resistant and cost-effective crops, assisting to promote farmers and long-term land rent orientated to market economy, organizing high-productive seed growing, providing sustainable favorable reclamation background, economical incentives to provide high water productivity and so on.

The important element in implementing the mentioned measures is to create a system of pilot representative projects with high water and land productivity, use them as reference objects for training and transferring experience to new generation of water and land users.

At that, it is important to show not only possibilities to achieve high crop and water productivity, but also economic effectiveness of water-conservation technologies and other measures for improving water use efficiency.

The orientation to water conservation in irrigated farming is the basis for sustainable economic development and improvement of environmental situation in the region.

Based on the necessity of sustainable water supply to population and economy in the countries in the region, today and in future it is necessary to use an ecosystem approach providing for the following principal directions of environmental development and water resources use:

- improving river water quality, first reducing water salinity down to limits not inflicting damage to water users;
- creating new environmentally sustainable anthropogenic-natural watered areas in degraded river deltas;
- organizing and implementing measures against further degradation of natural systems in flow formation zone;
- carrying out measures to prevent salinization and water-logging of irrigated lands;
- retaining and improving bio-diversity.

Central Asia has sufficient supplies of renewable water resources, reasonable and effective use of which would provide worthy living conditions and well-being not only for present population, but also for future generation. In this connection, coordinated mutually acceptable joint management of transboundary water resources is a source of our development and prosperity.