STRATEGY OF USE TRANSBOUNDARY RETURN FLOW IN ARAL SEA BASIN

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The Aral Sea Basin extends over 700000 km^2 and is shared by five countries of former Soviet Union - Kazakhstan, Kyrgyzstan, Tadjikistan, Turkmenistan and Uzbekistan. Several transboundary rivers cross the Aral Sea Basin. AmuDarya and SyrDarya are the main and the bigest rivers. Total water resources of region is 130km3 annualy average from which 90% is surface water.

Basins' water is the source of irrigation and a base for crop cultivation since the most agricultual lands are irrigated As a result of irrigation and water use in other brunches return flows are formed.

Total transboundary return water flow is 36…40 km^3 from which collector-drainage waters constitute 32…35 km^3. These waters are subdivided for three parts:

- Released to the rivers about 50% (18…20 km^3) returning used water resource for its re-use, but simultaneously bringing to the rivers 100…115 mln t of salt and other harmful components that deteriorates water quality dramatically;[1]
- Used for irrigation in places of its origin -13% (4…5 km^3/year);
- Released to natural depressions feeding different water bodies - 36% (14…16 km^3/year). In the result of centuries-old exploitation of the AmuDarya and SyrDarya rivers, especially more intensively in the second half of XX century, new human-induced systems were created on a base of return waters, that include broad collector-drainage network, hundreds water bodies with capacity of some amounting 30 km^3, and wetlands with area of tens thousands hectares (fig 1) Due to full sream flow regulation the natural hydrological regime of the large rivers is broken In some rivers after huge withdrawals water flow is often not available and is supported through small sanitary releases, emergence releases and return waters

Transportation of return waters creates big problems (flooding, water logging, salinization of adjacent areas, erosion of river bed and banks, destruction of engineering structures). Unorganized outflow of these waters into natural sinks and to pasture areas leads to landscape degradation, propagation of insects and weeds. The Aral Sea shore on area some millions ha of land is located within the semiarid zone of 3 States and had unique combination of delta (tugai, wetlands), sea shore, desert ecosystems, which results in a diverse fauna and flora composition numerous example of fauna species such as Bukhara deer, the Usturt Sheep, the Usturt Caracal, the little Amudarya Shovelnose are either unique to this region, globally endangered or both. The flora displays high level of endemism with up to 176 endemic plants identified and significance for agrobiodiversity with 33 wild species of plants recorded. In addition to this endemic, rare or globally endangered resident of flora and fauna, the area is also global importance for migratory of birds of the Central Asian, Indian and East African flyways as it has on the convergence place of these two major world flyways. More than 3 million migratory waterfowles and over 300 thousand birds during winter period is supported by this area.

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Creation of stable network of well-managed water bodies and wetlands on the base of TBRW will permit to guarantee the increase capacity of this nature biowater complex and save for future generations such global significant threaten species as Pelicanus Crispus, Oxyura Lencocephala, Authia Hyraca and others.

New natural processes should arise and develop in these water objects on a large scale. These processes caused growth and reproduction of fish, fur-bearing animals, aqua and coastal vegetation, birds and even arid forests. As a result, fauna, flora, climatic conditions, bird migration routes should changed on huge areas under influence of annual formation of these waters exceeding 40 km^3 in the basin. Beside this involvement 35…40 bln m^3 of water on the ecologically acceptable and economic efficient way should have regional and global importance for decision of problem water scarcity in Aral Sea basin in interest of riparian states. Specific environmental and social situation is being established around the water objects, since they become of interest for some social groups, such as fishermen, cattle-breeders, hunters, etc., settled nearby.

Return flow existed in basin long history, but in result the intensive development of irrigation area in 1940...1990, and construction of huge collector drainage network the quantity of return flow increases sharply, their influence of water quality became wrong catastrophically and their formation and interrelation with freshwater unstable critically. If in the Soviet time all transrepublic waters were under control of federal governments. Now situation changed and caused quantity and quality of water in delta of both river unsuitability, same as land degradation, reduction of natural biological resources, decease's with big social and environmental disaster in lowland, increasing poverty and reduction of economic ability of peoples, living in disaster zones.

Uncontrollable return waters create instability in their regime.

Spontaneous formation, dissemination and accumulation of transboundary return waters can (and already) cause considerable negative effects in environment and social development. Development of use and management strategy for these waters and its approval by the region’s countries allows to draw up a plan of common for all the countries measures preventing these effects and, simultaneously, to transform these waters into a source of life, biodiversity, sustainability and prosperity in the Aral Sea basin on a scale, that would influence the world community. For stabilization of these water bodies at regional, and, thus, at global scale it is necessary to eliminate the following threats:

– instability of Transboundary Return Waters regime in terms of quantity and quality;
– uncontrollable allocation and use of such waters;

injurious use, including poaching.

It is supposed that among such measures will be joining of the countries to Ramsa Convention on transboundary waters. In particular, it is proposed, that , will elaborate new legal provisions in international water law in respect to country obligations on cooperation in transboundary return water use and management.

For the decision this problem it is necessary to improve next positions:

1.. Transboundary Return Water (TRW) of the basin - as an object of research and management;

2. TRW management system;

3. Management strategy in general and its specific aspects - on example of demonstration pilot plots;

4. Creation of public awareness and public participation;

5 Potential for real improvement of environmental and socio-economical situation within the basin.

Expecting outputs from each of those components are next:

1.1. Preparation of the scheme of water streams and water bodies on return waters

1.2. Definition of possible return waters release into the rivers for different periods over zones.

1.3. Definition of possible return water volumes use for irrigation and other needs for different periods of development over zones.

1.4. Definition of return waters volume release into water bodies, wetlands and its change for different years.

1.5. Definition of water bodies' inventory where sustainable ecological profile is being created. Terms of reference for its development. GIS database preparation for these water objects.

2.1. Transboundary return water management's regional strategy including:

- establishing transboundary return water release limits on volume of pollutants for the countries and their separate zones;
- sanctions for agreed limits breakage;
- establishing borders of responsibility for transboundary return water management between regional, national and local entities;
- balance of salts distribution involved by return waters between zones of their accumulation.

2.2 National system of transboundary return water management includes:

- establishing inventory and composition of return waters' bodies protected and order of their transfer under administration of local and provincial water entities or/and nature protection bodies;
- development of rules and order of national organizations for return water management work;

2.3. Creation of new (or extension of existing) regional and national organizations to strengthen "capacity building" of water-ecological organizations responsible for transboundary return water management.

- 3.1.: transboundary return water management models' system;
- certain strategy adaptation on these models;

3.2. Transboundary return water use for irrigation and other needs strategy.

In this direction three types of use are suggested:

- in place of origin for irrigation and leaching;
- protection forest stripes creation with simultaneous wood processing;
- technical needs in industry, agriculture and municipal needs.

Transboundary return waters management system has goal to create system of transboundary return flow management within the framework of existing regional and national structures; development of institutional and technical principles of their interaction in order to reduce in the future negative effect of wastewater on surface and ground waters quality and on land, and, at the same time, to ensure raise of bio-productivity and biodiversity in these human induced systems. Paradox of the situation is that though 5 countries undertook joint management by transboundary river waters of the Aral Sea basin, and carefully control their allocation, return waters are not taken into account, polluting waters and becoming an uncontrollable source of land degradation.

Taking into account sustainable development and use transboundary waters require permanent monitoring and management over range of criteria, providing their ecological stability and safety as well as long-term bioproductivity and biodiversity of ecosystems supported by them.

Management system should include development of the set of principle provisions on Transboundary Return Waters (TRW) as for uses indicated in Table 1:

- definition of possible Transboundary Return Waters release limits into the rivers taking into account pollution limitation for different river's sites in order to not exceed allowable concentrations of pollutants and establishing on this base limits for countries;
- definition of design parameters of ecological and salinity releases of fresh water over control sites taking into account expected regime of Transboundary Return Waters release into the rivers;
- development of the principle of crop pattern and zonal measures selection for different soil conditions where Transboundary Return Waters use is recommended for irrigation;
- recommendations preparation for feasibility study on collector-drainage water use for irrigation, leaching, etc.;
- development of methodology of water bodies and wetlands regime prediction, their ecological sustainability providing and necessary regime improvements definition;
- definition of the set of organizational-technical measures on preventing of reclamation state worsening of lands of Transboundary Return Waters.
- to define set of organizational-technical measures to prevent transboundary return water use objects' ecological-reclamation state aggravation;

- This should allow to make
- to elaborate strategy for transboundary return water management and use in the Aral Sea basin, ensuring preservation and sustainable maintenance of a wide network of environmentally significant water ways, water bodies and wetlands emerged on a base of these waters, as well as radical improvement of water quality in the basin’s rivers;
- to prepare institutional and legal base of such management and use at transboundary level and at national levels, including use of transboundary return waters in food production;
- to demonstrate on example of pilot projects the expedience and simultaneously potential for increase of new water and water-land ecosystems’ natural productivity.

to enlarge water resource and turn it into stable element of sustainable ecological natural-antropogenic complex of rivers, water bodies and wetlands of the Aral sea basin.

Table1

Type of use of return waters	Direction of possible use	Stability criterion	Restrictions	Control
1	**2**	**3**	**4**	**5**
Release to rivers	Water resource enlarging	Prevention of allowable limit of pollution exceeding	Maximum limit of flow pollution over time	River water quality and salt accumulation in planning zones
Use for irrigation and other needs	- in upper watershed for agricultural crops irrigation; - On desert massifs for salt-resistant plants irrigation; - For saline lands leaching; - To feed root zone by back water in collectors; - For industrial needs.	- Preventing land salinization; - economic and ecological stability; - land desalinization; - preventing land salinization and water logging; - preventing machinery corrosion	- maximum flow pollution limit over time; - water resource availability; - seasonal salt balance is negative; - seasonal salt balance is negative, ecological expedience; - water resource available	- soil salt composition ions; - soil salt balance on anions; - desalinizatio n process; - ground water-table control; salt balance on ions; - water salt and ion composition
Release to water bodies and wetlands	- wetlands creation; - fish production; - fur-bearing animals breeding; - livestock forage; - hunting and tourism; - birds migration; - river deltas restoration	Sectors' requirements to salinity, discharge, flowing, oxygen exchange changes	- return water salinity and volume; - possibility of mixing with fresh water	- stagnant zones; - salt concentration; - oxygen concentration; - biological oxygen absorption

Especially difficult situation occurs in the SyrDarya basin, where return waters constitute 13.9…14.2 km^3 under their release to the river on 59-69%