

# Basin Water Organization “Amu Darya”



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For transition to basin water management principles at the regional level, in 1987, upon initiative of the Central Asian Republics, a Basin Water Organization (BWO) Amu Darya was established and subordinated directly to the USSR Ministry of Water Resources.

Since gaining independence by the Central Asian States, in order to keep integrity of transboundary water management in Amu Darya and Syr Darya Basins, the ICWC of Central Asia was established on 18 February 1992 and took control over basin organizations. The basin

organizations Amu Darya and Syr Darya have become the executive bodies of ICWC. Later on, SIC ICWC has joined also. In 1999, according to the decision of IFAS, the ICWC executive bodies gained the status of international organizations.

The 25-year activity of BWO Amu Darya under umbrella of ICWC was very productive. The organization solved the assigned tasks in timely manner, settled, by joint efforts, controversial issues and avoided conflicts. In tough times for the region, the ICWC members always rendered active help to the organization.

## BRIEFLY ABOUT THE BASIN

The Amu Darya River Basin covers a broad area of about 1,327,000 km<sup>2</sup>, of which 1,018,600 km<sup>2</sup> are located in Central Asian states. The rest of the basin is located in Afghanistan and Iran.

The Amu Darya is the largest river in Central Asia in terms of its catchment area and water abundance. It is formed by the confluence of the Vakhsh and Panj Rivers. The total length of the river from the sources of its headstream, the Panj River, to the Aral Sea is 2,574 km, and the length from the point of confluence with the Vakhsh Rivers is 1,415 km.

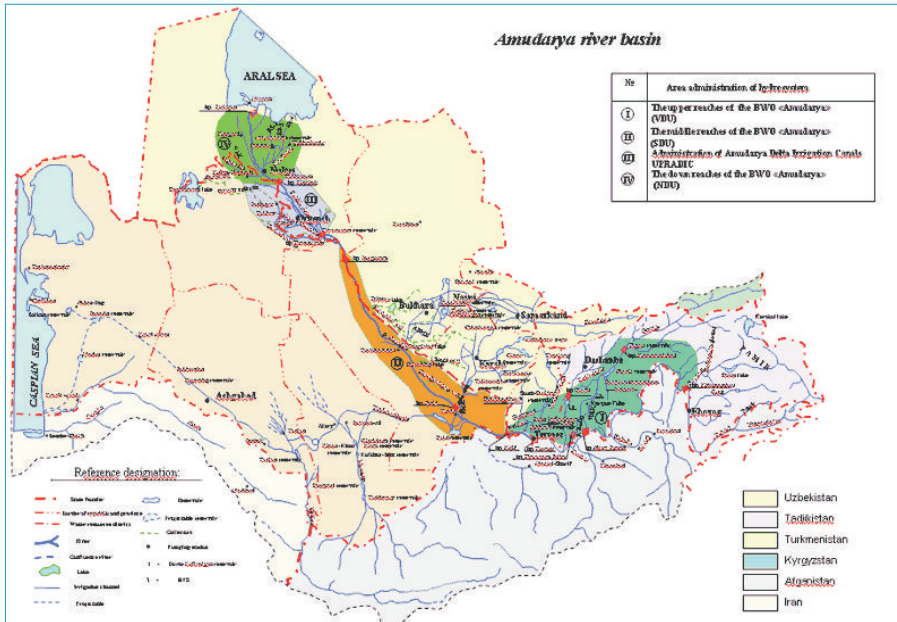
Almost along the entire length, the Panj River forms part of Tajikistan's border with Afghanistan.

Only in the first 180 km the Amu

Darya is joined by tributaries: from the left, 12 km below the junction of the Panj with the Vakhsh, by the Kunduz River (Afghanistan); from the right, at 38 km by the Kafirnigan River, at 137 km by the Surkhandarya River, and at 180 km by the Sherabad River.

The Amu Darya is a river with a glacier-snow catchment area. The glacier area is 7,300 km<sup>2</sup>. The catchment area is 226,800 km<sup>2</sup>.

There is strongly pronounced irregular flow distribution in the basin during a year: 77...80 % of flow is found in April-September and about 10...13 % in December-February. The river's flow increases in March and reaches maximum in June, July, and, rarely, August. Against the background of flow rise and fall, there are some pronounced peaks



caused by rain showers and increased melting of snow and glaciers in mountains.

The Amu Darya basin has complex irrigation system comprised of a lot of canals, pumping stations, collectors, and irrigation spillways.

As regards morphological and geographic characteristics, the Amu Darya basin is divided into three sections: the upper reaches (from the Kelif hydropost upstream to the border between Turkmenistan and Uzbekistan), the middle reaches (between the Kelif hydropost and Tuyamuyun), and the lower reaches (downstream from Tuyamuyun).

Land in Tajikistan, Uzbekistan (the Surkhandarya province) and Kyrgyz Republic (a small irrigated

scheme in the south of the republic) are irrigated in the upper reaches. There irrigated schemes are located in such tributary valleys as the Panj, Vakhsh, Kafirnigan, Surkhandarya, and Sherabad.

As to the middle reaches, the largest schemes of modern irrigation are concentrated on extended canals, such as the Garagum Canal, the Karshi Main Canal, which is served by 6 pumping stations, and the Amubukhara Canal. The system of each canal includes off-stream reservoirs. The irrigation systems located between the Kelif hydropost and Tuyamuyun receive water transported by a dozens of canals with non dam-water intakes.

In the lower reaches, both banks of the Amu Darya River have

seen large systems of canals constructed. Those are the Tashsaka, the Turkmendarya, the Pakhtaarna, the Klychniyazbai, the Urgench-Daryalyk-arna, the Khan-yab, the Dustlik, and the Suenli.

The total irrigated area in the basin is 3,108.73 thousand ha (Tajikistan – 259.06 thousand ha,

Turkmenistan – 1,388.60 thousand ha, and Uzbekistan – 1,461.07 thousand ha).

Two large seasonal-storage river reservoirs are located in the Amu Darya Basin: the Nurek reservoir along the Vakhsh River, and the Tuyuamuyun reservoir in the lower reaches of the Amu Darya.

## Nurek Hydroscheme

Construction of the Nurek HPS was started in 1961. First aggregate, 300 MW, was put into operation in 1972. The station's design capacity of 2,700 MW was reached in 1979. Reconstruction of nine hydro-aggregates of the Nurek HPS was completed in 1988, and thus, the capacity of each hydro-aggregate

reached 335 MW and the station's capacity was increased to 3,000 MW.

The full volume of the Nurek reservoir is 10.5 km<sup>3</sup>, including 4.5 km<sup>3</sup> of useful volume.



## Tuyamuyun Hydroscheme

Tuyamuyun Hydroscheme was constructed from 1970 to 1986 and put into operation in 1981, although it was not completed. First aggregates of the hydropower station started to be operated in 1983 and reached its full capacity (150 MW) in 1985.

The hydroscheme is located at the interface of the middle and lower reaches of Amu Darya.

The site of hydroscheme is in the Tuyamuyun gorge, where the Amu Darya River, cutting rock outcrops, is banked 15 - 25 m high on both sides. The average annual river flow rate at the hydroscheme's site is 1,900 m<sup>3</sup>/s. The average long-

term sediment yield is 230 million tons. The maximum flood flow, given the 0.01% probability, is 13,300 m<sup>3</sup>/s.

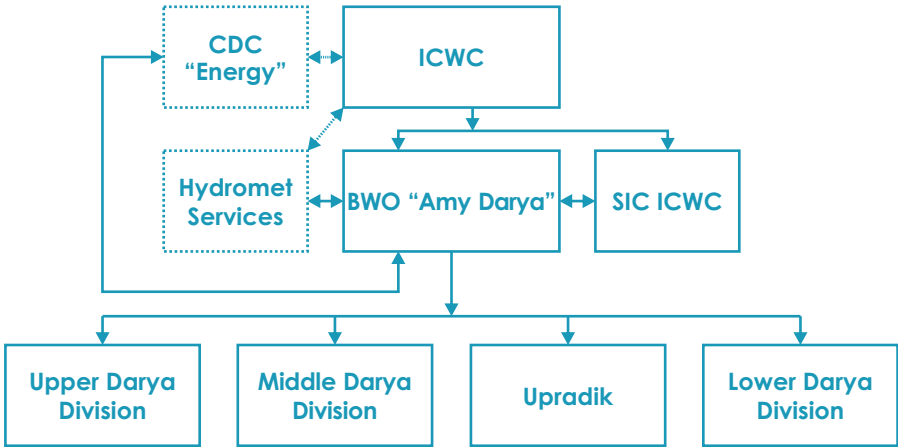
The required regulation capacity at Tuyamuyun site is from 5 to 7 billion m<sup>3</sup>.

The reservoir is topographically complex and consists of one in-stream body and three lateral bodies: Kaparas, Sultansanjar, and Koshbulak. At the time of putting into operation, their total capacity was 7.80 km<sup>3</sup> and the useful capacity was 5.27 km<sup>3</sup>; however, later this capacity diminished due to siltation.



# REGIONAL WATER RESOURCES MANAGEMENT

## Structure of Regional water resources management in the Amu Darya Basin



The main objective of BWO is interstate water management at the regional level.

Institutionally, **the water management structure** in BWO is organized by three levels, where lower chains are subordinated to upper ones:

**1. First hierarchical level:** represented by the Headquarters of BWO, which directly report to ICWC and deal with planning, management, regulation and allocation of water among the states.

In information aspect, BWO is connected with Minselvodkhozes, Minvodkhozes, SIC ICWC and Hydromets of Central Asian states.

**2. Second level:** represented by four territorial divisions that supply water directly to water users according to water intake limits plan approved by BWO. Each division has infrastructure providing water transportation, formation, and use within the territorial boundaries. Territorial divisions directly report to BWO Headquarters.

**3. Third level:** control and management stations (CMS). Those are hydraulic structures and gauging stations (or hypoposts) that are on the balance sheet of divisions.

According to general agreement of the Central Asian states, the interstate water management and distribution covers only main channels of the following rivers: the Panj, the Vakhsh, the Kafirnigan, and the Amu Darya itself.

For the purposes of surface natural water management, the Central Asian states transferred to BWO for temporal usage the head intakes along the Amu Darya and its main tributaries and the canals with structures of interstate importance.

BWO also controls: part of head intakes that were not transferred completely, all pumping stations diverting water from river main streams and main interstate canals, river reservoirs, key hydroposts, and spills of return water into the river channel.

Four territorial divisions for the operation of water intake structures, hydroschemes, and interstate canals were established under BWO Amu Darya with the centers in Kurgan-Tyube (Republic of Tajikistan), Turkmenabad (Turkmenistan), Urgench (Republic of Uzbekistan), Takhiatash (Republic of Karakalpakstan) so that BWO could manage transboundary water resources.

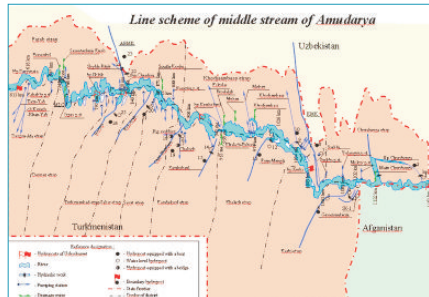
Each territorial division is responsible for specific river reaches or rivers:

**Upper Darya Division** operates intake structures, controls water intakes from the Vakhsh, Panj, and Kafirnigan rivers and on the Amu

Darya River 246 km reach up to the Kelif hydropost (Upper reaches).



**Middle Darya Division** controls water intakes at the Amu Darya River 552 km reach from the Kelif to Darganata hydroposts (Middle reaches).

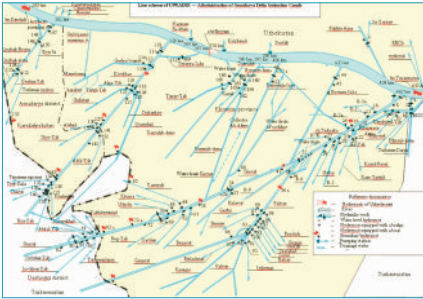


**Amu Darya Inter-republican Canals Division (Upriadik)** operates 11 river intake structures and 52 hydrostructures on main canals, 337 km of main canals, controls water intakes within river 167 km reach from the Tuyamuyun hydroscheme to the Kipchak hydropost (Lower reaches).

Upriadik manages three large-scale irrigation systems:



1. Tashsaka
2. Klychniyazbai
3. Kipchak-Bozsu



**Lower Darya Division** operates Takhiatash hydroscheme, head water intakes of canals Khan-yab and Jumabaysaka, controls all water intakes from river within 283 km reach from Kypchak hydropost to the Aral Sea (Lower reaches).



By September 2017, the total staff number was 720, including: 29 – staff of headquarters, 61 – Upper Darya Division (8 – Termez site), 116 – Middle Darya Division (8 – Amubukhara site), 307 – Upradik, 135 – Lower Darya Division, and 56 – Dashoguz administration.

### The practice of interstate water limit allocation is maintained in the Amu Darya Basin.

The limits of country water withdrawals are the agreed by all states quantities of water withdrawal for each state, the Aral Sea, and Prearalie. The Parties' limits of water withdrawal are set by ICWC. In total, the allocated limits in the basin amount to 59.45 km<sup>3</sup> in a hydrological year.

Regarding the Aral Sea and river basins, the organizational framework for interaction between the interstate water management bodies and with national agencies are coordinated with the IFAS framework through the ICWC and its executive bodies (such as the BWOs and the SIC). These provide the main channels of interstate cooperation.

The legal basis of the shared water management and distribution in the Aral Sea basin is laid by the Agreement on Cooperation in the Field of Joint Management of the Use and Conservation of Water Resources in Interstate Sources (Almaty, 1992) and also by other documents and acts adopted by the Central Asian countries for individual river basins based on earlier agreed schemes of water allocation.

BWO Amu Darya in its activity is guided by its Statute approved by ICWC, the acting legislations of the ICWC member-countries, as well as

ICWC decisions, agreements, protocols and other regulations.

The organization is financed through contributions from the three states (Uzbekistan, Tajikistan, and Turkmenistan).

It should be noted that, based on forecast and the current water-related situation in the region, the following water allocation options are approved at ICWC meetings:

**1. In the period of normal water availability** and if water storage is available in reservoirs, water allocation is made according to the approved limits of water withdrawals.

**2. In a low-water period,** Article 4 of the Almaty Agreement 1992 is applied, and the following criteria for interstate use of the established water withdrawal limits are set:

- if water content is below the design one, water withdrawals of the states should be corrected according to an ICWC decision;
- in case of water shortage in the basin over a certain period of time, the Basin Water Organization Amu Darya applies a percentage-based allocation of water among water consumers;
- the percentage shares of water allocation are set based on the ICWC-established limits of water withdrawals for the whole period of time for key water consumers.

For more effective distribution of

water resources, relief of water-related tension, and building trust among water consumers in the river's lower reaches, the water ministers of Turkmenistan and Uzbekistan, proceeding from a need for optimal flow management and operational solution of water distribution issues in the lower reaches of the Amu Darya River, signed in May 2007 the "Agreement on joint water use by Turkmenistan and the Republic of Uzbekistan in the Amu Darya lower reaches".

The respective commission has been met since 2002. By September 2017, 172 meetings of the joint commission for water allocation in the Amu Darya lower reaches were held, with participation of the heads of PO "Dashoguzsuvkhoyalik" (Turkmenistan), Lower-Amudarya BISA (Karakalpakstan and Khorezm), BWO Amu Darya, and Operation Division of Tuyamuyun Hydroscheme. The meetings developed operation regimes of the Tuyamuyun Hydroscheme, and water resources were distributed according to achieved agreements. Such approach to water distribution in the Amu Darya lower reaches suits all parties.

The monitoring of river water plays a key role in the region both in low-water and high-water periods. At present, regular monitoring is maintained only in the reach from the Aral Sea to Termez hydropost that is 1,277 km long or accounts for approx. 70% of the river's length. Roughly since 1992,

no information has been available from hydroposts located along the Panj, Vakhsh, and Kafirnigan rivers. This has a negative effect on reliability of short-term planning and forecasting. Currently, to make somehow an assessment of the water-related situation and the expected inflow at the border of the two main water consumers (Turkmenistan and Uzbekistan) and take preventive measures, the level-measuring Termez hydropost (1,277 km) serves as a key one.

In order to improve river monitoring in the Amu Darya basin, in our opinion, the riparian countries need to pay attention to the following priority tasks:

1. Use the river hydroposts along the Panj, Vakhsh, and Kafirnigan rivers that are on the balance sheet of TajikHydromet (Republic of Tajikistan).
2. Create a new river hydropost along the Amu Darya at the border between the Surkhandarya province, Republic of Uzbekistan and the Khatlon province, Republic of Tajikistan. This would allow monitoring how much

water flows from Tajik and Afghan territories. This idea was supported by the ICWC Central Asia.

3. For efficient control over implementation of the signed Agreement between Turkmenistan and the Republic of Uzbekistan on water distribution at the border (Kelif hydropost) in equal shares, 50 x 50, the level-measuring Kelif hydropost should be transformed into discharge-measuring one or a new hydropost should be created.

4. Re-equip or modernize all river hydroposts and implement the automated data reading and transmission.

### **Basin's water availability**

Water supply of states in the region directly depends on water availability in the Amu Darya Basin.

Estimation of water availability in the Amu Darya River Basin conventionally is made based on the given flow in the supposed Atamyrat hydropost upstream of the Garagum Canal. Water accounting and forecasting by this hydropost was started in 1974 by UzGlavHydromet.

## CONCLUSION

As long as 25 years, under quite new political and economic conditions, BWO Amu Darya, as an executive body of the ICWC, has been quite successful in fulfillment of the assigned tasks related to transboundary water management and maintenance of hydrostructures and interstate canals transferred to its balance sheets.

Historically, the positive role of the BWO Amu Darya and its contribution to the region has become obvious:

1. BWO Amu Darya, as an executive body of the ICWC, is the main channel for promotion of basin approach to transboundary water management. The basis of the basin approach have been laid and turned to be a true decision. This decision was approved and supported by the region's states and the world community.

2. The official recognition of the BWO as an interstate institution was confirmed by the Decision of the Heads of Central Asian State about approval of the Provisions regarding the Interstate Fund for saving the Aral Sea (IFAS) and the Agreement on the status of IFAS and its institutions adopted in April 1999 in Ashkhabad.

3. BWO Amu Darya has achieved a number of positive results in its activity:

- Established effective institutional structure to timely solve the basic tasks of operational water management and accounting;
- All branches of the organizations provided with qualified staff;
- Created necessary conditions for good operation of all branches;
- Maintained good conditions of the river headwork structures and interstate canals thanks to current and capital repairs and maintenance. No failures were observed during operation of the organization;
- Improved territories adjacent to hydrostructures, with good roads with solid coating for inspection of all interstate canals;
- Equipped control stations practically at all river water intakes and key structures of the interstate canals;
- Established quite reliable communication and electrification of almost all structures;
- Developed database on water withdrawals, hydrology, collector-drainage water discharge, and other parameters;
- Chemical analysis of river water made regularly in three operational divisions.

Despite the achieved positive results, it is necessary to pay attention to a range of issues to be solved:

1. Upgrade of material and technical facilities (land dredging equipment, transport facilities, cranes, communication and water accounting facilities, motor boats, boats, etc.).
2. Back-up power supply at head river intakes and large structures along the interstate canals.
3. Education and additional training of staff with account of up-to-date requirements.

It should be noted that the Aral Sea basin experiences complex situation in part of regional interaction on the interstate and intersectoral use of transboundary water. This requires appropriate decision making for strengthening of cooperation and for additional institutional and legal actions.

**In this context, improving** the interstate (regional) cooperation on water management in the Amu Darya Basin is one of priority tasks that, finally, consists in a need to elaborate (select) jointly a basin water management model that would secure equitable (proportional) supply with water of all water consumers in the region, including the lower reaches and the Aral Sea, and guarantee both appropriate quantity and good quality of water.

**Additionally, enhancing** the role of the BWO in the Amu Darya Basin is a very important issue that requires joint and mutually agreed actions from all actors of the water management system.

### **Lastly:**

Deeper and more detailed analysis of water-related, hydrological, climatic and other characteristics of the Amu Darya Basin is needed, including with application of up-to-date approaches.

Recommendations need to be prepared for reduction of losses in the river channel in the current context of flow regulation.

Improvement of water accounting at key river hydroposts and drafting of full river water balance are among the priority tasks of the BWO and its branches.

Based on detailed examination of the current water management system, recommendations should be developed on improvement of the latter.

Models for regional water management, with account of river water quality, will be developed.

Conditions will be created for development of information exchange among water actors.

The Urgench branch of SIC ICWC Training Center needs to be revived and the SCADA system should be implemented on a larger scale with the support of investors.

## UPPER DARYA DIVISION



Tail-water of Beshekent hydroscheme



Tail-water of Dekhkanabad head intake structure



Vakhsh Main Canal at DP-46



Staff of Beshekent hydroscheme



A.Faizov, Head of Dekhkanabad hydroscheme

## MIDDLE DARYA DIVISION



Headwork of Amubukhara pumping canal



Headwork Essen-Mengli



Headwork Upper Charshanga SDU



Headwork Sayat-Naukhana



## AMU DARYA INTER-REPUBLICAN CANALS DIVISION



Headwork of the Turanga Saka Canal



Headwork "Klychniyazbai"



Feeding structure at 42 km of the Shavat branch's canal



Headwork Tashsaka



Control station



## LOWER DARYA DIVISION



Office of Lower-Darya Division



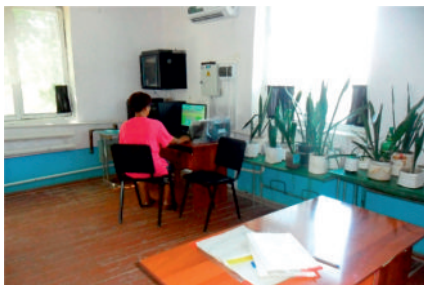
Sluice dam of Takhiatash hydroscheme



Museum of Lower-Amudarya Division



Staff of Lower-Amudarya Division



Control station of GRES power plant







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