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Analysis of water management organizations in Chirchik-Akhangaran river basin (Central Asia)

1. Chirchik-Akhangaran basin water resources (CHAB)

CHAB basic water sources are:

- **Chirchik River.** The largest river of Tashkent oasis (is formed by conjunction of rivers Pskem, Chatkal, Koksu). Its length - 161 km, water catchment area- 14240 km2, inflow regime: snow-glacier (SG). Average multiyear flow – 7,2 km3.

Chirchik river takes water from two relatively big tributaries – **Ugam river** (length – 68 km, water catchment area – 866 km2, inflow regime - SG) and **Aksakatasay** (48 km; 453 km2, inflow regime- snow-rain (SR);

- **Pskem river.** Length – 70 km, water catchment area – 2540 km2, inflow regime: SG;

- **Chatkal river.** Length – 223 km, water catchment area – 6580 km2, inflow regime: SG;

- **Koksu river.** Length - 57 km, water catchment area – 372 km2, inflow regime: SG;

- **Akhangaran (Angren) river** is the second significant water supply source in Tashkent province. Length 236 km, water catchment area – 5220 km2, inflow regime: SR. Average multiyear flow – 0,72 km3.

CHAB water resources form also tributaries of specified rivers (Chirchik river – Karankulsay, Galvasay, Aktashsay and oth.; Akhangaran river – Nishbash, Dukentsay, Karabau and oth.) as well as small rivers and says flowing in reservoirs constructed on area of Tashkent province (Charvak reservoir – rivers Yangikurgan, Nauvalisay, Chimgansay and oth.).

Water supply source of Tashkent province is Syrdarya river water too.

In order to regulate flow in CHAB reservoirs, list of which and basic parameters are given in the table below, constructed on the territory of Tashkent province:

№№	Reservoir	Water source (river)	Type	Input into operation	Regulation	Volume, mln.m3		Surface water area km2
						full	useful	
1	Charvak	Chirchik	channel	1970	seasonal	2006	1580	40,0
2	Tyuyabuguz	Akhangaran	channel	1960	seasonal	250	220	18,4
3	Akhangaran	Akhangaran	channel	1973	seasonal	250	183	5,3
4	Gazalkent	Chirchik	channel	1980	seasonal	16	7	5,0
5	Khojikent	Chirchik	channel	1976	seasonal	31	9	2,5

Charvak water reservoir is waterworks oriented on irrigation and hydropower, Tyuyabuguz – irrigation, Akhangaran – irrigation and drinking water supply, Gazalkent and Khojikent reservoirs – hydropower.

The most developed and sophisticated irrigation infrastructure in CHAB belongs to Uzbekistan (Tashkent oasis), less sophisticated to Kazakhstan (Keless massif), relatively weakly developed because of mountainous area – Kyrgyzstan. According to agreements reached before (Scheme of integrated Syrdarya river basin water resources use and conservation), CHAB water resources distribution is carried out in following proportions: Uzbekistan – about 88%, Kazakhstan – about 12%, Kyrgyzstan – less than 1% of total volume of basin rivers average multiyear flow.

2. Water resources management: basin principle

Integrated water resources management (IWRM) is considered as alternative for traditional (administrative) approach to water management. Key IWRM provisions cover all water management aspects, but the basic principle is basin water management principle. It represents integrity of water resources management.

Kazakhstan. Existing Water Code of Kazakhstan was adopted on 09.07.2003, where basin water management principle as well as set of other provisions (basic priorities, environment water needs, public participation in water management, etc.) that promote IWRM adoption at national level have been established.

Legislation of Kazakhstan in sphere of regulation of water, land, environmental and other relationships is the most progressive in region and serves as IWRM legal base for adoption at national level.

Kyrgyzstan. Existing Water Law of Kyrgyzstan was adopted on 14.01.1994. Basin water management principle was not reflected in the Law.

In the same time water, land and other legislation of Kyrgyzstan allows transition from administrative water management to basin one. There is a promotion of IWRM principles at high political level, in appropriate ministries and departments related to water management.

Uzbekistan. Existing Law of Uzbekistan “About water and water use” was adopted on 06.05.1993, later some amendments and additions were brought in it, set of sub-legal standard and legal acts in sphere of water relations regulating.

Basin water management principle was not reflected in the Law.

In the same time basin (hydrographic) principle of water resources management came to the effect according to Decree of President of Uzbekistan from 24.03.2003 № УП 3226 «About the most important aspects of deepening reformations in agriculture” by Statement of Cabinet of Ministers (CM) of Uzbekistan № 320 from 21.07.2003 «About water management improvement». According to this Statement institutional water management structure of the republic was reorganized.

Water, land, and other legislation of Uzbekistan allows IWRM principles’ implementation. In the same time it is required to make set of amendments and additions in existing standard and legal acts, or to develop new ones to succeed in IWRM components adoption and functioning. In particular, this concerns development of economic levers and incentives to implement reform in water management.

3. Water resources management: institutional structure

Governmental bodies responsible for water resources management (Chief Water Agencies) in «Rivertwin» Project states are as follows:

- *Kazakhstan:*

  - Committee on Water Resources of Ministry of Agriculture (CWR MA);

- *Kyrgyzstan:*

  - Water Department of Ministry of Agriculture, Water Resources and Processing (WD MAWR&P);

- *Uzbekistan:*

  - Main Water Organization of MAWR (MWO MAWR).

Kazakhstan. CWR MAWR carries out water resources management according to basin principle, 8 basin water administrations were created (BWA). Their basic objectives are: water use management, water diversion and supply plans establishment, issue of permissions for special water use, state water use account arrangement, supervision of waterworks' and reservoirs' technical state, etc.

National state water enterprises (NSE "Vodkhoz") operate major national water objects. In 1999 based on provincial water committees 14 RSE "Vodkhoz" were created. They carry out their activity according to administrative-territorial principle. RSE functions include: technical operation of waterworks, head water intakes, mains, reservoirs, pumping stations and grouped water pipelines.

District and inter-district Water System Administrations (WSA) subordinate to provincial NSE "Vodkhoz" that are based on self-financing basis. Interrelations of district and inter-district WSAs with private and cooperative water users are based on contract.

Kyrgyzstan. Sectoral management principle was retained in the republic.

Water management structure includes republican, provincial, and district levels. WD MAWR&P assumes instead of provincial level 7 basin water administrations (BWA), mainly – within limits of provinces, and 40 of district water administrations (DWA). Water management of the state at national, provincial and district levels is prerogative of WD MAWR&P.

Water Department regulates water use and manages designing, construction, and operation of irrigation infrastructure. Within WD structure Production Department "Sel'vodzaschita" functions that deals with protection of settlements and agricultural lands from mudflow and water floods.

Uzbekistan. According to appropriate Decree of President and Statement of CM of Uzbekistan water resources management was transferred to basin principle: 10 Basin Administrations of Irrigation Systems (BAIS) were created as well as Main Canal Management Organization (MCMO) in Fergana Valley including:

- *Amudarya river basin:* 5 BAIS (Amu-Surkhan, Amu-Kashkadarya, Amu-Bukhara, Lower Amudarya, Zarafshan).

- *Syrdarya river basin:* 5 BAIS (Naryb-Karadarya, Naryb-Namangan, Syrdarya-Sokh, Lower Syrdarya, Chirchik-Akhangaran as well as MCMO with unified Master Station for Fergana Valley) – in total 6 basin water organizations; these BAIS and CMO of Fergana

Valley include 3 Main Canal System Management Organizations (MSO), 7 Canal Management Organizations (CMO), 52 Administration of Irrigation System (AIS).

4. Water resources management: vertical hierarchy

Regional water management structure, in general, has at high hierarchic level Organization "Central-Asian Cooperation" (CAC) and International Fund for Saving Aral Sea Basin (IFAS), which include CAR water management as one of aspects of general political management of region.

CAC organization members are Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan.

IFAS was created according to decision of Heads of State CAR of 04.01.1993 (Tashkent). IFAS founders: Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

According to proposal of President of Turkmenistan S.Niyazov and President of Kazakhstan N.Nazarbayev and decision of Heads of State CAR of 28.02.1997 (Almaty), radical reconstruction of IFAS management structure was carried out. The same Decision approved principal IFAS management framework offered by and President of Kazakhstan N.Nazarbayev that exists up to date:

1.Council of Heads of State of CAR on Aral Sea basin problems.

2. IFAS President (Presidents of CAR states, based on rotation).

3. IFAS Board (five members, one from each state-IFAS founder – Deputies Prime-ministers).

4. IFAS Executive Committee (EC Chairman + 2 representatives from each state-IFAS founder).

5. IFAS branches (one in each state-founder). IFAS branches location in CAR states has been identified: Kzyl-Orda (Kazakhstan), Bishkek (Kyrgyzstan), Dushanbe (Tajikistan), Dashkhovuz (Turkmenistan), Nukus (Uzbekistan).

Official water management structure in Central Asia («direct water governance») includes following vertical hierarchic levels and appropriate water management organizations:

1. Interstate level – ICWC (Interstate Coordination Water Commission) **of Central Asia**.

Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan created ICWC of Central Asia according to Inter-governmental Agreement on cooperation in integrated transboundary water resources management, use and conservation signed on behalf of independent states on 18.02.1992 in Almaty.

ICWC activity bases on Statements of Heads of State of CAR, previously adopted bilateral and multilateral decisions on integrated water use in Amudarya, Syrdarya, Chu and Talas river basins, Provision "About Interstate Coordination Water Commission of Central Asia". Latter was signed by responsible representatives of Parties on 05.12.1992 (Tashkent).

According to «Provision about ICWC» (extraction without quoting):

- Main objective of ICWC creation is establishment of principles of decision making collective nature concerning general water issues;

- ICWC members are the first leaders of CAR water organizations;

- ICWC meetings are held on quarterly basis, and if necessary, more frequently based on initiative of Parties;

- ICWC meetings are held on rotation basis chaired by representatives of hosting state;

- Each of ICWC members has right to put "veto" upon discussed decision;

- ICWC executive and supervision bodies defined Basin Water Organizations (BWO) «Syrdarya» and «Amudarya»;

- BWO «Syrdarya» and BWO «Amudarya» annually develop water releases projects in Aral Sea. These volumes (releases in Aral Sea) can't be used for other purposes. Water transport to river deltas and Aral Sea is carried out under permanent supervision of all ICWC members and is topic discussion on each ICWC meeting;

2. Regional basin level – Basin Water Organization **(BWO) «Amudarya», BWO «Syrdarya»**.

Historical experience in system water resources management in Central Asia. Transboundary character of major CAR rivers – Amudarya and Syrdarya – defined necessity of regional water relationships' regulation.

In 1972 Amudarya Delta Irrigation Systems Management Organization (ADISMO). It dealt with construction and reconstruction of irrigation and drainage systems as well as water allocation among republics.

After separation from ADIS structure of provincial water organizations in Khorezm (Uzbekistan) and Dashkhovuz (Turkmenistan) it was re-named as Amudarya Irrigation Canals Management Organizations (AICMO). AICMO is historical predecessor of BWO "Amudarya" as regional water body.

In 1987 it was emphasized in the letter of Minister of Reclamation and Water Resources (MR&WR) of USSR addressed to Governments of CAR states that Amudarya water resources have been practically exhausted. It was noted that situation with water supply to people economy of CAR was exacerbated by lack of common water management bodies and that MR&WR intended for creating in 1987 BWO on water allocation among states. Much more critical situation was observed in 1980-ties in Syrdarya basin.

According to decisions of:

- October (1985) Plenum of Central Committee CPSU;

- CPSU Central Committee and Council of Ministers of USSR of 23.10.1984 №1082 «About long-term reclamation program, increasing of improved lands use efficiency in purpose of sustainable increasing of state fund» and of 17.03.1986 №340 «About measures on speeding up environmental and social development of Karakalpak ASSR»;

- protocol message from Secretary CC CPSU V.P.Nikonov of 17.03.1987.

Within MR&WR system of USSR Syrdarya and Amudarya Basin Administrations were created on 01.09.1987 to carry out water allocation among republics and hydraulic structures' operation with location in Tashken and Urgench, appropriately.

Amudarya and Syrdarya Administrations include appropriately:

- Charjou, Kurgan-Tyube, Urgench, Nukus (Amudarya BA),

- Gulistan, Uchkergan, Chardara, Chirchik (Syrdarya BA),

territorial production Administrations on regulating water resources, operating water diversion structures and waterworks along above rivers.

Amudarya and Syrdarya Basin Administrations created in 1987 are predecessors of BWO "Amudarya" and BWO "Syrdarya".

On 03.12.1987 protocol decision of MAWR of USSR was adopted. It established existing up to date Aral Sea basin surface flow among basin states taking into account traditional and existing water use, land use and designed specific water consumption according to level of full water resources exhaustion form Amudarya (average multiyear data):

In total over Amudarya basin[1] (without Afghanistan) – 61,5 km3 (100%), including:

- Kyrgyzstan: 0,4 km3 (0,6%);

- Tajikistan: 9,5 km3 (15,4%);

- Turkmenistan: 22,0 km3 (35,8%);

- Uzbekistan: 29,6 km3 (48,2%),

including everything below Kerky gauging station – 44 km3, over states:

- Uzbekistan: 22,0 km3 (50%);

- Turkmenistan: 22,0 km3 (50%).

Under water availability lower than designed one water diversions of states reduce proportionally.

In conditions of Amudarya river water availability higher than designed one water surpluses should be accumulated in reservoirs, and only in conditions of very high water availability some water can be passed in Amudarya downstream to improve sanitary-epidemiological situation in areas of Turkmen and Uzbek Priaralie.

Similarly, in total over Syrdarya basin (available for use water resources, water intake limits established by ICWC)[2] – 21,4 km3, including:

- Kyrgyzstan: 0,2 km3 (0,9%)

- Tajikistan: 2,0 km3 (9,3%);

- Kazakhstan: 8,2 km3 (38,3%);

- Uzbekistan: 11,0 km3 (51,5%).

Status of BWO «Amudarya» and BWO «Syrdarya». According to Intergovernmental Agreement[3] BWO «Amudarya» and BWO «Syrdarya» were defined as executive and interdepartmental supervision ICWC bodies and has status of international organization.

According to art.9 of Agreement, BWO «Amudarya» and BWO «Syrdarya» are maintained at the expense of water organizations' allocations based on parity and sharing participation.

By-laws of BWO «Amudarya» and BWO «Syrdarya» were approved by ICWC Decision on 06.04.1992 (Ashgabat), which establish, appropriately - that they carry out

[1] Source: Altiyev T.A. «Basic functions of regional water organizations. Coordination of national interests and basin constraints. Role of international agencies and country-donors in regional cooperation development» (separate printing). – Training Center SIC-ICWC, 2001 - p.3.

[2] Source: Dukhovny V.A. Transboundary water resources and approaches to their problems solution in terms of water right. - Training Center SIC-ICWC, 2001 - p.21.

[3] Agreement between Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan «About cooperation in integrated transboundary water use management and conservation» (art.9), Almaty, 18.02.1992.

water limits supply established by ICWC over Amudarya and Syrdarya basins (pp.3.1), to supply water to people economy and population of concerned states.

In 1992 BWO "Amudarya" included following structural units (p.4.1 of BWO «Amudarya» By-law) Amudarya National Irrigation Canal Management Organization (Urgench, Uzbekistan), Kurgan-tyube (Kurgan-Tyube, Tajikistan) and Charjou (Charjou, Turkmenistan), Nukus (Takhiatash, Karakalpakstan) Waterworks Management Organizations as well as other independent enterprises functioning based on self-financing.

By the moment of BWO "Syrdarya" creation it included following structural units (p.4.1 of BWO «Syrdarya» By-law) Hungerstep Waterworks and Kirov Canal Management Organization (Gulistan, Uzbekistan), Uchkurgan (Andizhan, Uzbekistan), Upper-Chirchik (Chirchik, Uzbekistan) Waterworks Management Organizations, Charvak (Charvak, Uzbekistan) and Toktogul Reservoirs MO (Tashkumyr, Kyrgyzstan) as well as set of self-financing transport, repair-construction units, household in Gulistan and Uchkurgan (Uzbekistan).

Thus, grounds of basin management of transboundary water resources of CAR have strong roots and were put long time before notion "integrated water resources management" (IWRM) became a custom, almost synonym of terminus "complex water resources management" (CWRM). BWO dealt not only with water allocation. They consisted of operational, repair, construction and other organizations that provided effective and integrated water management. In the same time main shortfalls of former approaches to water use planning and management was ignoring of environmental water rights and broad public involvement in water management. In this aspect very negative example and result of applied approaches to water management in CAR is Aral Sea and Amudarya and Syrdarya downstream zone natural disaster.

3. National level. Here and below vertical water management structure is given in context of «Rivertwin» project implementation. Water management vertical is considered in linkage with project investigation objects – three republics (Kazakhstan, Kyrgyzstan and Uzbekistan – project states) and water management organizations (WMO) that are interested in «Rivertwin» project too.

At national level Main Water Agencies carry out water management directly:

- Committee on Water Resources at Ministry of Agriculture (Kazakhstan);

- Water Department at MAWR&P (Kyrgyzstan);

- Main Water Organization of MAWR (Uzbekistan).

Basic functions of Main Water Agencies in project states are briefly presented above (Section 3. Water resources management: institutional structure).

At national level water management hierarchy on vertical includes also structures presented by legislative, executive and other governmental bodies at different levels (within their competence):

- national Parliament, Government, local governments, local self-government bodies;

- number of ministries and departments (National Agencies on natural resources, emergency situations, geology and mineral resources) directly or indirectly related to water management, or concerned about it;

4. National Basin level (Basin Water Administrations):

- Kazakhstan: Basin Water Administrations (BWA);

- Kyrgyzstan: Basin (provincial) Water Administrations (BWA);

- Uzbekistan: Basin Administrations of Irrigation Systems (BAIS).

5. Local level (conditionally[4]: provincial, inter-district and district WMO):

- Kazakhstan: Provincial NSE «Vodkjozes», to which district and inter-district Water System Administrations are subordinated. (WSA).

- Kyrgyzstan: Basin (provincial) Water Administrations (BWA), which command area coincides with provinces boundaries; district Water Administrations are subordinated to them.

- Uzbekistan: Administrations of Irrigation Systems (AIS) as well as Canal Management Organizations, to which district Agriculture and Water Management Organizations are formally subordinated (AWMO);

6. Local (inter-farm, on-farm) level of water management in all project countries is represented by non-governmental institutions[5]:

- water user associations/unions/cooperatives (WUA/WUU/WUC);

- shirkat, private, dehkan farms and their unions.

It should be noted that the respective legislative acts on associations, unions, and cooperatives of water users were adopted in Kazakhstan and Kyrgyzstan[6].

The prerogative of Central Water Agencies (CWR MA in Kazakhstan, MAWR&PI in Kyrgyzstan, and CWA MAWR in Uzbekistan) is water resources management at national, provincial, and district levels. As a rule, at the levels lower than district, district administrations are responsible for water management.

The above-mentioned water management institutions (ICWC, BWO "Syrdarya", Central Water Agencies, Basin administrations and other lower institutions) are authorized to perform water management in respective areas within their jurisdictions (region, river basin, irrigation system, administrative-territorial unit).

5. Water management institutions in the project zone

Presented below is the information on water management institutions by the following CAB's planning units:

- Kyrgyzstan (1 modeling zone/unit): Djalalabad province in the Chatkal river basin;

- Kazakhstan (1 modeling zone/unit): Keles scheme of Shymkent (former Southern-Kazakhstan) province;

- Uzbekistan: (16 modeling zone/units): 15 districts in Tashkent province, which is located in Chirchik-Akhangaran basin and Tashkent city.

In Kyrgyzstan, the project zone is under jurisdiction of Djalalabad (province) Basin water management administration (BWMA). The Administration reports directly to the Ministry of Agriculture, Water Resources and Processing Industries.

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[4] Условно, потому что границы административных делений (области, района) могут не совпадать с зоной командования той или иной ирригационной системы.

[5] Thus, Water User Associations (WUA) in Uzbekistan, as a rule, are, to a larger extent, public institutions established on the basis of former shirkat farms (previously collective and state farms) and report to local (district) administration (khokimiyats).

[6] **1.** Kyrgyz Republic's Law about Unions (associations) of Water Users of 15.03.2002г. **2.** Law of the Republic of Kazakhstan of 08.04.2003 N 404-II about Rural water consumers' cooperative.

The organizational framework of water management in the project zone is as follows (up to planning zone):

1. ICWC of Central Asia;

2. BWO «Syrdarya» at ICWC;

3. Ministry of Agriculture, Water Resources and Processing Industries;

4. Water resources department (WRD) at the Ministry;

5. Djalalabad BWMA at WRD.

This is theoretical scheme of water management hierarchy, from regional down to planning zone levels. At the same time, BWO «Syrdarya» (the second level) does not have waterworks in Djalalabad province and in the Chatkal river channel as a whole.

In Kazakhstan the project zone is under jurisdiction of Aralo-Syrdarya BWMA. National public enterprise (NPE) "Yugvodkhoz", which was established on the basis of Shymkent Provincial Committee for Water Resources in 1999. NPE " Yugvodkhoz" has 7 branches (Turkestan, Sary-Agash, Makhtaaral, etc.), of which Zakh-Keles branch is responsible for water management in Keles massif.

Water management structure in Shymkent province also includes State Public Utility Company (SPUC) «Ontustyk su sharuashylygy», which, despite NPE "Yugvodkhoz", does not control interstate and inter-provincial water structures. The company has 10 district branches (Baidibek, Sairam, Tyulkubas, Toleba, Otrar, Arys, Turkestan, Kazygurt, Saryagash, Shardara).

Keles massif of provincial NPE relates to control zone of Sary-Agash branch of NPE "Yugvodkhoz", while in the area of provincial SPUC it refers to service area of its Kazygurt branch.

Organizational (vertical) arrangement of water management in project zone (down to level of modeling unit, top-down in terms of power):

1. ICWC of Central Asia;

2. BWO "Syrdarya" of ICWC;

3. Ministry of Agriculture, Kazakhstan;

4. Committee for Water Resources (CWR) at the Ministry;

5.1. NPE "Yugvodkhoz", CWR, Ministry of Agriculture;

5.2. SPUC «Ontustyk su sharuashylygy», CWR, Ministry of Agriculture;

6.1. Sary-Agash branch of NPE "Yugvodkhoz";

6.2. Kazygurt branch of SPUC «Ontustyk su sharuashylygy».

In Uzbekistan, the project zone (in Tashkent province) is controlled directly by Chirchik-Akhangaran Basin Administration of Irrigation Systems (CABAIS).

The main tasks of CABAIS are as follows:

- organization of purposeful and rational water use on the basis of market principles and mechanisms;

- implement common technical policy in water sector;

- organization of continuous and timely water supply to users;

- provide maintenance of irrigation systems;

- provide reliable monitoring and accounting of water use, etc.

Main functions of CABAIS:

- surface water management in the basin as whole and in irrigation systems, organization of their purposeful and rational use;

- summarize expected water demands and make proposals on water withdrawal limits;

- set water withdrawal limits for economic sectors, main canals, irrigation systems;

- exercise control over intake and use of water resources, and many other functions.

As of 2004, CABAIS serves more than 386 thousand ha of irrigated lands in Tashkent province. The main water sources are rivers Chirchik, Akhangaran and Syrdarya. Waters from the Chirchik river irrigate more than 300 thousand ha of lands, Akhangaran river supplies water to about 41 thousand ha, and Syrdarya serves about 36 thousand ha. Springs, sais and collectors irrigated 7,7 thousand ha of land.

CABAIS is a part of Central Administration for Water Management (at the Ministry of Agriculture and Water Resources, Uzbekistan) and comprised of 1 Canal Management Organization, 3 Administration of Irrigation Systems and 1 municipal water organization:

1. Tashkent canal management organization;

2. Administration of Bozsu irrigation system (IS);

3. Administration of Parkent-Karasu IS;

4. Administration of Akhangaran-Dalverzin IS;

5. Tashkent municipal water organization.

Main characteristics of the above-mentioned water management institutions in CABAIS are listed below:

1. Tashkent canal management organization serves Parkent-Karasu and Akhangaran-Dalverzin IS's. The command area of Tashkent main canal is 63,1 thousand ha of irrigated lands. Command zones of Parkent-Karasu and Akhangaran-Dalverzin IS's include Akkurgan, Akhangaran, Bekabad, Byka, Pskent and Urta-Chirchik districts in Tashkent province.

The length of canal is 60,4 km. The canal has 25 hydrostructures, including 14 barrages, 8 duckers, and 3 aqueducts. Besides, there are 116 gauging stations (GS), 10 outlets and 9 pumping stations (36 motor pumps).

Tashkent main canal also transports water to Tajikistan (discharge of up to 1 m^3/s).

2. Bozsu irrigation system (IS) serves Kibrai, Tashkent, Zangiata, Yangiyul and Chinaz districts in Tashkent province.

Command irrigated area of the system is 93,9 thousand ha.

Bozsu IS includes 12 inter-district (the total length – 313 km) and 141 inter-farm canals (676 km). There are 402 hydrostructures in those canals, including: barrages - 366, duckers - 15, aqueducts - 21. There are also 856 gauging stations, 801 outlets, 54 pumping stations (130 motor pumps).

There are 171 primary water users in total in IS, of which: agriculture - 75, fishery - 2, communal services - 12, industry - 53, power engineering -1, other water users – 28.

Bozsu IS transports also water to Kazakhstan via Verhniy Tashkent canal (VTC) and Severniy Tashkent canal (STC). In turn, Kazakhstan supplies water to 16,9 thousand ha of irrigated lands in Tashkent and Kibray districts, Tashkent province via Zah and Khanym canal and Big Keles main canal (BKMC).

3. Parkent-Karasu IS serves Akkurgan, Akhangaranm Bostanlyk, Kuyi-Chirchik, Parkent, Urta-Chirchik, and Yukori-Chirchik districts.

Command area of Parkent-Karasu IS is 14,6 thousand ha of irrigated lands.

Parkent-Karasu IS has 7 inter-rayon (252,2 km) and 146 inter-farm (1096 km) canals. The canals are provided with 385 hydrostructures, including: barrages - 294, duckers - 49, aqueducts - 42. There are also 878 gauging stations, 852 outlets, 30 pumping stations (129 motor pumps).

There are 149 primary water users, of which: agriculture - 88, fishery – 5, communal services - 2, industry - 20, power engineering – 3, and other water users - 31.

4. Akhangaran-Dalverzin IS serves 83,6 thousand ha of lands in Akkurgan, Akhangaran, Bekabak, Buka, and Pskent districts, Tashkent province.

IS consists of 15 inter-district (161 km) and 104 inter-farm (723 km) canals.

The canals are provided with 321 hydrostructures, including: barrages – 256, duckers - 43, aqueducts - 22. There are also 952 gauging stations, 927 outlets, 41 pumping stations (119 motor pumps).

Amount of primary water users is 71, including: agriculture - 59, fishery - 1, communal services - 2, industry - 4, power engineering – 2, and other water users - 3.

Akhangaran-Dalverzin IS also transports water to irrigated areas in Tajikistan.

5. Tashkent municipal water organization (TMWO) serves 7350 ha of irrigated lands in city Tashkent. The organization operates 3 inter-district (15 km) and 34 inter-farm (111 km) canals. Those canals have 107 hydrostructures, of which: barrages - 32, duckers - 75. There are also 35 gauging stations and 22 outlets.

Organizational (vertical) arrangement of water management in project zone (down to level of modeling unit, top-down in terms of power) is as follows::

1. ICWC of Central Asia;

2. BWO “Syrdarya” of ICWC;

3. Ministry of Agriculture and Water Resources of Uzbekistan;

4. Central Water Management Administration (CWMA) at the Ministry;

5. Chirchik-Akkhangaran Basin Administration of Irrigation Systems (CABAIS) at CWMA;

6.1. Tashkent canal management organization;

6.2. Administration of Bozsu irrigation system;

6.3. Administration of Parkent-Karasu irrigation system;

6.4. Administration of Akhangaran-Dalverzin irrigation system;

6.5. Tashkent municipal water organization.

6. Interstate water objects in project zone

In Chirchik-Akhangaran basin, BWO "Syrdarya" operates 5 big head intake structures located at interstate canals (such as Levoberejniy Karasu; Big Keless main canal; Zah; Khanym; Parkent), gauging stations in these canals, head canal reaches up to gauging stations and controls:

- Chirchik river section from Charvak waterworks dam to Gazalkent waterworks,

- Intakes from diversion canal in section from Gazalkent waterworks to Akkavak HEPS,

- Intakes from canal Boz-su from Akkavak HEPS -1 to Nijne-Bozsu HEPS,

- Chirchik river section from Gazalkent waterworks to Verhne-Chirchik waterworks,

- Chirchik river section from Verhne-Chirchik waterworks to the point, where the Chirchik river inflows into the Syrdarya river.

At the same time, BWO "Syrdarya" is not a full-right "master" of the basin. Thus, recommendations of BWO on operating regime of one of the largest in Uzbekistan Charvak reservoir are of voluntary nature. Charvak reservoirs and other waterworks with power generation functions are under control of the Ministry of Power Engineering in Uzbekistan.

7. Water resources management system: problems faced and shortcomings

Owing to attention of the Heads of Central Asia to water and environmental problems faced in the Aral Sea basin and practical efforts of ICWC, relatively high stability of water management was ensured for transboundary rivers Amudarya and Syrdarya despite predictions of some analysts about probable "water wars" in CAR.

Establishment of ICWC in Central Asia according to the Agreement between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan "About cooperation in joint management, use and conservation of water resources from the interstate sources" (Alma-Ata, 18.02.1992) and of executive bodies of ICWC, such as BWOs "Amudarya" and "Syrdarya" (Ashgabat, 06.04.1992) and SIC ICWC (Bishkek, 05.12.1993) was an important step for preservation of the status quo in water management in the region. According to this Agreement, water allocation between the states is based on Water Use and Protection Master-Plans (WUPMP) developed in 80-ties for the river basins Amudarya and Syrdarya.

ICWC is responsible for general governance of the regional water-management system.

At the same time, a number of objective and subjective factors prevent ICWC and its executive bodies, particularly BWO "Syrdarya", from both execution of their mission in full and their mandate for solving problems related to transboundary water management. Analysis shows the following main destabilizing factors for water-related development in CAR:

- *water allocation principles reflected in the basin Master-Plans*. Different viewpoints of the states regarding water allocation may become the key problem in interstate contradictions. The Master-Plans were approved and the established water withdrawal limits and the earlier adopted documents on regional water management were confirmed by CAR states in Agreement of 1992 (Alma-Ata). Kazakhstan and Uzbekistan recognize the established interstate water allocation, while Tajikistan and Kyrgyzstan consider it unfair;

- *neglecting of ecosystem needs in WUPMP*. Additional water volumes are needed for restoration and preservation of ecosystems in Syrdarya (and Amudarya) downstream. Those volumes should be determined and agreed by the states for various water- availability conditions. In fact, downstream ecosystems receive their water shares only in high-water

years using the leftover principle or under force majeur (high floods, insufficient upstream reservoir capacities);

- *absence of agreed by the states quotas and quality standards for water releases to deltas of the Amydarya and the Syrdarya and to the Aral Sea*. This is very topical since the whole amount of available water resources in the region is allocated;

- *operation regimes of large reservoirs in the river basins Amudarya and Syrdarya*. Thus, in the Syrdarya River Basin the Toktogul waterworks was designed as multi-purpose reservoir to meet both irrigation and power needs. Recently, Toktogul has been operated mainly in power-generation regime causing environmental and other difficulties for downstream countries;

- *construction of water facilities having transboundary effect without agreement with riparian countries*. Thus, construction in Uzbekistan of Arnasai hydrostructure system reduced an opportunity of accidental releases from Chardara reservoir. This, in turn, has complicated management of water resources in the Syrdarya River in winter period;

- *plans and deliberations of long-term hydropower development in upstream states – Tajikistan and Kyrgyzstan* (construction of new and completion of already started hydropower stations: Rogun and Sangtuda HEPS's in Tajikistan and cascade of Naryn HEPS's in Kyrgyzstan);

- *uncertainties related to global climate change*. Thus, decrease in glacier and snowfield areas is observed in flow generation zone (Tajikistan, Kyrgyzstan). This would lead to reduction of their regulating capacities and would have considerable impact on annual distribution and amount of river flow.

These issues are still beyond consideration of regional water-management institutions;

- *lack of conflict resolution mechanism* as concerns water use, compensation of damage caused due to breach of Water Allocation Agreements and economic mechanism of interstate water allocation. This is one of the causes of relatively poor water management and of unstable water supply in terms of quantity and quality at interstate level;

- *weak exchange of information* between the states, first, of hydrometeorological information so that to get reliable forecasts on water availability in the sources. This also indicates to poor cooperation among departments that have effect on transboundary water management.

The above-mentioned, as well as:

- *absence of common approaches, directions and programs* for regional economic integration, weak regional cooperation (division of labor);

- *uncertainty regarding assessment of effects from and minimization of damage* caused by transformation of natural hydrological regime in large rivers;

- *poor organization of advanced experience dissemination* in Central Asian countries on transboundary water management;

- *weak public awareness and involvement of civil institutions* at all water-management hierarchical levels, including in decision-making;

- *relatively low capacities of regional water agencies* as concerns monitoring and control of water quantity and quality within area of their jurisdiction;

- *in a number of cases – attempts to solve national problems to the detriment of other countries,*

have negative effect on effectiveness of interstate transboundary water management in Central Asia.

Particular national problems are as follows:

- in a number of cases, as a result of privatization, transfer of a part of unified engineering system of water objects and facilities to the hands of people who have never dealt with irrigated agriculture (Kazakhstan). As a rule, those people become monopolists who make water users get in debt;

- while declaring basin approach to water management, provincial branches of the Central Water Agencies are transferred under jurisdiction of local public authorities and governments (Kazakhstan, Kyrgyzstan) or interactions of basin water-management administrations with district and provincial agricultural and water-management branches remain unclear (Uzbekistan).

- absence of mutual interest in water conservation from the side of water users and water management institutions. This is one of the main causes of low water and irrigated hectare productivities;

- excessive depreciation of capital assets and poor material and technical basis of water-management organizations, further deterioration of water infrastructure as a result of insufficient and unstable financing;

- weak economic basis for regulating relations between water managers and water users, particularly, imbalance between water service cost and agricultural producers' paying abilities;

- early transfer of a number of water-management organizations to self-repayment (Kazakhstan). This leads to weakening of their material and technical basis, deterioration of controlled irrigation and drainage system, and loss of water specialists;

- absence of strong legislative basis for WUAs (Uzbekistan) and, as a result, activities of these water management institutions is not enough efficient and most water users work separately (all project countries);

- lack of monitoring, primarily by the public, over water use. Monitoring is especially important during transition period, when changes take place in agricultural use, ownership, and water management structure;

- less attention paid to nature preservation measures, and, as a result, water shortage and pollution in the states;

- increase of irrigation costs in cost composition of output that sharply reduced the competitive ability of agriculture;

- critical situation regarding provision of population with safe drinking water;

- poor public involvement in water management, weak legal basis for their involvement in water-sector management;

- and many other problems in water-management system,

are related, to a certain degree, to the problems in regional water sector and caused by costs of water management at a national level.

Often water shortage is caused by inequitable distribution of established water limits along the irrigation system, thus creating conflicts between water users located in different parts of hydrographic system. As a rule, river or irrigation system's upstream users use water

above the limits, while downstream users receive less water. Such “distribution” takes place at all levels of water management (from local to regional one) and, generally, depends on water availability.

There is poor exchange of (hydrometeorological, hydrological, etc.) information, which is needed for operational water management at national level (this problem is more acute at the regional level).

Reduced fees for water services, financing of water-management institutions from the state budget, and absence of appropriate sanctions for excess use of water contribute often to low user’s interest in water saving.

One of the acute problems in water management is weak coordination between economic sectors-major water users.

Thus, as a whole, surface waters, including collector-drainage waters are controlled by water-management institutions, groundwater control is under responsibility of the Ministries of Geology, mineral resources, water supply, and sanitation of settlements are governed by local executive governments, ministries of relevant sectors control water supply to and waste disposal from industrial and construction enterprises, nature conservation departments control water quality, and microbiological water control is under jurisdiction of public health agencies. This picture is observed in all project countries (Kyrgyzstan, Kazakhstan, and Uzbekistan).

Many factors considerably influencing national water management are of transboundary nature and caused by costs of water management at the regional level. Particularly, sustainable water management in downstream area of the Syrdarya river, where the Chirchik river flows, depends on both the national water policy in Kyrgyzstan and the coordinated actions of Kazakhstan and Uzbekistan in water management, as well as on observance of “water” discipline by upstream regions.