



**MINISTRY OF
WATER RESOURCES OF
THE REPUBLIC OF UZBEKISTAN**



**UZBEKISTAN
NATIONAL COMMITTEE
ON IRRIGATION AND DRAINAGE**



**AGENCY OF
INTERNATIONAL FUND
FOR SAVING THE ARAL SEA**

IRRIGATION AND DRAINAGE IN REPUBLIC OF UZBEKISTAN PAST PRESENT AND FUTURE



2nd Edition

Tashkent 2022

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UZBEKISTAN: BACKGROUND INFORMATION

Along with Liechtenstein, Uzbekistan is one of the only two doubly landlocked countries in the world. Uzbekistan has an area of 448,840 square kilometers. Uzbekistan lies between latitudes 37° and 46° N, and longitudes 56° and 74° E. It stretches 1,425 kilometers from west to east and 930 kilometers from north to south. Bordering Kazakhstan and the Aral Sea to the north and northwest, Turkmenistan to the southwest, Tajikistan to the southeast and Kyrgyzstan to the northeast, Uzbekistan is one of the largest Central Asian states and the only Central Asian state to border all the other four. Uzbekistan also shares a short border (less than 150 km) with Afghanistan to the south.



Figure 1. Map of Uzbekistan

Uzbekistan is Central Asia's most populous country. Over 35,271 million people live in Uzbekistan (1 January 2022) – about half of total population in Central Asia. Rural population is 50 %. The population of Uzbekistan is very young: 34.1 % of its people are younger than 14. According to official sources, population in Uzbekistan representing more than 130 ethnic and linguistic groups among which Uzbeks comprise a majority (80%) of the total population. Uzbek language is the official state language.

Republic of Uzbekistan administratively encompasses: The Republic of Karakalpakstan, 12 veloyats (provinces), 159 tumans (rural districts), 119 large

and average cities, 114 urban-type settlements, and 1472 villages. Major cities include Andijan, Bukhara, Samarkand, Namangan and the capital Tashkent.

Uzbekistan declared its independence from Soviet Union on August 31, 1991. The Republic of Uzbekistan is a presidential constitutional republic. The government exercises executive power. Legislative power is vested in the two chambers of the Supreme Assembly, the Senate and the Legislative Chamber (Parliament).

The climate of Uzbekistan is arid and sharply continental, with hot and dry summers and short cold winters. The annual amount of precipitation in the flat area ranges from 80-200 mm, and in mountainous areas it reaches 600-800 mm.

In winter, air mass is coming here from the west and north – that is, the initially humid oceanic air from the Atlantic and Arctic zones. On the way across the continent to territory of the country, air mass dries up. Here, in winter season high pressure area is forming, due to cooling of the territory (especially after disappearance of the Aral Sea) and high mountain systems of the Tien Shan and Pamir along perimeter of the region. Due to anticyclonic processes and strong hypothermia within interior region of the continent, we observe during last 20 years that there are very scanty precipitation and low temperatures (up to -30°C) in winter season.

In summer season, meteorological conditions of the country differ significantly. Due to warming up of territory, the Asian maximum is replaced by area of low pressure. Reaching Central Asia, enclosed by the Tien Shan and Pamir mountains, the air becomes dry and hot in summer (the Aral Sea, as before, does not humidify it), the average July temperature here in the last 20 years has been up to 30°C with peaks up to 45°C .

Less than 10% of its territory is intensively cultivated irrigated land in river valleys and oases. The rest is vast desert (Kyzyl Kum) and mountains.

WATER RESOURCES OF UZBEKISTAN

In Uzbekistan, available water supply is formed by renewable surface and underground waters of natural origin, as well as by return water of anthropogenic origin. Water resources are mainly formed in the transboundary river basins.

The Amudarya is the biggest river in Central Asia. Its length from the headwaters of the Pyandzh to the Aral Sea is 2540 km, with a catchment area of 309000 km^2 . It is called the Amudarya from the point where the Pyandzh joins with the Vaksh. Three large right tributaries (Kafirnigan, Surhandarya and Sherabad) and one left (Kunduz) flow into the Amudarya river within the middle reach. Further downstream towards the Aral Sea it has no tributaries. It is fed largely by water from melted snow, thus maximum discharges are

observed in summer and minimum ones in January-February. In terms of sediment the Amudarya carries the highest load of all the rivers in Central Asia and one of the highest levels in the world. The main flow of the Amudarya river originates on the territory of Tajikistan. The river then flows along the border between Afghanistan and Uzbekistan, across Turkmenian territory and then again returns to Uzbekistan where it discharges into the Aral Sea.

In terms of water availability the Syrdarya is the second most important river in Central Asia but the largest in terms of length. From the Naryn headwaters its length is 3019 km, with a catchment area of 219000 km^2 . Its headwaters lie in the Central (Interior) Tien-Shan mountains. The river is known as the Syrdarya after the point where the Naryn joins with the Karadarya. The river has glacial and snow feeding, with a prevalence of the latter. The water regime is characterized by a spring-summer flood, which begins in April. The largest discharge is in June. The main part of the Syrdarya run-off originates in the Kyrgyz Republic. The Syrdarya then flows across Uzbekistan and Tajikistan and discharges into the Aral Sea in Kazakhstan.

Table 1. Total natural river flow by origin in the Aral Sea basin (multiyear flow, km^3/year)

State	River basin		Aral Sea basin	
	Syrdarya	Amudarya	km^3	%
Kazakhstan	2.426	–	2.426	2.1
Kyrgyz Republic	27.605	1.604	29.209	25.1
Tajikistan	1.005	59.578	60.583	52.0
Turkmenistan	–	1.549	1.549	1.2
Uzbekistan	6.167	5.056	11.223	9.6
Afghanistan and Iran	–	11.593	11.593	10.0
Total Aral Sea basin	37.203	79.280	116.483	100

Flow distribution over zones of formation within the states is done with help of GIS technologies. Data presented show (Table 1) that in Kyrgyz Republic – 25.1 %, in Tajikistan – 52 %, in Uzbekistan – 9.6 %, in Kazakhstan – 2.1 %, in Turkmenistan – 1.2 %, in Afghanistan and Iran – 10 % of total surface resources are formed. Thus, it is clear that Uzbekistan very depended from his upper neighbors for water, as well as country has own available water resources less that 20 % of demanded for uses.

The total land area in the Republic of Uzbekistan is 44,892.4 thousand hectares, which are divided into 8 categories depending on the purpose and procedure for using land, including: agricultural land; lands of settlements; lands for industry, transport, communications, defense and intended for other

purposes; lands of environmental protection, health and recreation; lands of historical and cultural significance; lands of the forest fund; lands of water fund; land stock.

Table 2: Socio-Economic Indicators of the Republic of Uzbekistan

Total Area	448,900 km ² , 55th country in the world according to a size of its territory
Population	35,271,276 as of 1 January 2022 (42th in the world); an average density – 74.1 persons per one sq. km. Almost 50% of population is rural
National Currency	UZ Sum (1 USD = 10928,58 UZ SUM; for 30 July 2022) 05.09.2017 – liberalization of currency market.
Gross Domestic Product (GDP)	734,587.7 billion UZ Sum or 69,235.41 billion USD in 2021 Pattern of GDP (2021): Agriculture – 25.0%, Industry – 25.8%, Services – 42.0%, Net taxes – 7.2%
Industry (including Construction)	Total production: UZ Sum 559,081.5 billion (2021)
Agriculture	Total production – UZ Sum 317,781.6 billion (2021), including: the crop sector – 49.9%; livestock sector – 50.1%
Key Agricultural Production	Raw cotton, wheat, vegetables, fruits, grape, melons, silk, astrakhan fur, meat, eggs, and milk
Key Export Goods and Their Share in Export in 2021	Industrial products (26.1%), Gold (24.7%), Services (15.3%), Foodstuffs (8.3%), Chemical production (6.8%), Fruits and vegetables (5.8%), Machinery and equipment (4.2%), other (8.8%)
Key Goods for Import in 2021	Machinery and equipment (32.4%), Industrial products (18.5%), Chemical production (14.3%), Foodstuffs (9.9%), Services (6.8%), Other (18.1%)
Rating in the World Economy	7th place in cotton lint production, 2nd place in astrakhan fur production, 4th place in gold reserves, 7th place in gold extraction, 7th place in uranium mining, and 14th place in gas production
Data Source	The State Committee of the Republic of Uzbekistan on Statistics: www.stat.uz

Agricultural lands belong to fertile lands, are considered the main means of national wealth, agricultural production and ensuring food security of the country. The total area of agricultural land is 20,236.3 thousand hectares, of which arable land is 3988.5 thousand hectares, perennial plantings – 383.1 thousand hectares, fallow lands – 76 thousand hectares, hayfields and pastures – 11028.3 thousand hectares, other lands – 4760.4 thousand hectares.

Due to the arid climate, agricultural production is almost entirely dependent on irrigation, and only about 752,900 hectares (18%) of arable land are rainfed.

WATER NEEDS AND USE IN UZBEKISTAN

The current annual water demand of all sectors of the economy is about 64.2 km³ (see table 3 below). In the long run, the demand for drinking water supply from industry, industry and rural areas will increase, while in irrigated agriculture it will decrease due to water-saving technologies and measures to increase fertility. At the level of 2030, the total required water volume for Uzbekistan should not exceed 60.1 km³ per year.

Table 3. Actual and prospective water consumption (demand) by sectors in Uzbekistan (million m³ per year)

Water consumers (by priority)	Total water requirement	including by source		
		Surface Water	Underground Water	Return Water
2018				
Domestic utilities	5320	2200	3120	0
Industry	1885	855	1030	0
Rural water supply	485	415	70	0
Fisheries	640	460	0	180
Energy	770	770	0	0
Irrigated Agriculture	55100	50000	1100	4000
Total	64200	54700	5320	4180
2030				
Domestic utilities	6200	2450	3750	0
Industry	3500	1580	1920	0
Rural water supply	950	810	140	0
Fisheries	640	460	0	180
Energy	780	780	0	0
Irrigated Agriculture	48000	46800	700	500
Total	60070	52880	6510	680

Source: Scheme for the Integrated Use of Water Resources of the Republic of Uzbekistan until 2027. Consolidated explanatory note. Association "Vodproekt" under the Ministry of Water resources of the Republic of Uzbekistan. Tashkent. 2018.

According to the Basin Master-Plans (Schemes), the limit (quota) of Uzbekistan as a whole for the basins of the Amudarya and Syrdarya rivers is 63.02 km³ / year with a 100% availability. In case of less water availability in dry years, water withdrawal limits are reduced.

The country's total annual water withdrawal in the 1980s was about 66.1 km³. After gaining independence, Uzbekistan clearly shows a tendency to decrease in water consumption and water withdrawal. In particular, during the period 2011-2015, the total water intake amounted to about 53 km³ per year (Table 4). However, in 2016-19 it was at a level of about 55 km³ per year. In the dry year 2021, the water intake was only about 45 km³.

Table 4. Dynamics of actual water withdrawal from rivers (million m³)

1960		1980		1990		2000		2010		2018		2021	
Total	Irrigation	Total	Irrigation	Total	Irrigation	Total	Irrigation	Total	Irrigation	Total	Irrigation	Total	Irrigation
30780	27900	64910	55510	56611	58156	53265	35687	56611	44718	54700	50000	45300	39000

It should be noted that the population of the republic from 1980 to the present time has grown from 15 million people to more than 33.7 million people. As a result of population growth, the specific indicator of water consumption per person significantly reduced.

An analysis of the use of the water withdrawal limit shows that since 2005 Uzbekistan receives water on average 85.0%, and in dry years, like 2008 and 2011, about 70-75% of the total annual limit.

Present-day irrigated farming remains one of the most important economic sectors in Uzbekistan, which provides 15.3% of GDP; but what is the most significant that it is the factor of social stability under ensuring 28% of employment (as of 2018).

Thanks to understanding of the social value of irrigation and the wise state policy in the water sector over years of independence, Uzbekistan has managed to maintain its irrigation potential.

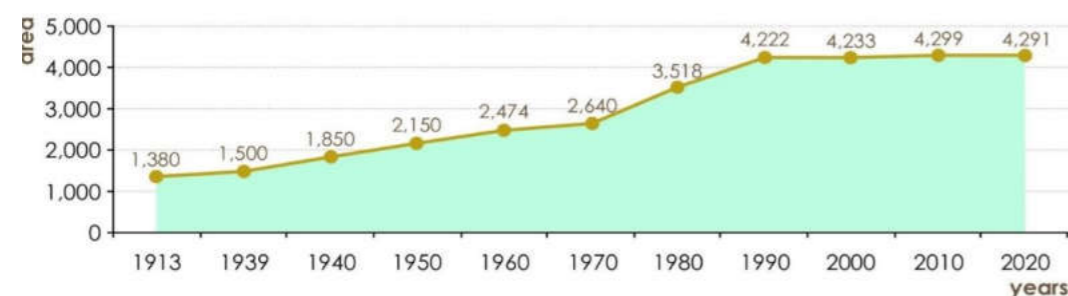


Figure 2. Trends of Irrigation Development in Uzbekistan (area, 000' ha)

IRRIGATION DEVELOPMENT IN UZBEKISTAN BEFORE INDEPENDENCE

In order to understand the value of irrigation for nations of Uzbekistan it is necessary to review, once more, the history of water development.

Archaeological studies testify that ancient spring irrigation along river bed and liman irrigation in the Amudarya and Syrdarya deltas represents the modern irrigation practice in its first stages. Over the centuries the local population was improving the skill of irrigation, water diversion from rivers, and water applications on fields under crops. In Uzbekistan, the folk proverb says: “Where there is water there life exists.” Indeed, in those places where there is water the oases are flourishing, cities are growing, agriculture and industry are in progress, but where there is not water there are only barren deserts.



Figure 3. Remnants of the Ancient Bridge – Water Divider in the Zarafshan Valley (Shodman Malik, the 16th Century AD)

In the Middle Ages, engineering practice of water resources management that included water diversion from large rivers with constructing various water intake structures, cleaning of irrigation canals, water distribution among water users, etc. has arisen in Central Asian oases. All this process was governed by

water professionals (“mirobs”)¹ and at the same time, highly experienced peasants (“dekhkans”) – land users were engaged in the farming practice.

Ruling regimes have always taken care of the water resources management system; and some features of the former approaches can be interesting ones even for present-day water managers. A person who was appointed by the monarch and had special rights and duties (Grand Water Vizier – Chief Mirob) has managed this important economic sector on behalf of the government; and mirobs appointed for managing big irrigation canals, as well as aryk-aksakals (managers of secondary irrigation canals) were directly subordinated to him.

As a rule, water application was made over juyaks (irrigated plots), but some crops such as alfalfa or rice were irrigated by flooding over the levelled parcels of arable land that were bordered by small earth levees for retaining a certain level of water.

When water available in the main irrigation canal and outlets was insufficient for simultaneous irrigation of the whole command area, water delivery into laterals and ariqs was managed according to the principle “mardiqurak” (the local term of water rotation – that means water application in the strictly scheduled time). “Mardiqurak” implied one water application during twenty-four hours (a day plus a night). Such a rigorous measure under distributing irrigation water due to restricted water resources had some positive effects: it raised the standard of discipline because water users had to irrigate their plots in good time with obligatory implementation of nighttime water applications, preventing over-irrigation and land waterlogging.

This measure contributed to sufficiently – economical and rational use of irrigation water. In addition, some of secondary canals and ariqs within the irrigation system were out of operation, in rotation, reducing water losses due to seepage and evaporation.

All works relating to construction, repairing, and cleaning of ariqs and water infrastructure that was necessary for water supply to water users within the local community were being carried out based on public works (“khashars”) with using labor and resources of water users in proportion to their irrigated area under the guidance of a community’s leader (“qosh boshy” in the Zarafshan Valley or “aryk-aksakal” in the Tashkent Oasis).

Legal regulation of water use and irrigation practice, and settling of disputable matters were being implemented based on the Sharia Laws and were the competence of imam-khotibs of mosques or qaziys (Sharia judges). It should be specially stressed that the Islam, as opposed to other world religions, has always paid attention of paramount importance to water-and-land relations.

¹ The word “mirob” originated from the combination of two words: Arabic word “amir” (a manager) and Persian word “ob” (water). Ariq or arik – a tertiary irrigation canal or irrigation ditch in Central Asia



Figure 4. The head structure at the Dustlik (“Friendship”) canal (in the Soviet years, the Kirov Canal. It starts from the derivation channel of the Farhad hydroelectric station. Construction began in 1907 and was completed in 1913)

Apart from legal regulation in the field of water and land use, the Islam successfully inculcated in the mind of its believers the ethic norms of attitude to water that is the sacred gift: God-given gift!

On the rivers with steep slopes and powerful stream, water intake structures were being built using large fractions of rocks. On the rivers with slow flow the bar-rages were being built, on the large rivers, water intake structures had many outlet canals. Sometimes the large dams were erected.

A chigir (Persian wheel) was the most widespread water-lifting device that could lift water up to 4 m high and even higher. When water was being lifted from deep ariqs the water-lifting wheels were turned by draft animals. By 1917 only in the low reaches of the Amudarya River the number of chigirs has amounted to more than 60,000 that were in operation till the 1930s; and some of them were preserved up to the present time.

General costs of the Russian tsarist government for capital irrigation works in Turkestan over the period of 35 years of the colonial rule amounted to only 36.5 million Roubles. In total, 80,000 hectares were irrigated over this period.

A notable official of the tsarist government, Prince V. I. Masalsky, who has directly governed the process of irrigation in Turkestan, wrote: “During our rule in Central Asia we made quite a lot for this region, but, as fate has willed, our activity almost did not touch its key need – legal normalization of water use. The Russian government that faced the vast water sector with the time-

honored governing system in the region has considered it is impossible to interfere in this unfamiliar business and has delegated responsibility for organization of water use to the local population.”

In early XX, two surveys over irrigated cotton land were undertaken in Turkistan: by senator, count K.K.Palen (1907), who estimated 1,472,000 desyatinas² of irrigation; and, by Prince V.I.Masalsky (1912), who made estimation of 1,955.000 desyatinas of irrigation. In 1916, 534,000 hectares were sown with cotton, while in 1922, cotton occupied only 42,700 hectares. In 1922, the areas under cotton amounted to only 42,700 hectares³.

In 1925, after implementing the water-and-land reform in Uzbekistan, intensive rehabilitation of agricultural sector has started. In December 1925, the Central Executive Committee of the Uzbek Soviet Socialistic Republic approved Decrees on the nationalization of land and water and declared land and water reform. The reform has led to dramatic transformations in rural structure by the end of 1928. The share of “peasants of average means” increased up to 61% of rural population through “privatization”. More than new 500 collective farms were established, and administrative-command political leverage of new regime has become the main incentive of production for the farmers.

Due to irrigation works implemented over this period, the area of irrigated lands has reached level of 1913 by the beginning of 1928. Construction of large number of big irrigation canals and water-works in Tashkent, Fergana, and Samarkand provinces has allowed to develop additionally more than 72,000 hectares and to increase the total area under cotton in Uzbekistan up to 468,000 hectares.

The Ravatkhodja weir on the Zarafshan River was one of the largest waterworks in that time. Construction of this dam provided guaranteed water diversion for the upper part of Zarafshan Valley. Introduction of new integrated methods of irrigation construction was started under developing the irrigated scheme in the Dalverzin Steppe (construction works were completed in 1932). The Dalverzin Main Canal (flow rate of 35 m³/sec), as well as the intensive irrigation and drainage networks were built creating conditions for irrigation developing of first 24,000 hectares in the Dalverzin Steppe.

In 1932 due to large-scale irrigation construction, 112,000 hectares of virgin lands were developed with setting up cotton-growing state farms. Significant works aimed at rehabilitation and modernization of existing irrigation systems such as the Narpay Canal in the Zarafshan Valley and the Lower-Khan Irrigation System in the Angren-Chirchik river basin were being implemented along with construction of new irrigation systems.

² desyatina is an archaic land measurement used in tsarist Russia – is equal to 2.702 English acres or 10,926.512 square meters

³ “Water in Central Asia: Past, Present, Future”; Victor A. Dukhovny, Joop de Schutter



Figure 5. The Ravatkhodja Hydrostructure on the Zarafshan River

At the beginning of the 1930s, such large-scale land reclamation objects as the Sarykul system of collector-drains (a tail flow rate of 60 m³/sec), Assakin escape structure (a carrying capacity of 150 m³/sec), drainage networks in Bukhara and Khorezm provinces were built. Reconstruction of the Shakhrud irrigation system in Bukhara Province was of great economic and social importance: as a result of this activity not only the land reclamation conditions were improved over the area about 100,000 hectares but also malaria foci were annihilated.

Since 1932, Uzbekistan has become the main cotton supplier (over 60%) in the USSR. As compared to 1913, cotton area expanded twofold, from 432,500 hectares to 876,400 hectares in 1937, whereas gross output increased threefold and amounted to 1.5 million tons. Consequently, this demanded increased water supply.

In spring of 1939, thousands of dekhkans were mobilized for irrigation works in the Lyagan Steppe in the Fergana Valley. Works were simultaneously started along the whole 32-km route of the Lyagan Canal. Construction was completed during 17 days instead of one year according to the project schedule. Earth works amounted to 293,000 m³. Remarkable initiative of Fergana dekhkans was taken up in all provinces of the republic. Thanks to the method of so-called People’s building works, 46 irrigation canals 454 km long in total (2.5 million m³ of earth works) were built.

In autumn of 1939, during the unprecedentedly-short period (45 days), Uzbekistan’s dekhkans have built the Great Fergana Canal 270 km long with a

carrying capacity of 100 m³/sec for transfer of water from the Naryn River abounding in water via the Qoradaryo River to the system of streams Shaarikhan-say, Isfaramsay, Sokh, and Isfara, where water users often faced water shortage.

The Great Fergana Canal is the main canal that along its route crosses the existing irrigation, drainage, and road infrastructure, as well as the railway. The 365 water structures were built along the canal's route. Putting the Great Fergana Canal into operation enabled the water authorities to irrigate about 100,000 hectares of virgin lands.

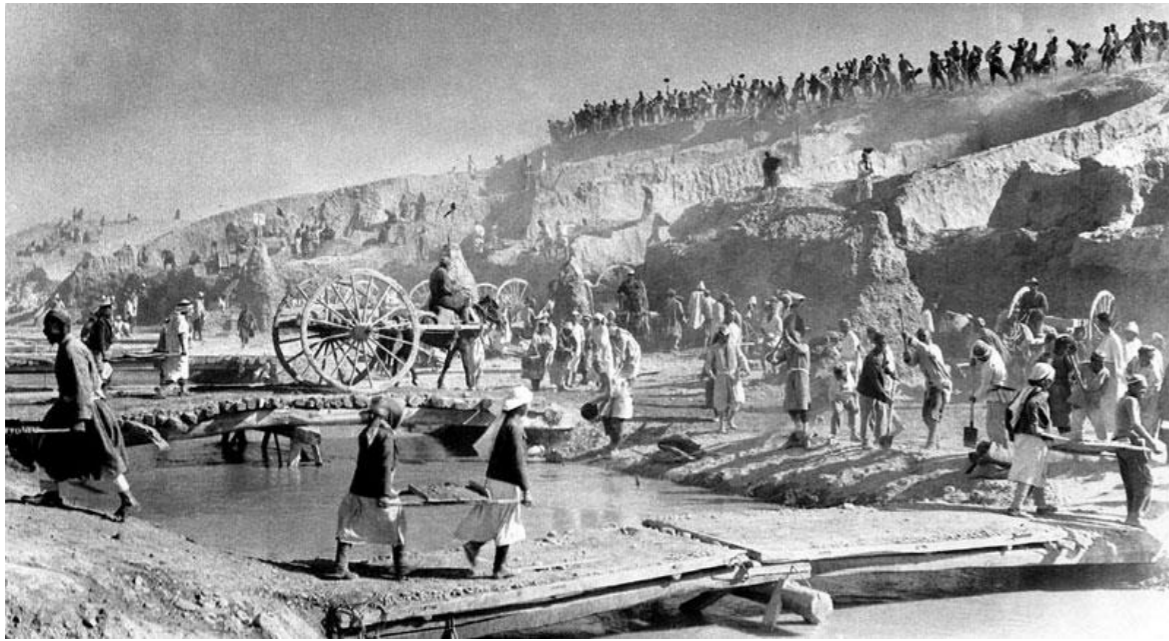


Figure 6. Thousands of dekhkans were mobilized for construction of the Great Fergana Canal in autumn of 1939 (discharge 100 m³/sec, length 270 km. It was constructed during the only 45 days by “khashar” method)

In 1940, using the experience of public works in the Fergana Valley, the similar irrigation canals were built including the North Fergana Canal, South Fergana Canal, Tashkent Canal, Tashsaka Canal in Khorezm Province, the Lenin Canal in Karakalpakstan, as well as the large Kampyravat Hydroscheme on the Qoradarya River.

In Uzbekistan, during the Second World War (1941 to 1945), works aimed at irrigation of waste land within boundaries of collective farms were implemented for cultivating cereal crops, vegetables, and watermelons. Based on the method of People's building works, the Farkhad dam was built, and later on it allowed starting development of virgin lands in the Golodnaya Steppe (Hungry Steppe). The North Tashkent Canal and Upper Tashkent Canal were also built in a short space of time.

In postwar years, all national resources were directed on further developing the national economy. Construction of the Kattakurgan Reservoir with the storage capacity of 600 million m³ on the Zarafshan River was completed, and this measure allowed improving water availability for irrigation in Samarkand Province and developing virgin land for further raising of the rate of cotton production. In addition, due to construction of hydroschemes with dams on the rivers and head regulators on main irrigation canals, the system of small scattered water intakes was eliminated. The Sarykurgan weir on the Sokh River (the command area of 120,000 hectares) can be referred to such hydroschemes.

In Tashkent Province the following works were implemented: construction of the North Tashkent Canal was completed; reconstruction of this canal with erecting three reinforced concrete culverts under the channel of the Angren River and constructing the system of in-channel dams; the Iskander Canal was widened and lengthened for water supply through the bypass gallery of the Chirchik Hydropower Plant, and Tyubuguz Reservoir on the Angren River with a storage capacity of 260 million m³. For improving irrigated land condition and disposal of waste irrigation waters and brackish groundwater into the natural water receivers – the North-Bagdad Collector-Drain the ramified drainage system was built in Fergana Province (earth works exceeded one million m³).

In the Fergana Valley, the headwork of the Great Fergana Canal and Kuyganyar Dam were reconstructed, and moreover, the headworks of the South Fergana Canal were upgraded.



Figure 7. The Great Fergana Canal today

Since 1956 Uzbekistan passed from irrigation of small-scale areas towards integrated development of huge tracts over virgin land (up to hundreds of thousands of hectares per year) located mainly in desert and semi-desert unpopulated regions of the republic with severe climatic conditions. The key priority was given to the zonal irrigation developments within the main oases of the country.



Figure 8. Pumping hall of the Babatag Pumping Station in Surkhadarya province

THE CURRENT IRRIGATION AND DRAINAGE SYSTEMS IN UZBEKISTAN

In Uzbekistan, a total length of the inter-farm and on-farm irrigation networks amount to 27,868 km and 154,957 km, respectively. 60 percent of inter-farm canals and 77 percent of on-farm canals have an earth (not lined) channel.



Figure 9. “Kampirravot” dam built on the Karadarya river. It was designed in 1962 and was completed in 1968-1982. The total length 1020 m. Dam is massive concrete with double buttresses-875 m. Maximum height 115 m.

The area of more than 2.2 million hectares is irrigated by pumps that consume electricity of 7,5 billion kWh a year. The following examples show a scale of pumping irrigation: the Karshi Pumping Cascade lifts 200 m³/sec of water up to 157 m essentially for irrigation of 335,000 hectares in the Karshi Steppe; a cascade of pumping stations along the Amu-Bukhara Canal lift 216.4 m³/sec of water up to 115 m for irrigation of 315,000 hectares. The Ministry of Water Resources is funding operation and maintenance of 1687 pumping stations where 5284 pump units with total annual capacity of 59.6 billion m³ of water.

Over 27,400 water structures and 19,700 gauging points were built on main and inter-farm irrigation canals, and there are over 73,200 water structures and 61,000 gauging points on the on-farm network. As a whole, the main and inter-farm irrigation canals were sufficiently equipped with waterworks.

More than 143,300 km of the drainage network including 33,675 km of main, inter-district and inter-farm collector-drains and 72,144 km of on-farm drainage network (including 36,740 km of subsurface drains) were built on the irrigated area of over 3 million hectares. There are 7,871 tube-wells including 3,802 drainage tube-wells and 4,069 tube-wells for irrigation in the operations by the Water Ministry.

55 big (with capacity more 10 million m³) water reservoirs are under operation recently in Uzbekistan. Reservoirs regulate the regime of natural river flow, making it favorable for economic use and promoting the increase of irrigated areas and their water availability. A total storage capacity of all reservoirs exceeds 21,4 km³ including about 17,4 km³ of an active storage of water.



Figure 10. Takhiatash hydrostructure on the Amudarya river in Karakalpakstan (the biggest water weir in Central Asia completed in 1974) – capacity more than 11000 m³/sec

Most of reservoirs have been built more than 30 years ago. Over the period of their operation all reservoirs were subjected to sedimentation that has led to loss of initial active storage almost on 20 to 35 percent.



Figure 11. Charvak water reservoir (Tashkent province) in winter

ACTUAL ISSUES OF THE WATER SECTOR IN UZBEKISTAN

Only 9.6% of total runoff of transboundary rivers in the Aral Sea basin is formed within Uzbekistan. In other words, Uzbekistan is quite dependent from other riparian countries from the point of view of available water resources.

The existing reality of interstate relations in Central Asia is directly related to the global political processes that take place after disintegration of the USSR in 1991. New conditions predetermine both the freedom of choice of further ways for development of the world politics' entities and the exclusive complicacy of this choice. At the same time, the independence has granted a chance to look at the surrounding world by "other eyes." Recognizing the fact that the global security depends on joint efforts in elaborating the ways of sustainable development by most of nations has become one of advantages inherent in the new system of international relations.

In 2007, Uzbekistan has joined to the international conventions: "Convention on the Protection and Use of Transboundary Watercourses and International Lakes" (coordinated by the UN Economic Commission for Europe, it was adopted in Helsinki in 1992 and entered into force in 1996) and "Convention on the Law of Non-navigational Uses of International Watercourses" (adopted by the United Nations on 21 May 1997 and entered into force in 2014). This fact confirmed Uzbekistan's respect and commitment to the principles of the international water legislation, as well as principles of those Conventions can help to resolve water issues in the region.

In September 2017, at the 72nd Session of the UN General Assembly the President of Uzbekistan H.E. Mr. Shavkat Mirziyoyev said: *"The issue of shared water resources is key for security and stability in Central Asia. I am sure that there is no alternative to addressing the water problem other than considering the interests of all countries in the region,"* and then continued: *"A peaceful and economically prosperous Central Asia is our most important goal and key task. Uzbekistan is determined to engage in dialogue, constructive interaction and strengthening the good-neighborliness. We stand ready for reasonable compromises with the countries of Central Asia on all issues without exception."* The Head of Uzbekistan has set that addressing of shared water use issues in the region is to be one of priorities for foreign policy of Uzbekistan.

Uzbekistan and drought risks

The Republic of Uzbekistan was the first of all states in the Asian region and the CIS to ratify the United Nations Convention to Combat Desertification (UNCCD) and took an active part in all stages of its preparation. In 1995

Uzbekistan joined this Convention (Resolution of the Oliy Majlis (Parliament) of Republic of Uzbekistan # 125-I from 31.08.1995 “About Ratification of the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa”).

In accordance with the policy of the Government and in fulfillment of the priority obligations assumed under the Convention, in 1999 the Republic of Uzbekistan developed a National Action Program to Combat Desertification (NAP). The NAP advocated action on three priority areas to combat land degradation:

- (i) prevent or reduce the scale of land degradation;
- (ii) restore partially drained lands; and
- (iii) reclaim lands affected by desertification.

The NAP was however weak in policy and programmatic content. The NAP process received some funds and technical support from the United Nations Environment Programme (UNEP) for its preparation, and from the United Nations Development Program (UNDP) and the Government of Finland for its implementation, mainly for the purpose of organizing awareness building workshops. However, substantive implementation of UNCCD/NAP activities were constrained by lack of adequate funds from budgetary sources.

In the end of 2017, there was organized a special observation the general opinion about issues related to drought in Uzbekistan. During the study, the following stakeholder groups were interviewed: farmers, farmers councils, water consumer associations, rural advisory services, national agricultural banks and insurance companies, local administrations, the Ministry of Agriculture and Water Resources, the Ministry of Emergency Situations, Uzhydromet, research institutes, agricultural universities and international partner organizations. Based on the survey results, key policy measures in the field of drought risk mitigation in Uzbekistan were identified:

- the need to improve the efficiency of water resources use by cleaning, repairing and maintaining irrigation and drainage systems;
- introduction of drought-resistant varieties of agricultural crops;
- introduction of water-saving technologies for irrigation;
- helping farmers to enter new markets, including ensuring access to insurance against drought risks.

Over the past two decades, Uzbekistan has experienced several extreme hydrological droughts that have resulted in between 50% and 75% of crops killed in drought-impacted areas (FAO, 2017 <http://www.fao.org/3/a-i6738e.pdf>).

The drought has had a significant negative impact on the livelihoods of the population and food security and is a serious risk to the country's economy. According to available data, during the drought of 2000-2001, the production of cereals decreased by 10%, cotton – by 17%, rice – by 60%; drought damage

is estimated at about USD 130 million (World Bank, 2005 <http://hdl.handle.net/10986/8724>).

According to surveys, the absolute number of farmers (94%) in Uzbekistan experienced drought-related shocks.

According to the Third National Communication of the Republic of Uzbekistan on climate change [https://unfccc.int/sites/default/files/resource/TNC_Uzbekistan_under_UNFCCC_rus.pdf]:

The increase in average annual air temperatures in Uzbekistan occurs against the background of high natural variability, which causes significant interannual fluctuations.

The highest rates of warming are observed in the north of the republic and in large cities (0.30-0.43°C for 10 years), the lowest in the mountain zone (0.10-0.14°C for 10 years).

The average warming rate in Uzbekistan was 0.27°C over 10 years.

According to the UNEP for Uzbekistan the aridity index is 0.65 – it means that territory of Uzbekistan is under influence of air and soil droughts, which are basis for ecosystems degradation and desertification processes.

On February 2019 President of the Republic of Uzbekistan approved the special Resolution # PP 4204 “On measures to improve effectiveness of work to combat desertification and drought in the Republic of Uzbekistan”. By this resolution it was stated:

“In order to improve the efficiency of work to combat desertification, restoration of degraded land, and ensuring the effective implementation of international obligations Republic of Uzbekistan related to the UN Convention to Combat Desertification to allocate to the State Committee of the Republic of Uzbekistan for Forestry additional functions, including implementation of functions as the National authorized body (focal point of the Republic of Uzbekistan) responsible for fulfilling the requirements of the Convention”.

In April 2022 Ministry of Water Resources in cooperation with the State Committee of the Republic of Uzbekistan for Forestry conducted special workshop to discuss the necessary steps to develop a National Drought Management Plan 2023-2030 with involvement representatives of all interested ministries, research institutes and non-governmental organizations. As a result, recommendations were given on the content of the national plan, namely:

The first priority area is capacity development for monitoring, risk assessment and drought prevention: strengthening the technical base of the Hydrometeorological Service and introducing innovative solutions for drought monitoring and forecasting; development of a drought monitoring and early warning system that will improve the decision-making process for planning and managing risks regarding the impact of drought on food and water security.

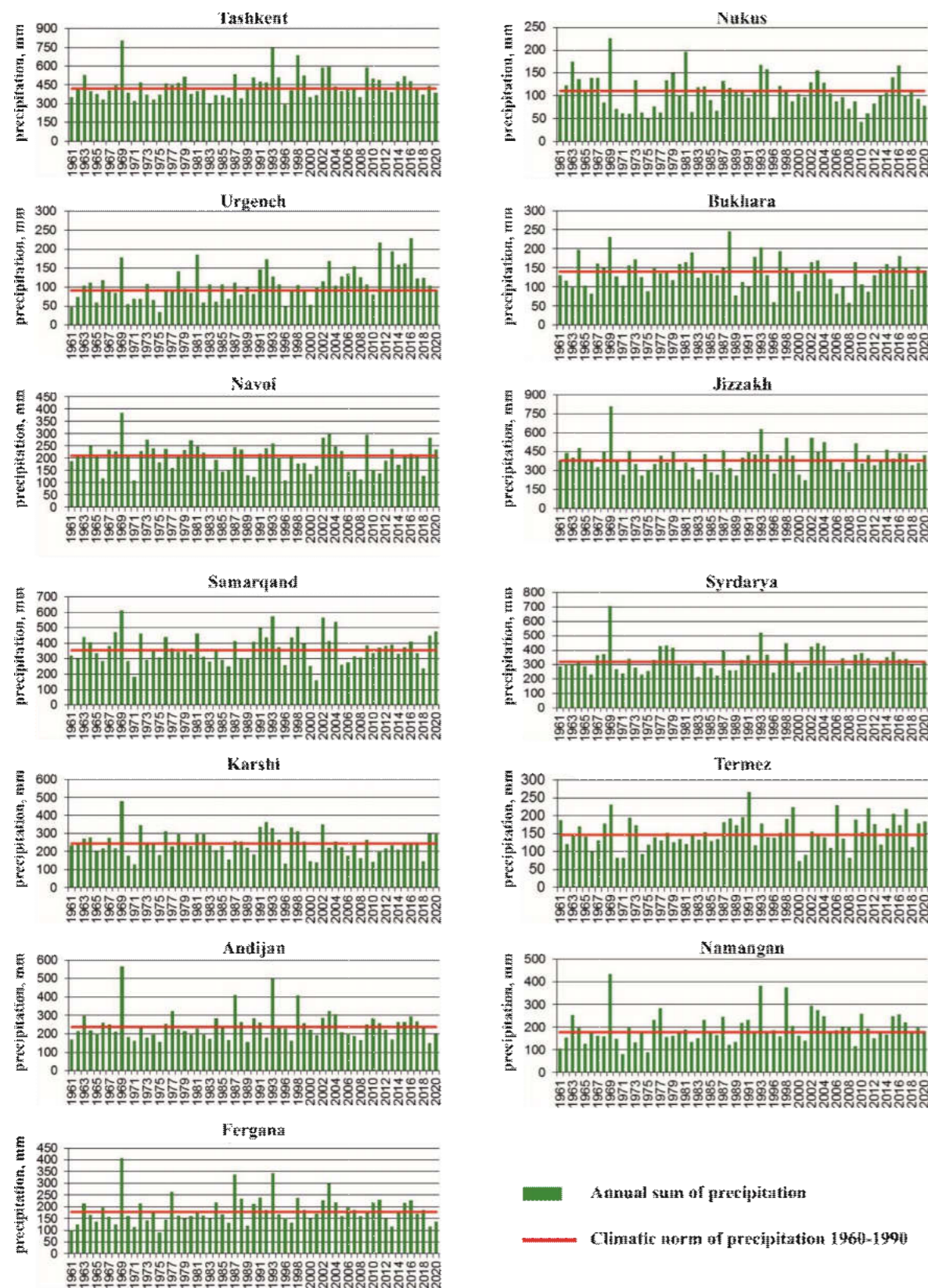


Figure 12. Long-term changes in annual precipitation in the provincial centers of Uzbekistan (<https://hydromet.uz/ru/node/41>)

The second priority is drought mitigation. This includes the development of measures to address water scarcity issues based on monitoring and early warning data: the degree of expected low water and drought (a set of indicators) is a criterion for the adoption of certain action plans to mitigate the effects of the expected drought.

The third priority area is capacity building and awareness raising: it is important to raise the awareness of the rural population (including women) about climate change adaptation and effective agricultural practices.

The fourth priority area is to actively develop regional cooperation: given the transboundary nature of the effects of drought, cooperation between the countries of the region is extremely important.

LAND RECLAMATION ISSUES

The current conditions of irrigated lands and irrigation and drainage systems restrain the further growth of crop productivity and incomes of rural commodity producers. Lack of the integrated and systematic approach under developing the land reclamation projects and reliable sources of their financing, as well as insufficient activity of water management organizations and water users associations has led to reducing the scope of reclamation works and to the rise of groundwater table and salinity on the irrigated fields. As a result, in 2007 over half of irrigated lands in the republic were affected by salinization to the different extent; at the same time, condition of over 16% of irrigated lands in the private farms was unsatisfactory.

In October 2007, the First President of the Republic of Uzbekistan Mr. Islam Karimov has signed the decree on formation of the Fund for Reclamation of Irrigated Lands in the framework of the Ministry of Finance.

At the expense of the Fund for Reclamation of Irrigated lands a large quantity of earth- moving machinery (bulldozers, excavators, etc.) was purchased using these funds. About US\$ 110 million annually Fund allocated for implementation of the Irrigated Land Reclamation Program.

President of the Republic of Uzbekistan Shavkat Mirziyoyev signed on 27th November 2017 Decree on the state program for irrigation development and irrigated land reclamation over the period 2018 to 2021. This document stipulates construction and modernization – through the Reclamation Fund – of 2,227 km of collector-drainage network and 238 vertical drainage wells, as well as repair of 34,800 km of collector-drainage network and 1,087 vertical drainage wells.

On 8th April 2021 the Cabinet of Ministers adopted Resolution No. 190 “On additional measures to organize the work on reclamation of agricultural land.” By this document it was established:



Figure 12. The Main South Drain Collector under construction in Karakalpakstan

- Land reclamation (leaching of the soil) is carried out by land reclamation expeditions of the Ministry of Water Resources in a timely manner and in accordance with the standards developed on the basis of scientifically based recommendations;
- Land reclamation measures are carried out at least once every three years;
- Water intake for reclamation is carried out within limits (quotas) for water intake allocated in accordance with an agreement with organizations providing services – users, accounting and reporting on water is kept;
- It is not allowed to discharge water supplied for melioration back into the collector-drainage network;
- In accordance with the requirements of Article 442 of the Tax Code, water users must be taxed for use of water in accordance with established procedure in case of excess water intake for melioration.

The Regulation on procedure for preparing agricultural land for leaching and organizing land reclamation was approved, which includes:

- land reclamation planning;
- procedure for carrying out land reclamation work in accordance with established standards;
- procedure for use and accounting of water.

In accordance with the Regulations, by October 1 of each year, the Ministry of Water Resources approves water withdrawal limits for user organizations that provide services based on real availability of water resources. Then, until October 20, water use and water consumption plans are drawn up, as well as relevant agreements with agricultural clusters, farms and other organizations growing agricultural products based on water withdrawal limits (quotas).



Until November 1 of each year, reclamation cadastral documents for the regions are developed by reclamation expeditions of the Ministry of Water Resources. Until November 20, water consumers develop plans for preparing lands for reclamation in accordance with recommendations issued to them and water consumption plans.

THE ARAL SEA CRISIS

The Aral Sea, which was unique, beautiful and one of the largest inland water bodies in the world, almost ended up on the verge of a complete extinction, spelling unprecedented disaster and irreparable damage to the life of the more than 80 million people living here today, to the ecosystem and biodiversity of the Aral Sea and adjacent territories.

The Aral Sea with its significant water surface (over 69.790 km²) and water volume about 1080 km³, served until the mid-1960s as a climate control reservoir and mitigated sharp weather fluctuations in the Central Asian region. Coming to the region, mainly from the west, the air masses warmed up in the winter, and cooled in the summer over the water area of the Aral Sea. Due to this temperature regime, the moisture, carried by air currents, fell out as precipitation over the mountains of Tien Shan and Pamir in the autumn-winter period, replenishing snow cover and volume of the glaciers.

Since 1960, in connection with the intensive irrigation and hydropower development in the Aral Sea basin, the total water consumption in the Amudarya and Syrdarya basins began to increase rapidly due to regulation and irretrievable withdrawal of surface runoff: 7.7 km³ / year in 1961-1965; 17 km³ / year in 1966-1970; 30 km³ / year in 1971-1975 and up to 50 km³ / year or more at the end of the 80s. Thus, since 1960, the negative water balance of the sea has become the norm and, from 1970 to 1990, the annual balance deficit exceeded 30 km³. The formation of such big deficit in the sea balance is also largely due to climatological factors – in the seventies the water formation in

the Amudarya and Syrdarya rivers was 20-25% lower than normal and the total renewable water resources of the Aral Sea were 20-25 km³ / year less than before.

The Aral Sea was divided into the North and South in 1989 as a result of lowering the water level and drying out of the Berg Strait. By the end of the 1990s, the Great (Southern) Aral Sea turned into a hyperhaline (salt) reservoir. Salinity in 1997 was 57‰ (ppm). In 1997, Barsakelmes island was connected to land, in 2001 – Vozrojenie island too.

In 2003, the South Aral Sea was divided into eastern and western parts, which were connected by a narrow strait Uzun-Aral, located at an altitude of 29 m. This location does not allow the mixing of water from two reservoirs. In 2004, the small lake Tuschibas, which was previously the eponymous Gulf of the Aral Sea, was separated from the Eastern part. In 2005, the Small Aral Sea was cut off from the Great Sea by the Kokaral dam – in Kazakhstan. Both water bodies were finally disconnected.

The Kokaral dam, which blocks the Berg Strait in between the North Aral Sea (Small Sea) and the South Aral Sea (Big Sea), was designed to regulate the water level in the Small Sea. The length of the dam is 13,034 m, the width is up to 100-150 m. The height of the dam crest is 6 m (45.5 m abs), the filling of the Small Sea is supposed to reach 42.2 m abs. A structure with nine spillways to discharge of 600 m³ / s was built on the dam to release excess water.

Today, the surface area of the remaining parts of the Aral Sea is less than 10% of the area in 1960. It is distributed between three reservoirs – the Western Sea with an area of 2.35 thousand km², the Eastern Sea with an area of 0.5 thousand km², and the Small (Northern) Aral – with an area of 3.13 thousand km². Accordingly, the volume of water decreased by almost 15 times.

The Aral Sea - in the Past and Today

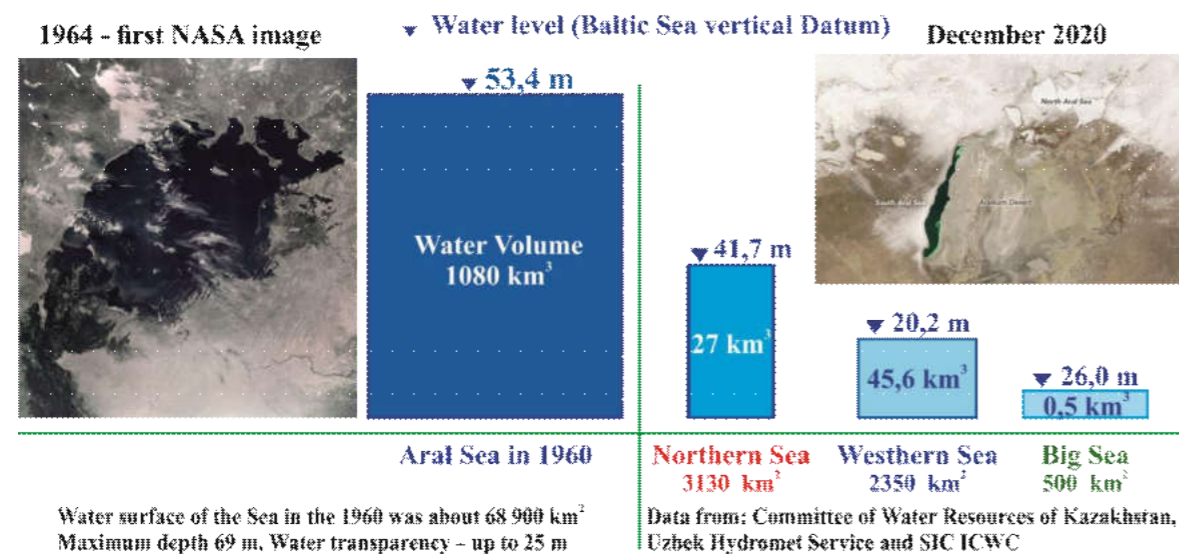


Figure 14. The Aral Sea Ecological Crisis

For the full restoration of the Aral Sea, 1080 km³ of water (sea volume at the level of 1950s) plus about 50 km³ annually will be required to compensate evaporation losses. The total annual runoff of the Amudarya and Syrdarya rivers is about 120 km³. Thus, in order to fill the sea in the same volume, it will be necessary to completely stop all economic activity in the basin for at least 30-40 years – that is mostly unrealistic!

At the Summit of the Heads of the Founding States of IFAS on August 24, 2018 in Turkmenistan, the President of Republic of Uzbekistan, Shavkat Mirziyoyev, suggested a number of important initiatives that, when implemented, will be allowed to “radically improve the unfavorable environmental situation in our region”. This requires “decisive and non-standard measures.

The main initiative is to declare the Aral Sea region a zone of environmental innovations and technologies. Objectives of the Aral Sea Concept – a zone of Environmental Innovations and Technologies:

- Creation of conditions for joint actions by the countries of the Aral Sea basin aimed at transforming the zone of ecological crisis associated with the drying up of the Aral Sea into a zone of socio-economic development via introduction of environmental innovations and technologies.
- It proposes fundamental changes in the practice and scope of policy development and implementation of actions for the restoration and functional integrity of ecosystems, which are the basis for the socio-economic development in the region.

On May 18, 2021 the UN General Assembly adopted Resolution 75/278 “Declaration of the Aral Sea region as a zone of environmental innovations and technologies”

1. *Supports* the initiative to transform the Aral Sea region from a zone of ecological crisis into a zone of ecological innovations and technologies;
2. *Expresses its support* for the ongoing regional efforts and initiatives to strengthen the environmental, social, economic and demographic situation of the Aral Sea region;
3. *Encourages* research and scientific advisory activities to further recover and improve the environment, preserve natural resources and enhance the quality of life of the population of the Aral Sea region;
4. *Reaffirms* that the **International Fund for Saving the Aral Sea** remains the main international agency that aims to solve international problems of an economic, social or humanitarian nature in the Aral Sea region, and the whole Aral Sea basin, taking into account the interests of all countries of the region;

5. *Invites* Member States, the funds, programmes and agencies of the United Nations system, international financial institutions and other relevant stakeholders to conduct joint collaborative interdisciplinary research and scientific and innovative cooperation in the Aral Sea region with the International Fund for Saving the Aral Sea, as well as with national initiatives such as the International Innovation Center for the Aral Sea Basin under the President of the Republic of Uzbekistan, and to establish protective forest plantations on the drained bottom of the Aral Sea;

6. *Emphasizes* the importance of strengthening regional cooperation in the implementation of joint actions to overcome the consequences of the Aral Sea crisis and stabilize the ecological situation in the Aral Sea region, prevent further desertification and mitigate the negative environmental and socioeconomic consequences by stabilizing the methods of forest amelioration of sand formations on the drained bottom of the Aral Sea, which is subject to ash, salt and dust transfer, and promoting socioeconomic development and adaptation to climate change, the development of ecotourism and the implementation of other measures;

7. **Declares the Aral Sea region a zone of ecological innovations and technologies**, and in this context calls upon Member States, the funds, programmes and agencies of the United Nations system, international financial institutions and other relevant stakeholders to develop and implement in the Aral Sea region environmentally sound technologies, sustained, inclusive and sustainable economic growth, and energy- and water-saving technologies, in line with goal 17.7 of the 2030 Agenda for Sustainable Development.

Resolution of the Cabinet of Ministers No. 41 of January 25, 2022 “**On additional measures to turn the Aral Sea region into a zone of environmental innovations and technologies**”.

This document was developed as part of the implementation of Presidential Decree No. PP-5202 of July 29, 2021 “On measures to implement the special resolution of the United Nations General Assembly of May 18, 2021 “On declaring the Aral Sea region a zone of environmental innovation and technology.” <http://aral.uz/doc/PP-5202w.pdf>

Approved:

- The concept of transformation of the Aral Sea region into a zone of ecological innovations and technologies;
- Multilateral “Roadmap” on the priorities of attracting foreign investment in the Aral Sea region for 2022-2026.

The concept includes the following areas:

- Creation of “driver” clusters for technological innovations, including introduction of effective methods of ecosystem management, in particular, new technologies that save natural resources;
- Development and implementation of economic and financial

innovations, formation of market and price mechanisms necessary to stimulate technological innovation and create “green” jobs;

- Implementation of innovative policies and legal innovations, including reducing risks associated with climate change, implementing agricultural and green economic strategies, and implementing land reforms that stimulate investment by landowners.

The multilateral “road map” for attracting foreign investment in the Aral Sea region for 2022-2026 includes:

- Priorities for implementation of measures for integrated development of the Aral Sea region in 2022-2026;
- Measures to expand international cooperation for sustainable development of the Aral Sea region and monitoring of programs and projects implementation;
- List of projects aimed at sustainable development of the Aral Sea region.

THE INSTITUTIONAL SET-UP OF WATER RESOURCES MANAGEMENT

After gaining independence in 1991 the government of Uzbekistan has undertaken the measures related to reforming the water and agricultural sectors. Those reforms were addressing to growth of agricultural production, and incomes of rural population. A lot of efforts were addressing to the maintenance and development of the enormous water management complex inherited from the past. But up to 2016 efficiency of water use (especially for irrigation) in Uzbekistan remained at very low level (FAO Report, 2021)⁴.

Water Governance process influenced

In February 2017, following comprehensive examination of topical issues of concern among population and broad public consultation, the President of Uzbekistan approved the Action Strategy on five priority areas of country's development for 2017-2021. This document is serving as a roadmap for achievement of the 2030 UN Sustainable Development Goals.

In line with this Strategy there were started specific huge reforms in the water sector of Uzbekistan. **The first step** was done in August 2017 when within the main National authority responsible for water management – the Ministry of Agriculture and Water Resources – there was established the Information-Analytical Resource Center (IARC) with proper support from

⁴ <https://www.unwater.org/publications/progress-on-water-use-efficiency-641-2021-update>

CWP-Uzbekistan. Also, there was creation of three new Basin Administration of Irrigation Systems (additional to 10 BAISes already existed before), and formation of new Rayon Irrigation Departments (RIDs) – in each of administrative districts of Uzbekistan (in total 152 units).

The main motivation for Government to establish the RIDs as sole direct interface between water users and the irrigation system has been to reinforce the horizontal links between water management, agriculture and the local administration at rayon (district) level. RIDs are also to improve (i) access to information on crop structure for accurate water demand estimation, (ii) maintenance of the local irrigation network to be funded by the rayon administrations, starting from 2019, (iii) monitoring of water use, and (iv) involvement of key stakeholders in improving water productivity.

Another development in this regard was reorganization of over 1500 existing Water Consumers Associations (WCAs) into 158 new ones established within the boundaries of rayons (districts). Accordingly, Government is tasked to assist WCAs with re-registration, facilitate collection of irrigation service fees and support their efficient operations. In this context, RIDs became also the core focal points for WCA support and water extension activities⁵.

The second step was done on February 12, 2018, when the President of the Republic of Uzbekistan decided to separate water and agricultural sectors. Decree of the President of the Republic of Uzbekistan № UP-5418 from 17.04.2018 "On measures to radically improve the system of public management of agriculture and water resources", the Ministry of Water Resources and the Ministry of Agriculture were established separately.

The newly established Ministry of Water Resources (MoWR) became responsible for implementation of the unified national policy in the field of water resources management, as well as coordination of all activities in the field of rational use and protection of water resources, prevention and elimination of harmful impacts of water, raising the level of water use culture.

The establishment of a separate Ministry of Water Resources followed by development of the Road Map on Cardinal Reforming of the Water Management System. There was a decision about abolishing of the 50 Administration of Irrigation Systems (AIS), which were the hydrographic sub-units of BAIS. However, the AIS had to be reinstated in November 2018, as an essential water delivery link was missing between the BAIS, RID and Water Consumer Association (WCA).

The whole process of water reforms in Uzbekistan during 2017-2022 are shown in Figure 15.

⁵ Resolution of the Cabinet of Ministers of Republic of Uzbekistan PKM -982 dated December 11, 2019 on measures to improve operations of Water Consumer Associations

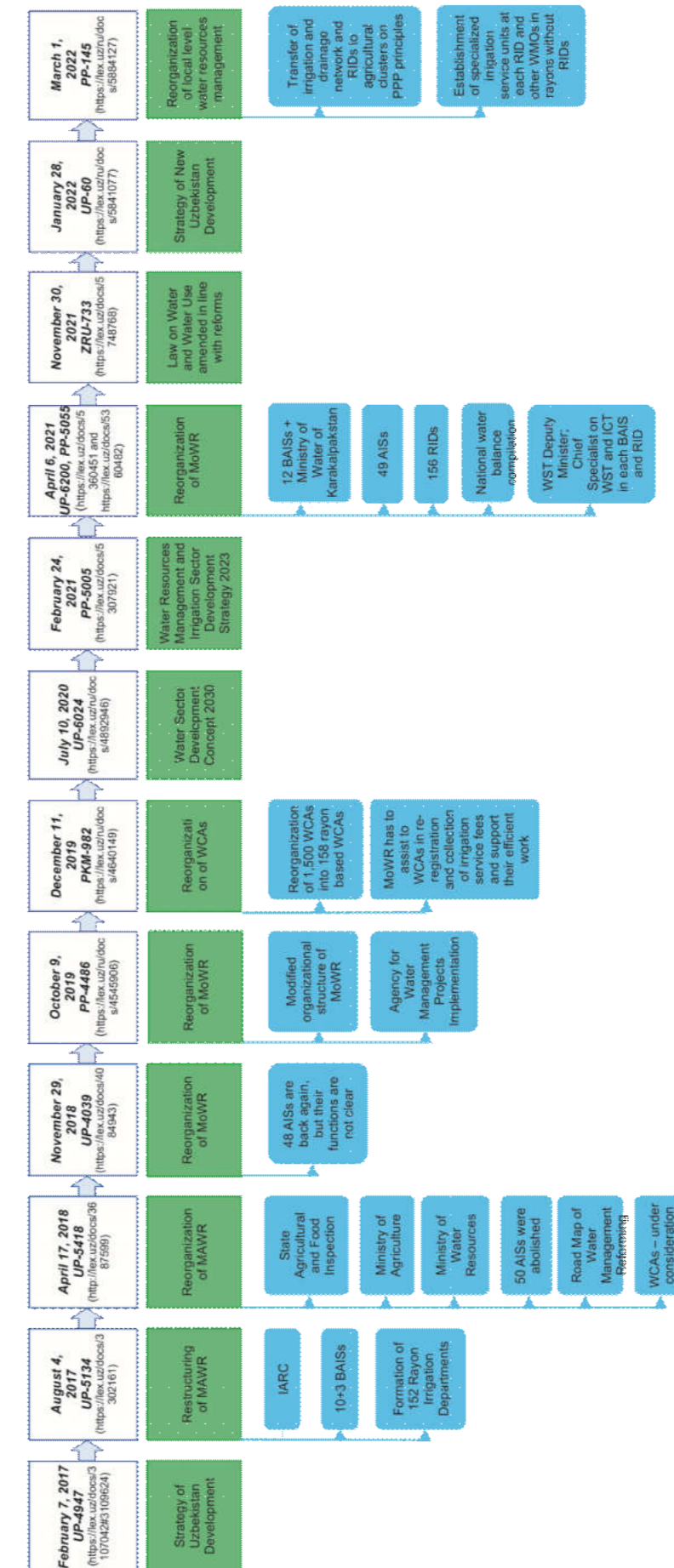


Figure 15. Overview of institutional changes in water sector of Uzbekistan during 2017-2019

These restructuring efforts have had implications on the implementation of the IWRM principles in the country, which has been promoted by GWP and Swiss Cooperation (SDC) for many years. On one hand, the mandate of the new MoWR consists of a range of functions, which are relevant to IWRM, including responsibility for implementation of the unified water sector policy and coordination of all sources and uses of water resources to ensure their rational consumption and environmental protection. However, on the other hand, application of IWRM principles has been somewhat compromised by mixing hydrographic water distribution and delivery with administrative water demand consolidation through the RIDs at rayon level, where the main agricultural outputs are produced.

Furthermore, to improve water use efficiency, the government has recently endorsed a range of subsidies for introduction of drip irrigation and other water saving technologies in the cotton, horticulture and livestock production areas.

Farmers have been a key target of agricultural and water reforms and MoWR's role is to facilitate improved level of water management and water productivity. An important recent change in agriculture has been the introduction of so-called Agricultural Clusters to add value by private investments in processing, spinning, weaving and, finally, garment production. Cluster owners (private business) invest for farmers substantial financial, organizational and human capacities to adopt best practices in modern water management and agricultural practices to increase water productivity. Consequently, they do and will continue to put pressure on the entire water management system to perform better and allow for more efficient crop production. Key elements of current water demand and supply management are shown in Figure 16.

The third step was done in accordance with Decree of the President of the Republic of Uzbekistan, dated July 10, 2020 № UP-6024 "On the approval of the concept of the development of the water sector of the Republic of Uzbekistan for 2020-2030". The concept was elaborated by Ministry of Water Resources with support from many partners, among which the CWP-Uzbekistan was one of the most active.

In the end of 2019 it became clear that the lack of a long-term concept for development of the water sector creates the barriers for efficient use of water resources, the widespread introduction of investments in the sphere, the development of scientific and innovative potential in the water sector, the introduction of scientific achievements and know-how, as well as the widespread use of modern information and communication technologies and innovative solutions.

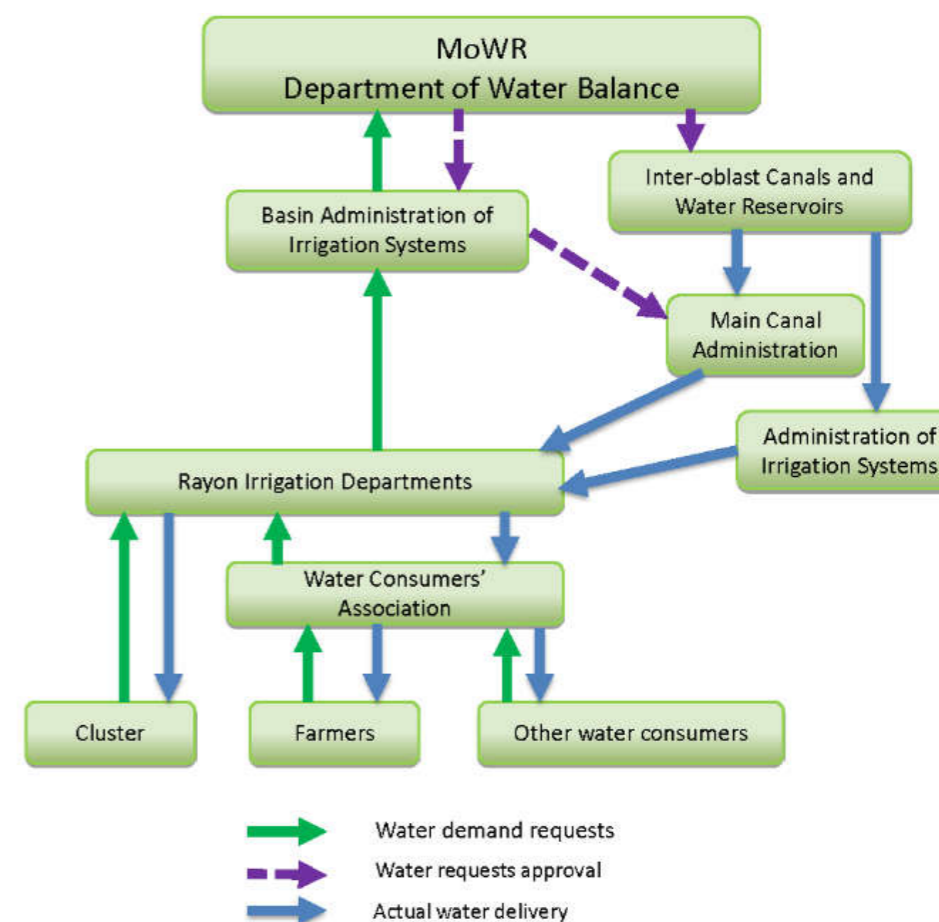


Figure 16. Key elements of current water demand and supply management in Uzbekistan

From those viewpoints, the concept defined the goals, objectives, priorities and directions for development of the water sector in Uzbekistan for the medium and long term. It is the basis for development of the "Strategy for management of water resources and development of the irrigation sector" and programs for the further development of the water sector as a whole.

The priority indicators to implement the Water Concept by 2030 include:

- irrigation systems' efficiency increases from 0.63 to 0.73;
- irrigated lands with poor water supply decrease from 560 to 190 thousand hectares;
- saline irrigated land areas decrease by 226 thousand hectares;
- annual volume of electricity consumption by MoWR pumping stations decrease by 25%;
- "Smart Water" devices installed at key irrigation structures to monitor water use;
- water management processes automated at 100 key water structures;
- total area under WST reach 2 million hectares, of which 600 thousand is drip irrigation;

- 50 public-private partnership projects implemented in the water sector.

Due to MoWR efforts to advance IWRM based Water Concept⁶, in 2020, despite the 20% reduction of water availability, consumers received 32.5 billion m³ of irrigation water from all sources during the vegetation season, while water supply to more than 300,000 hectares of irrigated lands improved due to introduction of water saving technologies.

In order to consistently implement the tasks and ensure achievement of the main target indicators defined in the Concept for Development of Water Resources in Uzbekistan for 2020-2030 there was adopted Decree of President of the Republic of Uzbekistan No. PP-5005 "On approval of the strategy for managing water resources and developing irrigation sector in the Republic of Uzbekistan for 2021-2023" dated February 24, 2021.

Approval of the Water Strategy is an important milestone in reform of water sector in Uzbekistan. It contains a set of priority measures aimed at implementation of fundamentally new ideas and ways of further development and modernization of the sector, the introduction of IWRM principles, market mechanisms and information technologies, as well as strengthening of regional cooperation to ensure efficient and sustainable use of water resources in Uzbekistan. monitoring of 2,100 operating reclamation observation wells using digital technologies;

Priority Directions of the Water Strategy

Development and implementation of the principles of integrated water resources management (IWRM):

- Guaranteed water supply to economic sectors based on the interconnected management of all water resources (surface, ground and return waters);
- Improving the system of planning and management of water resources;
- Development of the Water Code;
- Creation of flexible mechanisms for the distribution of water between sectors;
- Rational use of return waters;
- Preservation as strategic reserves of underground fresh water.

Scaling up the application of water-saving technologies:

- Further expansion of water-saving irrigation technologies (drip, sprinkler, watering with portable flexible hoses, etc.);
- Widespread use of the circulating water supply system in industry;

⁶ Sh. Khamraev, Minister of Water Resources of the Republic of Uzbekistan. Irrigators are supporters of farmers, Agriculture and Water Resources of Uzbekistan, №1. 2021/ pp 7-8

- Further improvement of incentive mechanisms for the introduction of water-saving technologies;
- Raising awareness of existing ways to conserve water, including highly efficient surface irrigation methods;
- Formation among the population and water users will for careful use and protection of water resources.

Modernization of water infrastructure:

- Modernization and improvement of technical condition of water infrastructure;
- Reconstruction, repair and modernization of main, interregional, inter-farm, on-farm canals;
- Reconstruction and repair of hydroelectric facilities and structures, replacement and restoration of the hydromechanical and electrical parts;
- Replacement and restoration of the hydromechanical and electrical parts, as well as control and measuring equipment of reservoirs;
- Attracting investments in the modernization of hydro structures.

Modernization of pumping stations:

- Gradual replacement of old pumps and electric motors by modern energy-saving pumps and high efficiency electric motors;
- Restoration and renewal of pressure pipelines of pumping stations;
- Phased replacement and renovation of electrical part with modern energy-saving equipment;
- Stage-by-stage equipping of pumping stations with a capacitor compensating reactive power and modern frequency converters;
- Creation of an automated system for monitoring management and control of electricity consumption at pumping stations in real time;
- Establishing use of alternative energy sources at pumping stations.

Improving the ameliorative conditions of irrigated lands:

- improvement of the technical condition of the collector-drainage systems and other reclamation facilities, their modernization;
- strengthening material and technical base of reclamation expeditions, providing them with modern ones;
- equipment and mobile operational laboratories;
- effective organization of work to reduce level of salinity and waterlogging of irrigated lands, the implementation of research work;
- Attraction of investments for implementation of land reclamation measures.

Introduction of market principles and mechanisms of public-private partnership:

- System of taxation and incentives, state subsidies in the water sector;
- Transfer of economic functions in the field of management and maintenance of water infrastructure, provision of services to third parties within framework of public-private partnership (PPP) and other forms of outsourcing;
- Covering part of the state costs for delivery of water by water users;
- Transfer of part of water management functions to water users (farmers' associations, clusters, etc.);
- Development and introduction of public-private partnership (PPP) and other principles of outsourcing in water management system.

Widespread introduction of information and communication technologies (ICT) in water sector:

- Automation for control and accounting of water;
- Automation for control of hydraulic structures;
- Creation of a unified information system of water resources;
- Automation for monitoring system of reclamation observation wells;
- Ensuring availability of information about water resources.

Development of personnel, scientific and innovative potential of water management

- Improving the level of staffing in water management organizations;
- Improving the system of advanced training for leading specialists and managers in the water sector;
- Introduction of modern educational technologies and distance learning methods into the educational process;
- Consistent organization of regional specialized higher educational institutions in the form of branches of TIAME in the Ferghana Valley and in the Khorezm-Karakalpakstan region;
- Bringing wages of employees in organizations of water management system to the level of average monthly wage in the country.

Development of interstate relations for effective use of transboundary water resources:

- Promotion of constructive dialogue and development of cooperation with neighboring countries on joint management of transboundary water resources in the region;
- Development and promotion of mutually acceptable mechanisms for joint use of transboundary water resources in the region;
- Studying international experience, as well as attracting international experts;

- Development of joint plans for regional water management and identification of joint tasks for future.

In line with the Water Strategy role of MoWR in IWRM implementation process has been reinforced by another Decree of the President of the Republic of Uzbekistan UP-6200 dated April 6, 2021 on measures to further improve the system of public administration and control in the field of water resources use, as well as to ensure the safety of water facilities. The MoWR is now responsible for implementation of a unified national policy in the field of water resources management, formation of accounting, reporting and balance of water, as well as coordination of the activities of the public bodies and other organizations in the field of rational use and protection of water resources, prevention and elimination of the negative impact of water disasters. MoWR is now an authorized governmental body for accounting of all water resources, coordination of relevant measures to improve the efficiency of water use and consumption, as well as the formation of the water balance of the Republic of Uzbekistan.

Water Legislation in Uzbekistan

Before independence, the self-sustainability of Uzbekistan in the development of norms of national water law, as well as other republics of Central Asia (Kyrgyzstan, Tajikistan, and Turkmenistan) and Kazakhstan, was possible under the relevant legislation of the USSR. Thus, according to the "Fundamentals of the Water Legislation of the USSR and the Union Republics" (1971), the latest Laws of the Soviet republics of Central Asia in the field of water relations were adopted:

1. The Water Code of the Kazakh SSR (1972);
2. The Water Code of the Kirghiz SSR (1972);
3. The Water Code of the Turkmen SSR (1973);
4. The Water Code of the Tajik SSR (1974);
5. The Water Code of the Uzbek SSR (1972).

The legal regulation of inter-republican and international water relations was carried out in accordance with the Water Codes of the Republics and other legislation of the USSR.

The Declaration of independence by the countries of Central Asia necessitated the revision of legal framework for regulation of water relations at the national and interstate levels.

The fundamental national legislative act in the field of regulation of water relations is the Law of the Republic of Uzbekistan "On Water and Water Use" dated from May 6, 1993 No. 837-XII. During 1997-2017, in line with economic

reforms and changing situation, the legal framework was continuously improving.

The most significant changes and additions to the Law “On Water and Water Use” of 1993 were made by the Law of the Republic of Uzbekistan of December 25, 2009 (No. LRUz-240)

In General, more than 90 articles of the law of the Republic of Uzbekistan on “Water and Water Use”, or about ¾ of the text of the Law were changed only in 2009-2016.

In total, the law “On water and water use” at level of 2017 contained 121 articles. The main issues that are regulated by this Law:

- Competences of public authorities and administration in the field of regulation of water relations
- Participation of non-governmental non-profit organizations and citizens in water resources management
- Water resources management: harmonization (inter-sectoral)
- Water resources management: establishment of types of general and special water use and water consumption, issuance of permits

The law was quite progressive for the water sector of Uzbekistan because it clearly regulated interrelations of water users and their responsibility for effective water use, it identified status of the water consumers’ associations (former water users associations) and regulated introduction of basic IWRM principles.

At the same time, despite such an impressive revision of the Law of the Republic of Uzbekistan on “Water and Water Use”, the analysis of this Law and a number of other normative legal acts, which regulate other aspects of water relations done in 2017 showed that there was a need to improve the regulatory framework for water resources management.

On November 30, 2021 President of the Republic of Uzbekistan approved the Law of the Republic of Uzbekistan № 733 Amendments to Law "On Water and Water Use". There are fixed a number of new statements:

“State control over the use and protection of water is carried out by local government bodies, the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection, the State Committee of the Republic of Uzbekistan on Geology and Mineral Resources, the Inspectorate for Control of the Agro-Industrial Complex under the Cabinet of Ministers of the Republic of Uzbekistan, the Ministry of Health Republic of Uzbekistan, Ministry of Water Resources of the Republic of Uzbekistan, Inspection for Control over the Use

of Drinking Water under the Ministry of Housing and Communal Services of the Republic of Uzbekistan in the manner prescribed by law“.

“Operating organizations of the water sector – water management operating organizations using water management facilities (district irrigation departments, departments for irrigation systems management, main canal (system) departments, pumping station and energy departments, ameliorative expeditions, department for operation of reservoirs and large hydraulic structures, Ministry of Water Resources of the Republic Karakalpakstan, Basin Administration of Irrigation Systems under the Ministry of Water Resources of the Republic of Uzbekistan)“.

“Payment for water delivery and other water management services – making payments on a contractual basis for provision of water delivery services provided by water supply organizations (water operating organizations, water consumer associations and others), and other water management services (repair of water facilities, introduction of water-saving irrigation technologies, assistance in use of water control and metering devices)“.

The issues of issuing permits for special water use or water consumption are regulated by the Regulations on the procedure for issuing permits for special water use or water consumption (entered into force on April 01, 2018), approved by the relevant Resolution of the Cabinet of Ministers (CM) of the Republic of Uzbekistan (dated March 31, 2018 No. 255).

The regulation establishes the procedure for issuing permits for special water use or water consumption when using surface and groundwater in the territory of the Republic of Uzbekistan.

More detailed issues of water use and water consumption, including the establishment of water withdrawal limits, are governed by the Regulation «On the procedure for water use and water consumption in the Republic of Uzbekistan» (effective from April 1, 2013), approved by the Resolution of the Cabinet of Ministers of Uzbekistan (March 19, 2013 No. 82).

Water withdrawal limits are set in the following order of priority:

- (1) Drinking, medical, and household sector (100%);
- (2) Industries and livestock (100%);
- (3) Agriculture (with limits in accordance with real water availability);
- (4) Sanitary and environmental releases (100%).

The procedure for withdrawing water resources, keeping records and reporting on water use and water consumption:

1. Withdrawal of water resources for water use and water consumption is carried out only if there is an agreement on water use and water consumption (WW), duly registered, in agreement with the service operating organization.

2. Water intake is carried out only upon written requests of water users

and water consumers (except for cases of water intake from the public water supply system, as well as underground reservoirs) according to their readiness for water use and water consumption, on the basis of a water use and water consumption plan, within the established water withdrawal limit.

3. The declared amount of water resources for withdrawal from the source should not exceed the approved water withdrawal limit.

4. Places of water intake must be equipped with appropriate means of their regulation and accounting.

5. Means of regulation and accounting must be constantly kept in good working order.

6. In order to ensure state accounting of waters and their use, maintaining the Unified State

7. Water Cadaster with the creation of a unified information system for water balance, systematic accounting and reporting on water use and water consumption and their monitoring is established according to coordination authorities (within their competence):

- with the Ministry of Water Resources (surface water and collector-drainage water)
- with the State Committee of the Republic of Uzbekistan on ecology and environmental protection;
- with the State Committee of the Republic of Uzbekistan for Geology and Mineral Resources (groundwater);
- with the State Inspectorate of the Republic of Uzbekistan for Supervision of Geological Exploration of Subsoil, Safe Work in Industry, Mining and Public Utilities under the Cabinet of Ministers of the Republic of Uzbekistan (thermal and mineral waters).

8. The procedure for the intake, accounting and reporting of water resources for water use and water consumption from the public water supply system is established by the Ministry of Housing and Communal Services.

9. All special water users and water consumers are obliged to keep records and reports, provide information on water use and water consumption, as well as on water disposal in accordance with the procedure established by law.

Water Cadaster as systematized collection of data on water accounting, registration of all water users, as well as data on water use accounting within the country

Until November 2019, issues regarding the state water cadaster were regulated by the Regulations on the procedure for developing and maintaining the state water cadaster of the Republic of Uzbekistan, approved by the relevant Resolution of the Cabinet of Ministers of the Republic of Uzbekistan (dated January 7, 1998 No. 11).

Questions regarding water monitoring are reflected in more detail in the Regulations on state monitoring of the natural environment, approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan “On approval of the regulations on state monitoring of the natural environment in the Republic of Uzbekistan” (dated April 3, 2002, No. 111).

President of the Republic of Uzbekistan did attempt to change system of monitoring and accounting for water by Decree No. UP-5883 dated November 26, 2019 “On measures to improve the management of water resources of the Republic of Uzbekistan to increase the level of provision of the population with drinking water and improve its quality”. Ministry of Housing and Communal Services of the Republic of Uzbekistan was appointed as the authorized state body in the field of coordination of accounting, monitoring, as well as the formation of a unified water balance and Unified State Water Cadaster.

But finally the role of MoWR has been reinforced by the Decree of the President of the Republic of Uzbekistan UP-6200 dated April 6, 2021, on measures to further improve the system of public administration and control in the field of water resources use, as well as to ensure the safety of water facilities. Accordingly, the MoWR remain to be in charge for water balance of the Republic of Uzbekistan instead of the Ministry of Communal Services and Housing.

The transfer of this responsibility to MoWR is logical within its mandate to implement a unified policy in the field of water resources management.

ACTIVITIES AT THE INTERNATIONAL LEVEL

The Uzbekistan’s achievements in the sphere of water resources management appreciated by the world water community. That was confirmed by active participation and contribution to activities of international water organizations such as the World Water Council, Global Water Partnership, International Commission on Irrigation and Drainage, International Network of Basin Organizations, Asian Pacific Water Forum, etc.

After gaining independence, delegations of water professionals from Uzbekistan participated at all ICID congresses since 1993, at 2nd World Water Forum in the Netherlands and all next World Water Forums held in Japan, Mexico, Turkey, France, Korea and Brazil.

The Republic of Uzbekistan has been a member of the ICID since 1993. The National Committee of the Republic of Uzbekistan carries out its detail under the Ministry of Water Resources of the Republic of Uzbekistan.

In Indonesia, on the island of Bali, on September 6, 2019, at the 70th meeting of the International Executive Council of the International Commission on Irrigation and Drainage (ICID), the Minister of Water

Resources of the Republic of Uzbekistan, Mr. Sh. Hamraev, was unanimously elected as Vice President of the ICID for 2019 -2022 years.

The Ministry of Water Resources of the Republic of Uzbekistan is using ICID as platform to promote new philosophy: that People and the Earth will be saved not so much by saving technologies such as sustainable consumption and new labor management. But also, we have to set a new culture of water governance with an open soul of policy makers to overcome ambitions and barriers towards common water and food security and achievement of the SDGs 2030.



Figure 17. President of ICDC, Mr. Felix Britz Reinders (in the center), Minister of Water Resources of the Republic of Uzbekistan, Vice-president of ICID, Mr. Shavkat Khamraev (in the left), Secretary of the UZNCID, Mr. Lutfulla Mukhamednazarov (in the right)

The Ministry of Water Resources of the Republic of Uzbekistan has its own website: <http://www.water.gov.uz>

List of information related to the activities of the ministry to be posted on the official website:

- Normative-legal documents defining legal status of the ministry and its structural and territorial subdivisions;
- Information on normative legal documents, normative and other acts adopted by the ministry, as well as on progress of their implementation;
- Information on amendments and additions to legal documents, normative and other acts adopted by the ministry, as well as on the recognition of these documents as invalid;
- Information on draft legal documents, normative and other acts developed by the ministry;
- Information about implementation by the ministry of state and other programs;
- Information on public events held by the ministry (sessions, meetings, press conferences, briefings, seminars, round tables and others);
- Information about interaction of the ministry with other bodies of state power and administration, individuals and legal entities, as well as foreign and international organizations;
- Information on international treaties of the Republic of Uzbekistan, in the implementation of which the ministry takes part;
- Information on the main indicators related to the field of activity of the ministry, showing the state of sector (territory) and the dynamics of its development, including socio-economic development;
- Information on open competitions (tenders) and auctions held (organized) by the ministry;
- Information on vacancies, conditions of employment and requirements for candidates;
- Information on coordinating and advisory bodies formed in the ministry;
- Plans for holding open collegiate meetings of the ministry, including draft agendas for meetings, date, place and time of holding, order of attendance at meetings.

In accordance with the law, other information may also be posted on official website of the ministry.

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Agency of International Fund for Saving the Aral Sea**

