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HANDBOOK

ON WATER RESOURCES MANAGEMENT IN UZBEKISTAN



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IN UZBEKISTAN**

Tashkent - 2018

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The EU Programme on “Sustainable management of water resources in rural areas in Uzbekistan” works within the framework of the EU Multi-annual Indicative Programme for the period from 2014 to 2020 and helps Uzbekistan to implement best European practices based on the EU Water Framework Directive. The Programme has the overall objective of promoting sustainable and inclusive growth in the rural sector in Uzbekistan in a changing climate. The objective of the Programme is to improve water supply and water management efficiency at the national, basin and farm levels.

The Program consists of three interrelated components:

- Component 1 is presented by the “National policy framework for water governance and integrated water resources management” project implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.
- Component 2 on “Technical capacity building” is implemented by UNDP.
- Component 3 on “Raising awareness and partnership for sustainable water and environment development in Uzbekistan” is implemented by the Regional Environmental Center for Central Asia (CAREC).

This Handbook is prepared under Component 1. The goal of the component is to contribute to the further development of the national water management strategy by strengthening legal, institutional, organizational and financial mechanisms, as well as regulatory tools and bringing them in line with international standards.

To implement this program, GIZ works closely with three partners - the International Water Management Institute (IWMI), the Italian Council for Agricultural Research and Economics (CREA) and the Austrian Environment Agency (UBA Umweltbundesamt). Representatives of these organizations form the project management group, which is the main management body at the working level.

Further development and strengthening of IWRM in Uzbekistan is envisaged as an important part of the Program. Based on the memorandum of understanding signed with the Academy of Public Administration under the President of the Republic of Uzbekistan (APA) on November 4, 2016, two professors of the Koblenz University of Applied Sciences prepared a curriculum on IWRM for APA for the Master program. In support of this curriculum, a Handbook on water resources management of Uzbekistan is provided as an additional document for APA students.

This Handbook is intended for specialists - not only water specialists, but also including those who determine the general development policy of the country and make decisions that shape the course and content of modern reforms, including in the field of water governance and management. The Handbook can also be useful for a wide range of civil society representatives - stakeholders for the proper implementation of water management reforms – not only in Uzbekistan, but also abroad.

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FOREWORD

Dear Reader,

Anton Pavlovich Chekhov once put it into very simple words: “Wisdom.... comes not from age, but from education and learning.” Education and learning have been fundamental to the development of mankind for centuries and will never cease to be important.

There are, however some topics that require our full and undivided attention – maybe more than others. One of those topics is water and efficient water management.

Without water, life would not have developed on our planet and it is the availability of this very special natural resource that determines our life and its quality. Water is essential, and we need it for many purposes: for drinking, for personal hygiene, for agriculture and food production, for energy generation and for keeping our environment healthy and our flora and fauna intact.

In the Republic of Uzbekistan, we have several higher education institutions of an extraordinary standard that are preparing the future managers and decision makers for the country. Building capacities and further developing them is pivotal to the Government of Uzbekistan.

The European Union is committed to support the Republic of Uzbekistan in its efforts to strengthen its water management to the benefit of all stakeholders. The EU programme “Sustainable management of water resources in rural areas in Uzbekistan” promotes best European practice based on the EU Water Framework Directive and pursues the overall objective to contribute to sustainable and inclusive growth in the rural sector in Uzbekistan in the context of a changing climate. Capacity building on different levels of engagement plays a crucial role in this overall endeavour.

The Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ) GmbH operates in Uzbekistan since 1992 and is committed to support the host country in its sustainable development in different sectors, such as health, economic development and in the efficient management of natural resources. The GIZ traditionally engages in capacity building as major support to the partner countries in shaping their own future according to the identified needs.

The GIZ is proud to implement this programme component for the European Union in very close coordination with the Ministry of Water Resources and higher education institutions such as the Academy for Public Administration under the President of the Republic and the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers.

In addition, valuable in-house expertise is provided by the International Water Management Institute, the Austrian Environment Agency and the Italian ‘Council for Agricultural Research and Economics’.

This Handbook provides an overview on Integrated Water Resources Management in the Republic of Uzbekistan.

It is intended to serve a wide audience; in particular, however it provides valuable background information for master students and future regional administration specialists graduating from the Academy of Public Administration under the President of the Republic of Uzbekistan. I hope that this Handbook will help implementing the principles of Integrated Water Resources Management and mainstreaming them into all relevant policies in the Republic of Uzbekistan. My special thanks go to Mr. Vadim Ilyich Sokolov who put all this valuable information together.

Dr. Caroline Milow
Team Leader, GIZ

LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ASBP	Aral Sea Basin Program
BWM	Basin Water Management
BWO	Basin Water Organization
CAWATER	Central Asian Water Internet Portal
CIS	Commonwealth of Independent States
COP	Coefficient of performance
EC IFAS	Executive Committee of the International Fund for saving the Aral Sea
EECCA	Eastern Europe, Caucasus and Central Asia
ENDC	Estimated Nationally Determined Contributions
GWP CACENA	Global Water Partnership (GWP) Central Asia and Caucasus
ICSD	Interstate Commission for Sustainable Development
ICWC	Interstate Commission for Water Coordination
IFAS	International Fund for Saving the Aral Sea
IUPWR	Integrated use and protection of water resources
IWRM	Integrated Water Resources Management
MDG	UN Millennium Development Goals
MM	Mass Media
NGO	Non-governmental organizations
OSCE	Organization for Security and Cooperation in Europe
SCADA	Dispatch control and data collection
SCO	Shanghai Cooperation Organization
SDG	UN Sustainable Development Goals
SIC	Scientific Information Center
UN	United Nations
UNDP	United Nations Development Program
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Program
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WCA	Water Consumers Association
WUA	Water User Association
ZIDC	Zone of intensive drainage consumption

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CHAPTER 1. WATER RESOURCES AND ENVIRONMENT

1.1. HYDROLOGICAL CYCLE AND WATER BALANCE

Water is constantly recycled through the earth's water cycle system, while the total amount of water remains constant. Three quarters of the surface of the globe are covered with water. The water shell of the earth is called the hydrosphere. Most of it is salt water of the seas and oceans, and the smaller part is fresh water of lakes, rivers, glaciers, groundwater and water vapor.

Water exists in three physical states on earth: liquid, solid and gas. Organisms cannot exist without water. In any organism, water is the environment for chemical reactions, without which organisms cannot live. Water is the most valuable and essential substance for the life-sustaining activity of living organisms.

The constant exchange of moisture between the hydrosphere, atmosphere and earth's surface, consisting of the processes of evaporation, movement of water vapor in the atmosphere, its condensation in the atmosphere, precipitation and runoff, is called the water cycle in nature (Figure 1.1). Water cycle in nature

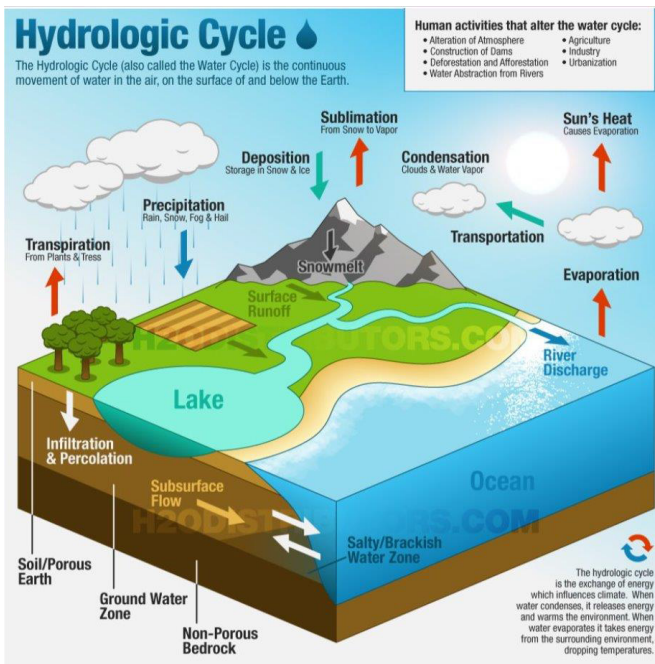


Figure 1.1. Classical system of water cycle in nature

The water cycle is driven by the energy of the sun. The sun heats the water in the oceans and seas and it evaporates into water vapor. A parallel process takes place on land: water evaporates from the sun-heated surface of the earth or evaporates by plants because of transpiration.

During the process of advection, the water vapor moves with the air masses until it ends up in a zone with a low temperature. This causes condensation of moisture in the clouds. Clouds continue to move with the air while the condensed water droplets in them mix and stick together and grow in size. As a result, water falls in the form of precipitation over land or ocean; while the ocean evaporates more moisture into the atmosphere than it acquires from precipitation, and land - on the contrary, receives more precipitation than it evaporates.

Some precipitation falls in the form of snow or hail, rain and snow, and can accumulate in ice caps at the poles and glaciers in the mountains that store frozen water for months to tens of thousands of years.

However, even in this form, a slight exchange of ice with the atmosphere remains - sublimation is in play (transformation of energy or the transition of water from one state to another). At a time when the temperature in the sediment zone rises, melting begins, and water actively flows out from these sources and forming a drain.

Most of the water comes back from the atmosphere in the form of rain. The foliage of plants intercepts part of the precipitation before they reach the soil. Once on land, water flows over the land in the form of rivers, moving to the oceans.

Some of this water is absorbed into the soil because of infiltration, penetrates deep into the ground and replenishes groundwater aquifers, which also accumulate fresh water for a long time. There is also water masses movements under the ground, as well as on its surface, and the water moves, by changing its location. Groundwater exchanges water with the surface in the form of springs and artesian wells (groundwater discharge). This, as well as a small part of the water, which was absorbed into the ground, but did not reach the level of aquifers, falls back into surface water bodies and the ocean.

While the natural forces control the cycle, everything goes more or less normally according to the cyclic order established by nature. Water, thanks to the natural cycle, is constantly renewed. However, once human beings start to interfere in the natural process with removal, use and contamination of water, the patterns of nature are broken, and the water environment begins to degrade: the water resource runs out - the capacity of water renewability declines and the water quality deteriorates, etc.

A tool for quantitative assessment of the water cycle in hydrology is water balance. Water balance is the ratio between the inflow, consumption and change of water resources within the entire Earth, atmosphere, the world ocean, continents, part of the land or water body for a certain period of time. Water balance is a reflection of

the law of conservation of matter, the quantitative expression of the water cycle on earth, characterized by the equation of water balance. The units of measurement of the components of the water balance equation should be the units of mass, but usually this equation is written in units of volume (km³) or water layer (mm).

Analysis of water exchange processes within certain territories (river basins, administrative districts, etc.) is a necessary condition for the rational use of their water resources, protection of water from depletion and pollution. Particular attention in recent years is paid to water balance studies due to the intensive use of water resources and finding possible ways to fill water deficit in many areas of Uzbekistan. Water balance studies allow not only to explore the existing relationship between the individual elements of moisture exchange, but also to predict their changes in the future.

The result of modern ideas about the theoretical foundations of the doctrine of water balance is the international guideline on the “Methods of calculation of water balances”, prepared by the hydrological program of UNESCO in 1976 (<http://www.cawater-info.net/library/rus/hist/sokolov.pdf>).

1.2. CATCHMENT AREA – FORMATION OF RIVER FLOWS

A catchment basin (catchment area, water-collecting area) is an area of the earth's surface from which all surface and ground water flows into a given water body or watercourse, including its various tributaries. Most often, it is referred to river basins.

The basin of each water body includes surface and underground catchments. A surface catchment is an area of the earth's surface from which water flows into a given river system or a particular river. Underground water catchment forms the strata of loose sediments, from which water enters the river network. In general, the surface and groundwater catchments do not match. However, since the identification of the boundary of the underground catchment is almost very difficult, only the surface catchment is used as the measurement unit for the river basin. The border between the basins of separate water bodies passes through the watersheds.

Basins are divided into waste and drainage basins. The areas of inland runoff deprived of connection with the ocean through the river basins are called as “non-source”; the forms and sizes of the basins are very different and depend on the geographical location, landscape and geological structure of the area. The tributaries of the rivers have their own small basins, the total aggregate of those basins shapes the main river's area.

The catchment area of the world's Oceans is 118.8 million km² (about 80% of the total land area), including: the Atlantic Ocean - 50.7 million km² (34%), the Pacific Ocean - 24.8 million km² (17%), the Arctic Ocean - 22.4 million km² (15%), the Indian Ocean - 20.9 million km² (14%).

Of the inland water bodies (lakes), the largest catchment area near the Caspian sea is over 3.1 million km² (river flow comes from an area of about 2 million km²). The Caspian Sea is over 3.1 million km² (river flow comes from an area of about 2 million km²). The Aral Sea Basin is located in the heart of the Asian continent and covers the entire territory of modern Tajikistan, Turkmenistan, Uzbekistan, the southern part of the Kyrgyz Republic (three regions), and the southern part of the Republic of Kazakhstan (two regions) (see fig. 1.2). Some parts of the basin are located in Northern Afghanistan and Iran (about 8 per cent) and some in China (less than 0.1 per cent).

The total area of the Aral Sea Basin (within the borders of the former Soviet republics (Afghanistan, Iran and China are not included) is about 158.5 million hectares (see table 1). This territory extends between 56° and 78° of East longitude and 33° and 52° of North latitude. The territory of the basin has two main morphological zones: Turan plain (Central and Western parts) and mountain zone (in the East). The Karakum desert covers the western and southwestern parts of the Aral Sea Basin within the Turan plain and the Kyzylkum desert in the northern part. The mountain area includes the Tien Shan and Pamir mountains with the highest peaks over 7000 meters. The rest of the basin consists of different types of alluvial and intermountain valleys, dry and semi-dry steppe.

From the hydrological point of view, the feature of the catchment of the Aral is a division of its territory into three main zones of surface runoff: (a) flow formation zone (upper catchment basins in mountainous areas in the south-east - the territory of Kyrgyzstan and Tajikistan), (b) transit zone and runoff dispersion (central part) and (c) the delta zone (in the north-west - the Aral Sea zone).

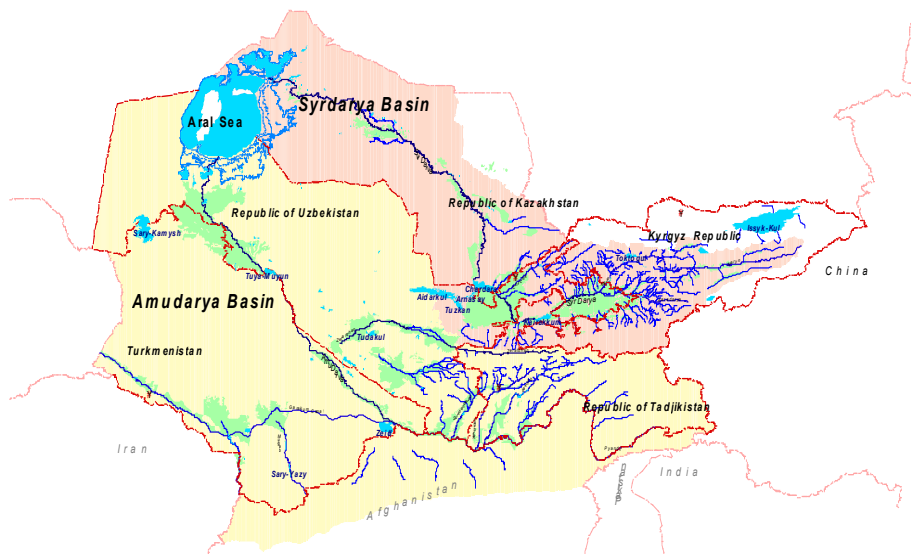


Figure. 1.2. Aral Sea Basin

Table 1. Territory of the Aral Sea Basin, hectares

Country	The area of the country
Kazakhstan *	34 440 000
Kyrgyz Republic*	12 490 000
Tajikistan	14 310 000
Turkmenistan	48 810 000
Uzbekistan	44 884 000
Afghanistan *	3 600 000
Aral Sea Basin	158 534 000

* Only areas located in the Aral Sea basin are included.

The Amazon Basin is the most high-water basin among the world river basins (territory 7045 thousand km²). The water system of the Nile River is considered the longest on Earth - 6852 kilometers. The area of the Nile River Basin is 349 thousand km². The largest river basin on the Euro-Asian continent is the Ob River Basin (2990 thousand km²). All the rivers of Central Asia originate in the Tien Shan, Hissar-Alai and Pamir

mountains, where a large amount of snow and ice is concentrated. In the mountains of Central Asia, up to 12 thousand water sources are formed - mountain and sai rivers. There are more than 600 such sources in Uzbekistan.

Mountain and sai rivers have their own characteristic features. Flowing down from mountain hollows, ridges, peaks and smaller brooks flow into larger ones that flow in narrow valleys and canyons with sheer cliffs and slopes. The bed of Mountain Rivers is rocky - with a noticeable slope and sharp drop of the riverbed, which creates a torrential river and sometimes - flashy water flow. The fall is a few meters per kilometer of the river length. Moreover, where waterfalls and thresholds are formed, this fall can reach tens or even more meters per kilometer of the river length.

The amount of river water runoff is associated with many factors: the absolute heights of river basins, the degree of glaciation and the area of snowfields, the ratio of precipitation and evaporation. The amount of precipitation in mountainous areas is greater than in flat areas, and their losses due to evaporation are minimal. The formation of the drain occurs because of the melting of seasonal snow and glaciers, as well as rain. The intensity of runoff formation in the compared mountainous areas is different.

The maximum value of runoff in Uzbekistan is observed in the Chirchik River Basin, where the slopes of the Western Tien Shan are well moistened and precipitation prevails over evaporation, which creates conditions for the formation of glaciation in the upper reaches of the Pskem and Chatkal Rivers, the main tributaries of the Chirchik River. The glaciers of Pskem and Chatkal, covering an area of 128 km² and 51 km², respectively, are located at sufficiently low level, playing an active role in the formation of surface runoff.

According to Shultz V. L. (1965) (well-known hydrologist), the average module of water flow in the mountains of Central Asia in average compose 6.5 l/sec from an area of 1 km², which is quite significant figures compared to the same records in Eastern (6 l/sec) and Central Europe (5.2 l/sec), as well as in some parts of Russia (6 l/sec). Mountains of Central Asia is a powerful storage of moisture, the flow of which is estimated at 5000 m³/sec or 160 km³ / year. 4 900 m³/sec (155 km³ / year) of this flow reach the plain.

Mountains with South and South-West orientation are distinguished by the highest specific water content in Uzbekistan. Some slopes of the Western Tien Shan and spurs of the Hissar range have the highest water content. Such rivers as Aksakata, Koksui, Ugam, and Pskem in the Western Tien Shan have an average flow module of 20-30 l/sec /km², and for the Surkhandarya tributaries (Gissar range) it is 30-40 l/sec/km² and more. These figures exceed the average module discharge through all the mountains of Central Asia by 3 - 4, 5 times (rivers of the Western Tien-Shan) and the tributaries of the Surkhandarya River by 4,5-6,0 times. In addition, the slopes of the South-West of the Fergana ridge are characterized by high water content.

In Central Asia and Uzbekistan, four types of river can be distinguished according to the nature of river feeding:

- Rivers of snow and rainwater. They have a maximum runoff starting from March to April. These are such rivers as Djinidarya, Guzardarya, and Keles.
- Snow feeding rivers. These are Akhangaran and Kashkadarya Rivers, the maximum runoff of these rivers starts in April and May.
- Rivers of snow-glacial feeding. Their maximum flow is from May to June. The Chirchik and Karadarya Rivers can be considered as snow-glacial feeding rivers.
- The rivers of snow and glacier feeding are Aksu, Sokh, Khodjabakirgan, Isfayram rivers, whose maximum flow runs from July to August.

The share of snow melt waters of the middle mountains of Uzbekistan is about 70% of the total flow. The share of glacial power is 25-30% of the annual flow. It should be mentioned that many of the rivers with glacier feed flow from the territories of Kyrgyzstan and Tajikistan. The rain-fed rivers of Uzbekistan are small, and their share is 1-2% of the High-Mountain Rivers and 10-15% of the annual flow in the low mountains (figure 1.3).

Almost all rivers with a large catchment area receive their waters from all these sources, and only one of the above types of sources can feed only sai and small rivers located on the same altitude belt. It is also necessary to note the role of groundwater formed as a result of the seepage of surface water into the soil. At the same time, all types of rivers receive a constant inflow, including the inflow from these underground sources. More details on groundwater will be described below (section 2.5).

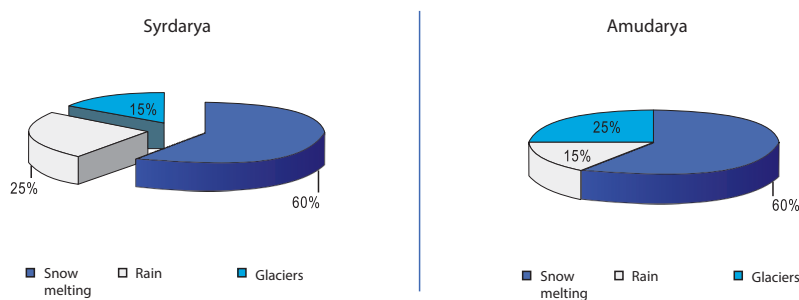


Figure 1.3. The structure of the feed flow on the basics of river basins in Uzbekistan

The flood begins on March 10-20 at an altitude of about 2000 m above sea level, and on April 10-20 on rivers whose drainage basin is located at an altitude of about 3000 m. In Uzbekistan, 70-95% of the annual river flow occur during the flood period. Rivers with high watersheds, such as Chirchik, Naryn, Karadarya, Isfara, Sokh, Pyanj, Vakhsh and others, receive the largest annual runoff from July to September (40-60% of annual flow). During this period, the rivers are fed mainly as a result of the melting of snow and glaciers. From March to June, these rivers receive a minimum flow - 20-30% of the annual flow, but not more than 40%. Rivers with low watersheds receive

their snow and rain food in the foothills, low mountains and middle mountains. The largest runoff here occurs from March to June, when there is from 60% to 80% of annual runoff. By mid-spring, the snow reserves dry up, and by early summer the rains stop. And in the period from July to September there is only 15-20% of the annual flow.

The main factors influencing the change in river flow are: increased precipitation variability; air temperature rise; degradation of glaciation, reduction of snow stocks; an increase in evaporation in river basins, as well as human activities.

1.3. THE MAIN PROCESSES IN THE FORMATION OF RUNOFF AND WATER USE

Water management is the art of delivering the required quantity and quality of water to the right place and at the right time. This requires linking available resources and the need for them. At first glance, this seems to be an engineering task to ensure balance (see Fig. 4, the Central fragment). On the one hand, available water resources shall be assessed: precipitation, surface runoff, groundwater, waste water. On the other hand, the water demand of different sectors shall be measured: drinking and communal water supply, irrigation, industry, hydropower, and recreation, fish farming, and navigation and, most importantly, nature itself. Each of these elements of the water balance is associated both with the social situation and with economic and political conditions. A variety of water sources, their interrelationship, diverse departmental interests, different impacts and their consequences, mechanisms and management tools, complex infrastructure – all this makes the simple task of achieving a balance in the complex linkage of the system of interactions of different blocks. This task requires a comprehensive approach if we want to keep a balance of interests, current and long-term goals, the development of society and the preservation of nature, etc.

Let's consider in more detail the processes of interaction of spheres and factors in the water management system. The balance of management and development always took into account all water resources, the so-called disposable water resources, which included the hydrological volumes of river flow determined for the estimated years plus groundwater resources approved for use minus the mandatory flow costs in the form of losses for filtration and evaporation from the channels and reservoirs and the so-called regulating releases. Often, these resources were added to the volume of return water from irrigation, industry, municipal use - regardless of their quality and time of formation. Such an approach was adopted, for example, in schemes for the integrated use and protection of water resources (IUPWR) of the Syrdarya and Amudarya River Basins. At the same time, the natural demand of the river, the delta, the closed reservoirs (of the Aral itself), and the protected zones were determined by the residual principle. This caused a crisis in many of our rivers and reservoirs.

Taking as a priority the needs of nature in water, and then society, management should be based on water resources that are environmentally acceptable for use. That is, we take away the minimum demand of the natural complex in disposable water resources (that is, the river bed itself — so that the river remains a river; the river deltas — so that it can ensure fish production, and be a bird migration zone, etc.). For the conditions of the Aral Sea Basin, this value is not 126 km³, defined for use by the IUPWR Schemes, but only 78 km³ per year (as calculated by SIC ICWC).

This value did not meet the needs of the former water use system, but it is quite satisfactory if the requirements are oriented towards potential productivity. It is very important to remember that this limit would allow to apply economical and rational water consumption more than thirty years ago, instead of wasteful use of water, the

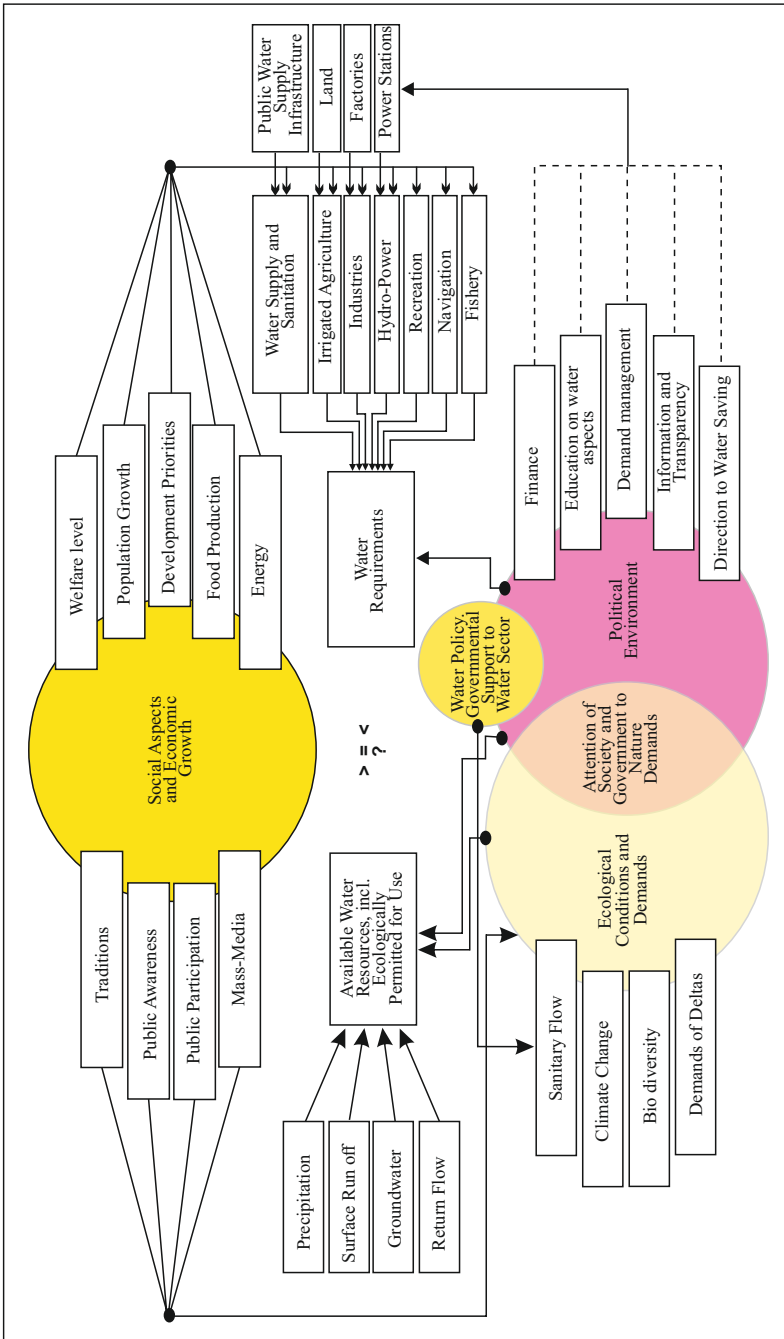


Figure 1.4. The variety of factors in the process of water resources management (from the book: *Integrated water resources management: from beautiful theory to real practice. Experience of Central Asia*. Edited by Prof. VA Dukhovny. - Tashkent: SIC ICWC, 2008)

fruits of which we reap today, spending an average of 2500 m³/person per year. However, this line of behavior required strong political will. Only today we began thirty years ago, instead of wasteful use of water, the fruits of which we reap today, spending an average of 2500 m³/person per year. However, this line of behavior required strong political will. Only today we began to understand the importance of “leading the political environment” - the need to focus on the priority of nature’s demands on water.

At the same time, if the orientation is directed to the use of water within the limits of environmentally permissible discharge of runoff, the political environment should immediately adopt the transition to the economical use of water as well as to the management of water needs and general water saving as the main principle. This accordingly causes the need to improve the legislative, financial and regulatory framework and tools that should be used in water management.

Today, a corresponding distribution of roles between the political superstructure (political system, legislation, regulation), which in foreign literature is defined by the word “governance”, and the management system, which is divided into subsystems of water distribution, water use, environment and extreme situations, is required. At the same time, the “governance” determines the rules of the game and provides incentives (regulatory) mechanisms, and managers are responsible for implementing, detailing and applying the distribution, regulation and protection system, while water users are responsible for the rational use of water itself in their sphere of operation. Relations between water authorities and water users related to the management and use of water resources are included in the water management system, and a political superstructure provides development of a “governance” mechanism.

From the diagram in fig. 1.4, it becomes obvious that every water management organization, whether in the interests of water supply of city, village, district or irrigation canal, irrigation system, must meet the demands of its consumers in a sustainable, fair and high-quality manner. From this perspective, it would seem that successful management implies that the supplying organization must always have more water than the consumer requires and, through its reserves, be able to meet the needs of consumers in any demand fluctuations. However, such management implies an excess of resources, either in the extraction of water or in the cost of water supply, and hence the corresponding consequences that go beyond simply maintaining the demand – supply balance and the consequences associated with all of the above institutions and areas of governance.

Here an important role of the state emerges, which should define the framework within which water management organizations should act in the interests of all industries and water users. The success of survival is that the water management system must achieve (or approach) maximum water productivity for all water users, whether this be irrigated agriculture, industry or municipal water supply. Here it is meant that the production of a unit of production will consume the amount of water that is close to (or tends to) biological or technologically necessary consumption with minimal

unproductive losses throughout the cycle from water intake, transportation, from water supply to water use (so-called “potential productivity” of water). This requires a very clear linkage of all technological processes of water use with the processes of distribution and water supply, as well as compliance with other (non-water-related) technological demands.

In irrigated agriculture, for example, this means the need for strict obedience to the rules of land reclamation, agricultural engineering, protection of soil fertility, selection of crop varieties, etc.; in water supply - the rules of sanitation, combination of cleaning system and the use of drains, etc.; in industry - providing advanced production technologies, return (cyclic) water use, waste disposal, etc. Thus, the activities within the framework of water management often go beyond the organization of “clean” water use and protection of water resources and include all areas related to water as the main limiting factor. It is this experience that should be drawn from the integrated (crosscutting) development and management of the territorial complexes of reclaimed desert lands, which were used at one time in the Golodnaya and Karshi steppes, and which ensured the highest specific productivity of water and land resources in the Central Asian region. This is also guided by examples of management of territorial complexes within river basins in such developed countries as the USA, the Netherlands, Switzerland, Australia and others. Therefore, the scope of application of IWRM principles should go beyond the usual water resources management in certain areas with water scarcity and invade the management of the social sphere and natural complexes, ensuring their harmonious development under the auspices of the “governance”.

Let us turn again to the diagram in Fig. 1.4. It can be seen that the political environment with the help of certain tools (progressive block payment for water, a system of fines and incentives) encourages all sectors of water users to manage the demand for water-to reduce it. At the same time, the “governance” encourages the use of public pressure tools - the involvement of the traditions of economical water use, public involvement in the management and development of the water sector. Under these conditions, with well-defined rules of the game in the political space, the water management system can adapt to the conditions of each basin based on the general principles of “governance” and take into account the limiting factors of managing the balance of demands and resources.

An objective obstacle to the wasteful and “easy” approach to water use from the standpoint of today is the lack of water resources in Uzbekistan that does not allow overabounding. Another limiting factor is the hydrological link between surface and groundwater, as well as territorial unevenness in the distribution of water users and natural users of water within the basin.

It is the spatial and temporal disproportion in water consumption that contributes to the development of a conflict of interest in terms of consumption (water use by water users in the upper part of the basin, that reduces the volumes of water flowing downstream), water supply regime (the schedule of water use by hydropower

often does not coincide with the schedule of demand for irrigation water and the environment) and water quality (return water discharges in the upper parts of the basin pollute the downstream flow). Another problem is limited funding for the maintenance, operation and development of water infrastructure, which to a certain extent is associated with difference in water productivity and efficiency of its use in various sectors of the economy. These contradictory trends generate conditions for “water egoism”, which can be overcome only with a very balanced and reasonable management in the water sector and integrated water management, which requires not only technical knowledge and management skills, but also a systematic approach.

It is important to note that while improving water management, one should not look for uniform or template approaches that are acceptable to all, but at the same time more or less general rules should be developed regarding the organization of the institutional structure, which is less possible for reforms of the legislative base, and especially financial and economic structures, as they are more dependent on the specifics of the political and economic conditions and possibilities of the government and water users, the state of the environment, and the need to develop and support the culture and education of society, its traditions, social structure of land use, etc.

To a greater extent, this is applicable to the management rules, which are the weakest link in the modern management system and which require the greatest attention of all water management specialists, since each basin, each sub-basin, each water management and irrigation system, as well as each person, has own characteristics. This is determined not only by the specifics of the landscape, the configuration and structure of the catchment area, but also by the conditions of water intake and water distribution (water intake of surface or groundwater, overregulation of the water source by the reservoir), parameters of the water distribution system; the presence of ameliorative network; a combination of hierarchical levels of management, composition and conditions of work on water distribution at various levels of the hierarchy, etc.

Therefore, the mechanism of management and distribution of water resources should use not only the developed industry rules, but also ensure the possibility of formulating adequate guidelines under the changed conditions. This development requires active interaction of international qualified specialists, scientists and practitioners with local professionals and water users working in organizations that implement the principles of IWRM.

At the same time, water management becomes not only a profession and science, but also an art. A certain system of organization of active “stakeholders” is being established, aimed at solving specific tasks and achieving necessary results, which ensures the formation, maintenance and development of management mechanisms necessary to respond to the impacts of transition processes, and is capable of self-improvement. It is extremely important that the objectives, framework conditions and principles defined for the management system remain stable in the long term, and

adaptation and self-improvement mechanisms will adapt to changes in the external and internal environment. Thus, such an approach and methods for its implementation serve to ensure a sustainable balance of many components, which should be the basis for integrated water resources management.

On the implementation of IWRM principles in Uzbekistan, see section 4.3 for more details.

Summarizing the above, the following shall be emphasize:

Modern development in the conditions of sharp global economic changes, unpredictable dynamics of prices for agricultural products, energy resources and explosive fluctuations of exchange rates and nuances of market relations creates absolute uncertainty associated with both the lack of comprehensive information and the inadequacy of our knowledge about natural and economic processes. In this environment, with its multilateral connections, the complexity and unpredictability of hydrological and natural processes associated with the general complex of problems of development and existence of society are imposed on water management.

It is clear that in such circumstances, the sectoral approach to water management increases the complexity of the mutual coordination of interests. Therefore, the need for an integrated approach to water management is a logical response to the dynamics of the modern world. This is a response to our certain lack of knowledge on multilateral links and causal links between water and economy, the environment, etc. – not with respect to water itself as a substance, but with respect to the use of water and the consequences of its management or uncontrollability in the existing versatile world. This is one of the modern problems of turning IWRM into a panacea for saving the water sector from the uncertainty and complexity of causal phenomena, which determine the water management, use, maintenance of quality, development of water resources, and interaction of water with economy, nature and society.

1.4. ECOSYSTEMS: COMPONENTS AND SERVICES

Currently, the concept of “ecosystem” is defined as a natural-territorial dynamic complex of communities of organisms and inanimate environment interacting as a single functional unit. Ecosystems are one of the components of biological diversity, which represents a higher hierarchical level than a collection of genes or species. Biological diversity is necessary for the further sustainable development of humanity, not only because it is of immediate value, but also because it plays a key role in the implementation of ecosystem functions and other processes on which humans ultimately depend.

All water bodies and land areas in their zone of influence are united by the concept of aquatic (hydromorphic) ecosystems. In Central Asia, there are three main classes of aquatic ecosystems:

- Water areas (seas, lakes and reservoirs, river beds);
- Delta (avandelta and river deltas);
- Floodplain-valley (river valley).

Aquatic ecosystems are intrazonal because they can be equally represented in both flat and mountainous landscapes (Box 1). However, within the main classes of ecosystems smaller units can be identified, which are determined depending on the nature of biotic elements (vegetation). By the nature of the vegetation, aquatic ecosystems are divided into 2 main types: reservoirs with submerged aquatic vegetation (large algae and higher aquatic plants) and reservoirs with air-aquatic vegetation (reed and coniferous vegetation, flux). Coastal ecosystems (deltaic and floodplain-valley) are also divided into hydromorphic ecosystems with appropriate types of vegetation. Among them, within both regions stand out:

- Grass bogs (sedge, reed, reed, etc.);
- Meadows (real, halophytic, steppe, desert grasses and grasses);
- Floodplain forests (in the desert zone – a tugai forest);
- Saline basins with halophytic vegetation (marching, coastal and sor-affected areas);
- Dune and churot (with close occurrence of groundwater) sands with meadow-psamophytic vegetation;
- Oligotrophic bog or “sazy” (mountain high bogs).

The importance of aquatic and semi-aquatic ecosystems for humanity is very great. They provide water and biological resources to a huge number of people in the world, determine the stability of local climatic conditions, serve as habitats for many species of living organisms, among which are animals – fish, mammals, birds. For many migratory and sedentary species of wetland birds, which are valuable biological resources, many water bodies and wetlands are of particular importance. Aquatic ecosystems are extremely important both for the conservation of biological diversity and for the well-being sustainable development of local communities.

Lowland regions	Mountain regions	Intra-zonal Ecosystems
<p>Forest-steppe: (KZ) 1. South forest-steppe plains 2. Steppe with kolkis and forest-steppe plains 3. Forest steppe of lowland belt</p> <p>Steppes: (KZ) 1. Arid steppes 2. Dry steppe 3. Deserted steppes 4. Halophytic steppes</p> <p>Desert Ecosystems: (KZ, KG, TJ, TM, UZ) 1. Northern Desert (semi-desert) 2. Middle deserts 3. Southern deserts 4. Desert intermountain depressions 5. Halophytic deserts</p> <p>(Desert ecosystems include sagebrush, perennial saltwort, psammophyte-shrub, saxaul, astragalus, and convolvulata).</p>	<p>Foothill plains and foothills (KZ, KG, TJ, TM, UZ) 1. Step foothills 2. Desert Plains and Foothills of the North Tien Shan type 3. Desert and savanna foothills of the Central Asian type</p> <p>Mountain ecosystems: (KZ, KG, TJ, TM, UZ) 1. Mountains with Altai type of zone 2. Mountains with Sauro-Tarbagatai type of belt 3. Mountains with Dzungaro-North Tien Shan type of belts 4. Mountains with Karatav-Zapadno-Tyanshan type of belt 5. Mountains with Pamir type of belt 6. Mountains with Khorasan-Kopetdag type of belts</p> <p>(Mountain ecosystems are divided into semi-savanna, forest, and mountain meadows and nival with moraines, eternal snows and glaciers).</p> <p>Water-aquatic ecosystems: 1. Aquatic (water areas of lakes and reservoirs, riverbeds); 2. Inundable-valley (Mountain tugai, Meadow Inundable marshes).</p>	<p>Anthropogenic ecosystems: (KZ, KG, TJ, TM, UZ) 1. Agricultural Irrigated land Rainfed lands Woody valley plantation 2. Urbanized Urban Rural Recreation areas Other</p> <p><i>Source: Botanical Geography of Kazakhstan and Central Asia, Saint-Petersburg, 2003; Landscape and biological diversity of the Republic of Kazakhstan, 2005; SSAU CA, 2003;</i></p>

Box 1. Classification of the main types of ecosystems in Central Asia

The formation and spatial distribution of vegetation is determined by the interaction of a complex of zonal-intrazonal factors and the processes caused by them. The geographical background of the latitudinal (on the plains) and altitudinal (in the mountains) differentiation of hydromorphic vegetation is the climate and geological and geomorphological conditions in the basin. Changes in the composition and structure of communities depend on intrazonal factors - the regime of river flow, transgression and regression of water bodies. The main properties of the vegetation cover of hydromorphic ecosystems are high dynamism, instability in time of composition and structure, spatial heterogeneity. Therefore, aquatic ecosystems and all their components are highly dependent on the general state of the environment and are extremely sensitive to any changes in water regimes occurring under the influence of certain factors.

The territory of Central Asia includes flat and mountainous parts that have a relatively high diversity of natural ecosystems and species (Box 1).

In the lowland regions, forest-steppe (Kazakhstan only) and steppe (Kazakhstan, Uzbekistan) are widely represented, as well as desert types of ecosystems (all countries) and habitats. In the mountains (also represented in all countries), the high-altitude zone is well expressed, therefore several zonal-climatic zones are clearly defined here, corresponding to the main types of mountain ecosystems. Water-near-water ecosystems are represented both in the plains and in the mountainous regions, forming specific habitats in each of them. Other zonal ecosystems, especially those represented in mountainous areas, may not be aquatic and semi-aquatic, but have a noticeable impact on the formation and support of the latter, as well as nival and forest ecosystems in the mountains ensure the sustainability of the water regime and the normal functioning of aquatic and semi-aquatic ecosystems. Glaciers ensure the formation of water resources in the downstream areas and maintain the necessary balance of feeding of rivers formed in mountainous areas. Glaciers of Central Asia play a special role in the water balance of water bodies. The area occupied by glaciers in Central Asia is 8.5 times the glaciation of the Greater Caucasus and 28 times the glaciation of Altai. Intrazonal types of ecosystems are represented by anthropogenic systems on the plains, foothills and mountains, including agricultural land and urbanized areas. A characteristic feature of all countries in both regions is the increased fragility of arid, mountain, and inland water ecosystems. The natural ecosystems of the countries are of high importance in ensuring the vital activity of a large and rapidly growing population due to the limited area of arable land and water resources. Part of the territory of five countries of Central Asia is included in the zone of the Aral ecological disaster.

The countries of Central Asia belong to the Palearctic biogeographical province. According to the modern global classification, three sub-provinces are classified: the Turan Plain, the Pamir-Tien Shan Mountains and the Aral Sea. The Global list of the World Wildlife Fund (WWF) is based on a biogeographical approach and a combination of floristic and zoogeographic provinces; it identifies 867 different eco-regions in the world. Each eco-region has its own name and a letter code that

determines its biogeographic features. The list of regions for the protection of which urgent measures are needed is highlighted as WWF's "Ecoregions-200" Global List. To date, about 240 such eco-regions have been identified, of which 195 are terrestrial (including 53 freshwater) and 43 are marine. In Central Asia, currently four "eco-regions" are included in the WWF Global List¹. They are:

- Altai-Sayan mountain forests: The global eco-region № 79 extends over an area of 862,000 km² and covers part of Russia, China, Mongolia, as well as a small section of northeastern Kazakhstan. These forests represent the most prominent part of mountain coniferous ecosystems in Central Asia. The most disturbed is the southern steppe part of this region, which is under the pressure of intensive grazing of sheep, logging, ore mining and hunting.
- Central Asian mountain steppes and woody vegetation: the Global eco-region № 111 covers approximately 878,500 km² and extends across all five Central Asian republics to neighboring Afghanistan, China and Pakistan. Hissar-Alai open thickets, Pamir Alpine desert and tundra, as well as the Tien Shan mountain coniferous forests, steppes of the Alai and Western Tien Shan, Alpine meadows of the Hindu Kush, Tien Shan mountain meadows and steppes and Tien Shan arid steppes of the foothills, represent ecosystems here. This ecoregion is a huge grassy plain, which includes several mountain ranges with snowy peaks and cliffs covered with trees. The longest ridge of the Tien-Shan extends over more than 2.5 thousand km, with the highest peak of the Victory - about 7400 meters above sea level. Several large rivers flow through this territory and glaciers here are common. Due to the abundance of isolated habitats, this eco-region contains a huge variety of endemic herbaceous plants and shrubs. Walnuts and fruit trees, pistachio and juniper represent woody species. The most common are onion bulbs, among which it is especially necessary to distinguish tulips, desert candle, and ungeria.
- Central Asian deserts: Global eco-region № 134 represents the richest desert biodiversity from all of Asia, with unique ecological features and a high diversity of endemic species. Three types of ecosystems are represented here: the North Central Asian deserts, the South Central Asian deserts, and the unique tugai forests and oases. This eco-region is represented only in five countries of Central Asia and contains a mosaic of clay, rocky, saline and sandy deserts. The richest biological diversity is represented mainly in the sandy deserts (Karakum and Kyzylkum). The Amudarya and Syrdarya - the largest rivers of Central Asia – cross the desert on the way to the Aral Sea. Many species of flora and fauna have adapted well to the combination of an extremely cold frosty winter and a contrasting hot summer. The afforested river valleys in the past served as habitats for species that have now become extinct, such as the Turanian (Caspian) tiger or have become rare (Bukhara deer, reed cat). In the deserts, a cheetah, kulan, gazelle and saiga have recently lived, which also have almost disappeared at the present time as a result of strong human drive and habitat change due to irrigation and industry development.

¹ Udvardy, M. (1975). A Classification of Biogeographical Provinces of the World. Prepared as contribution to UNESCO's Man and the Biosphere Programme Project No18. IUCN, Morges, Switzerland.

Often, Central Asia is perceived as a republic of the former Soviet Central Asia (Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, and Turkmenistan) (sometimes with the inclusion of the Xinjiang-Uyghur Autonomous Region of China and Afghanistan). Despite specific local differences in climates, a temperate and subtropical continental dry climate is common in Central Asia, which distinguishes it from other parts of Asia. This is an area of deserts, steppes and imposing mountain ranges. In the south, the region borders with Afghanistan and Iran, in the east with China, and in the west and north with Russia. The territory runs from the Caspian Sea in the west to Mongolia in the east and from Siberia in the north to the Hindu Kush mountain system in the south. Central Asia in hydrographic terms is a closed inland drainage basins, isolated from the seas and oceans, located deep in the continent of Eurasia. Deep continental and relatively southern location of the region, as well as its openness in the north, cause a great dryness and sharp continental climate. In accordance with the natural and climatic conditions, a number of the most typical regional ecosystems have been formed on the territory of the region: desert ecosystems of plains; foothill semi-deserts and steppes; river and coastal ecosystems; ecosystems of wetlands and deltas; mountain ecosystems. Each of them is a complex of natural components, which determines the development and functioning of communities of flora and fauna. Ecosystems of the plains occupy more than 70% of the territory, and the rest of the area falls on the mountain uplifts, where the main river flow is formed.

In the context of excess heat in the arid zone, water resources are the limiting factor for the development of natural ecosystems in the region, and therefore the richest and most productive regional ecosystems are initially classified as floodplains and river deltas. At the end of the tertiary and during the fourfold periods, the uplift in the southeast and east of Central Asia resulted in the formation of massive mountain systems that now frame this territory in the south and east. The main mountain ranges in this region are the Pamir, Tien Shan and Altai. The highest peaks are located in the Eastern Pamirs and the Central Tien Shan. Highland and fertile plains of Tajikistan, Fergana, Issyk-Kul, and other territories distinguish these mountains. The mountainous region of the region, with all the diversity of precipitation distribution (60–2500 mm per year), receives them 3.5 times more than the plain areas and gives it to the underlying plains, mainly in the form of surface runoff, where its intense dispersion and evaporation occur. . In addition, in the mountains there are high-altitude belts, which, depending on the latitudinal position, demonstrate diversity of the following ecosystems:

- Mountain deserts and semi-deserts,
- Mountain steppes,
- Bush light forests,
- Small-leaved and broad-leaved forests;
- Coniferous forests (spruce in the north of the region, juniper in the south);
- Subalpine and alpine mountain meadows;
- Sub-nival and nival zone of eternal snow.

Mountain river systems have a variety of mountain floodplain forests with various tree and shrub groupings. The traditional system of grazing includes seasonal migration

from the plains to the highlands and back. The territorial combination of desert-steppe spaces and Aquifer Rivers, cutting through them, entails the intensive use of these rivers for irrigation of lands devoid of moisture in the plain area. In this regard, human economic activity has long been one of the key factors affecting the formation of runoff. The different directions of runoff in the mountains and on the plains gave the basis² (as noted above) to highlight the area of flow formation in Central Asia, corresponding schematically to mountain elevations, and the area of runoff dispersion, where the runoff is disassembled for irrigation and evaporated. Taking into account the prevailing role of the anthropogenic factor in recent times, such concepts as the zone of runoff formation and the zone of intensive runoff consumption (AIPC)³ are used to designate these contrasting hydrographic zones. The abundance of solar energy and the presence of vast plain spaces predetermined the intensive development of irrigated agriculture, due to which the demand for water resources, especially since the mid-60s, has increased dramatically and water consumption has increased threefold.⁴

To meet the needs of growing agriculture and the population in the Aral Sea Basin, a complex irrigation farm has been created from interconnected natural watercourses, artificial reservoirs, water intake facilities, irrigation canals of the collector-drainage system⁵. However, due to the low efficiency (COP) of most water management systems there are huge irretrievable losses of water. In the Aral Sea Basin, a system of regulation of river flow is developed including a large number of channel and bulk water reservoirs.

At the same time, in the mountains of Central Asia, degradation processes, such as deforestation and erosion, pollution by waste and reduction of pastures⁶ are exacerbated. Shift of zone of intensive runoff consumption (ZIRC) occurs in the high-altitude direction, namely in the zone of flow formation, due to the expansion of urbanized and recreational zones and the associated withdrawal of river flow by numerous local water intakes. The rivers are particularly prone to this process, for which the withdrawal of water and the peak of the recreational load coincide with the minimum flow of water in them. As a result, there is a depletion of the flow of these rivers, intensive overgrowing of the channels with filamentous algae and a decrease in the quality of water in them to transitional classes II-III or III (moderately polluted water). This was recorded in the Nurata Reserve Park and in the Ugam-Chatkal Nature National Park. In the zone of intensive drainage consumption (IPPA), the natural flow regime of rivers is significantly distorted by reservoirs, irrigation water abstraction, and discharge of collector-drainage water, industrial and municipal effluents that

² Schulz V.L. Hydrography of Central Asia. Short essay. Publishing house of SSAU, Tashkent, 1958, 117 p.

³ Chub V.E., Toryanikova R.V., Talskikh V.N. Optimization of the monitoring system of surface water quality in the Aral Sea basin // Assessment of environmental pollution in the Central Asian region. Proceedings of SARHI, 1998, № 155 (236), p. 5-18.

⁴ The Aral Crisis, Tashkent, UNDP, 1995, 16 p.

⁵ Gorelkin N.E., Gorshkov N.I., Nurbayev D.D., Talskikh V.N. Assessment of the state of reservoirs and lakes on the right bank of the Amu Darya. - Problems of desert development, №2, 2002, p. 49-57.

⁶ The Environment, Water and Security in Central Asia (Central Asia Sustainable Development Goals) - CAREC, 2003, 28 p.

violate their hydrodynamic, hydrochemical and hydrobiological regimes⁷, as it is most pronounced in urbanized industrial-urban agglomerations and in the lower reaches of rivers associated with irrigated areas. The quality of river water in the zone of intensive consumption of runoff varies mainly from class III to class IV (polluted water), and in the zone of large industrial-urban complexes its quality may at times decrease to V-VI hazard classes (dirty and very dirty water), under which water is environmentally hazardous, with a pronounced degradation of aquatic biota, and cannot be used for any purposes⁸.

Central Asian region retains a rich and unique biodiversity. According to modern estimates, there are more than 3,000 species of fungi, about 8,000 species of higher and lower plants, about 20,000 species of invertebrates (according to incomplete estimates) and about 1,000 species of vertebrates, among which there are about 120 native species of fish, 15 species of amphibians, 103 – reptiles, about 560 species of birds and 160 species of mammals. The biodiversity of the region has a high level of endemism, especially among plants and invertebrates. Species diversity of flora and fauna is directly dependent on the state of biological ecosystems. Extensive development of irrigated agriculture, excessive use of pesticides, salinization, waterlogging, soil erosion, water pollution, regulation of river flow, overgrazing, deforestation and tugai vegetation, etc. have led to the loss of habitats and a reduction in the number and range of species. The greatest changes have been made to the lowland, water and near-water ecosystems, which have been affected by large-scale land development and the accompanying redistribution of water resources.

Ecosystem services to support aquatic and semi-aquatic ecosystems in Central Asia

Clean and accessible fresh water for public use is one of the fundamental conditions for the successful development of each region. At the same time, it should be noted that due to increasing water consumption for various purposes, pressure on water resources has increased and continues to increase, which leads to a number of specific problems related to sustainable integrated water resources management. Lack of drinking water or water for crop irrigation can lead to serious local, national and regional conflicts. Therefore, the importance of freshwater resources for the sustainable development of humanity continues to increase and attracts serious attention of all segments of society to solving the problems of the water sector. Water allocation and water distribution issues are particularly acute in the Central Asian regions.

The role of ecosystems such as forests, soils and wetlands, which provide collection, filtration, storage and distribution of water, prevent drought and mitigate the impacts of floods are receiving increasing recognition, both at global and national and local

⁷ The first national communication of the Republic of Uzbekistan under the UN Framework Convention on Climate Change. Tashkent, 1999, 124 p.

⁸ Chub V.E., Toryanikova R.V., Kenshimov A.K., Talskikh V.N. Problems of quality management of transboundary waters in the Aral Sea basin // problems of desert development, №1, 2001, pp.28-35.

levels, where measures to ensure the protection and restoration⁹ of these ecosystems are being developed. The Millennium Ecosystem Assessment, published in 2005, noted the impact of changes in ecosystems on human well-being, presented options for responding to these changes, and quantified the value of individual ecosystems and the services they provide¹⁰. Although these Ecosystem Assessments cannot be considered complete enough, they are sufficient to mark the continuing degradation of 15 of the 24 analyzed ecosystem services, which increases the likelihood of potentially drastic changes that will seriously affect human well-being. These include the emergence of new diseases, a sudden change in water quality, the appearance of “dead zones” along the coasts, a reduction in fish stocks and climatic changes in various regions. Two types of services - fish stocks and drinking water supplies - are far below the level that can be met by the needs of the current generation, not to mention the needs of future generations. Over the past 50 years, people have changed ecosystems faster and more than any other period in the history of civilization. These changes were aimed at meeting the rapidly growing demand for food, drinking water, wood, fiber and fuel. After 1945, more land was converted into agricultural land than in the 18th and 19th centuries combined. This led to a significant and generally irreversible loss of the diversity of 'life on earth, with the result that between 10 and 30 percent of all mammals, birds and amphibians were endangered. The Ecosystem Assessment Summary Report also shows that the poorest segments of the population suffer the most from changes in ecosystems. The regions, facing the greatest difficulties in achieving the United Nations Sustainable Development Goals, are also experiencing the greatest problems associated with the degradation of ecosystems. The Central Asia region is amongst them.

The development of agricultural and industrial production in Central Asia in the last century was accompanied by a significant transformation of ecosystems, among which aquatic ecosystems were particularly changed. The most significant disruption of ecosystems and the largest man-made disaster in Central Asia was the drying up of the Aral Sea and the Amudarya and Syrdarya deltas. Due to the unsustainable use of water resources for irrigated agriculture, since the mid-1970s the average river inflow (primary: 56 km³/year) decreased 10 times, the surface of the Aral Sea (primary: 66100 km²) decreased by more than 2/3, it lost 4/5 of the primary volume (1062 km³), its initial level (53.46 m above sea level) fell by 30 meters, the salinity of the water (primary 11-13) increased 6-12 times. The total area of the delta lakes has decreased by 2 times (more than 60 highly productive lakes, covering an area of 600 km², have dried out). In place of the former seabed and river deltas, a highly salty desert of 33.4 km² appeared. The exposed bottom of the sea has become a source of salt and dust removal on a geological scale. The climate of the region has changed, fish and game have disappeared, and agricultural activity has become ineffective. The environmental crisis has created a social crisis. The incidence rate of the population increased, life expectancy decreased, and as a result, the outflow of the population began and

⁹ Workshop on environmental services and financing for the protection and sustainable use of ecosystems. Geneva, 10-11.10.2005

¹⁰ Millennium Ecosystem Assessment Compilation Report, 2005. <http://www.millenniumassessment.org/admin/Documents>.

environmental refugees appeared. Now in the arid zone of the Aral Sea region, about 100,000 km² of pastureland are in need of fundamental improvement. 17480 km² of desert areas are subject to secondary salinization; 15% of irrigated land; water erosion is developed on 14,200 km² of arable land, of which 7,500 km² is irrigated.

In many parts of Central Asia, ecosystems have been seriously degraded. It is caused by agricultural activities (overgrazing, irrigated agriculture, pollution of land with pesticides), construction of dams, hydroelectric power stations, extraction of sand and gravel, deforestation and slashing, urbanization of natural areas. A large increase in arable land in the South of Central Asia in recent decades (from 25,850 km² in 1955 to 42218 km² in 1990) occurred at the expense of biodiversity, as most arable land was under mono-cropping (cotton). More than 70% of the Aral Sea crisis are caused by anthropogenic factors, the rest of changes were caused by climatic factors – the current natural low water in the long-term hydrological cycle. The extremely negative consequences of the Aral crisis, in addition to the reduction of the surface area, growth and changes in the nature of water salinity in the sea, was the formation of a huge salt desert with an area of almost 3.6 million hectares on the drained bottom. Intra-delta waters of the Aral Sea region also have a whole complex of negative changes-reduction of water volume, increase of water salinity, decrease of biodiversity and bio productivity¹¹.

Ecosystem services can be grouped into six broad categories based on their environmental and economic functions¹²:

- Purification and detoxification: filtration, purification and detoxification of air, water and soil;
- Cycling processes: nutrient cycling, nitrogen fixation, carbon sequestration, soil formation;
- Regulation and stabilization: pest and disease control, hurricane and flood mitigation, erosion control, rainfall management and water supply;
- Provision of habitat: habitats for animals and plants, conservation of genetic resources;
- Recovery and production: production of biomass for raw materials and food, pollination and seed distribution;
- Information/life needs: aesthetic, recreational, cultural and spiritual roles, education and research.

River systems and groundwater require a certain amount of water to provide the normal functions of ecosystems that determine the stability of water resources¹³. This

¹¹ Tuchin A.I., Gromyko K.V., Ruziev I.B. Environmental problems of the Southern and Northern Priaralie and proposals for their rehabilitation and stabilization of functioning // Environmental sustainability and advanced approaches to water management in the Aral Sea basin: Materials of the Central Asian International Scientific and Practical Conference. Almaty-Tashkent, 2003, p.341-351

¹² Water-related ecosystems and their role in water management: Environmental services and financing for the protection and sustainable use of ecosystems. - Seminar on environmental services and financing, Geneva, 10-11.10.2005.

¹³ Dycon, M., Bergcamp, G., Scanlon, J. (eds.). Flow. The Essentials of Environmental Flows. IUCN, Gland, Switzerland and Cambridge, UK. Xiv + 132 pp. – 2 edition.

amount of water is called environmental runoff or discharge. Each aquatic ecosystem (river, wetland, aquifer, etc.) can be characterized by its overall resource potential. A river catchment capacity can be represented by average annual runoff, which reflects the natural (undisturbed, before the development period) conditions of the catchment. For lakes and certain types of wetlands, the average annual volume of water in the lake (wetland) can represent their potential. Each aquatic ecosystem needs a certain amount of water to maintain its ecological integrity. River systems need water to sustain themselves and their functions and to satisfy various needs and provide benefits to people. The amount of water required for this is called “environmental flows”.

Self-purification of water is a combination of all natural processes in polluted waters, leading to the restoration of the original properties and composition of water. The amount of regulating releases on rivers was determined by design studies (the “Schemes”, the “Rules for the operation of hydroelectric complexes”) and now requires a more thorough substantiation, since river regimes have changed significantly in recent years, both in quantitative and qualitative terms. Specialists from Central Asian regions highlight requirements for three releases: sanitary, environmental along the river, and sanitary-environmental through the channels into the irrigation network. Regulating releases to rivers are necessary to maintain rivers as water bodies that have natural (ecological) and social value, in particular, to prevent deterioration of the sanitary situation and quality of river water. Ecological releases to rivers are necessary to maintain natural and artificial aquatic ecosystems. Regulating-environmental releases to the irrigation network are carried out with the aim of maintaining minimum volumes of water in the canals, but mainly to meet the household and drinking needs of the population.

Not only aquatic ecosystems, but also forest ecosystems supporting them, need protection and proper management. Numerous studies have established that the development and intensity of erosion processes in mountain areas is closely related to the degree of forest cover. Thanks to water protection, soil protection and other functions of forests, the soil is protected from water and wind erosion, floods and destructive mudflows. Deforestation in the drainage basins of Mountain Rivers is accompanied by excessive grazing of livestock, which leads to increased weathering and erosion and the accumulation of their products on bare slopes. As a result, the precipitation of heavy rainfall in Mountain Rivers often formed destructive mud flows – mudflow, which is especially typical for mountainous regions with abundant seasonal precipitation.

CHAPTER 2. WATER RESOURCES OF UZBEKISTAN

Water resources of Uzbekistan are part of the water resources of the Aral Sea Basin, and consist of renewable surface and groundwater, as well as return water from anthropogenic use (waste and drainage water).

There are two main river basins in the Aral Sea Basin: the Syrdarya in the north and the Amudarya in the south. Separate basins (closed but related to the Amudarya) form such rivers as Kashkadarya, Zarafshan, Murgkhab, Tedjen, which lost their links with the main river many centuries ago.

The Amudarya is the largest river in Central Asia. Its length from the headstream of the Payne to the Aral Sea is 2,540 km, and the catchment area is 309,000 km². The Amudarya River starts from the point where Pyanj connects with Vakhsh. Three large right tributaries (Kafirmigan, Surkhandarya and Sherabad) and one left tributary (Kunduz) flow into the Amudarya River in the middle course. Further to the Aral Sea, it has no tributaries. The maximum consumption is observed in the summer and the minimum in January-February.

Such availability of flow during the year is very favorable for the use of river water for irrigation. When crossing the plain, from Kerki to Nukus, the Amudarya loses most of its flow to evaporation, infiltration and irrigation. The Amudarya contains sediment more than all the rivers in Central Asia, and their composition is one of the highest in the world (after the Yellow River - China's Yellow River). The main flow of the Amu Darya is formed on the territory of Tajikistan. Then the river flows along the border of Afghanistan with Uzbekistan, crosses Turkmenistan and returns to Uzbekistan again and mouths into the Aral Sea.

In terms of water availability, the Syrdarya is the second most important river in Central Asia, but it is longer in length. From the headstream of the Naryn, its length is 3019 km, with a catchment area of 219,000 km². Its headstreams lie deep in the Central Tien Shan. The river is called Syrdarya after the point where Naryn is connected with Karadarya. The river has glacial and snow feed, with a predominance of the latter. The water regime is characterized by spring-summer flood, which begins in April. The largest drop is in June. The main part of the Syrdarya river flow is formed in the Kyrgyz Republic. Syrdarya River flows through Uzbekistan and Tajikistan and flows into the North Aral Sea in Kazakhstan.

2.1. SURFACE WATER RESOURCES

The list of sources (rivers) forming the natural surface runoff in the Amudarya Basin was substantiated in the hydrology department of the “Sredazgiprovodkhopok” institute as part of the Scheme for the integrated use and protection of water resources of the Amudarya River Basin in 1984. According to this rationale, the total resources of the river flow are estimated by 34 components, a list of which is given in Table 2.1.

Similarly, the list of sources (rivers) forming the natural surface runoff in the Syrdarya Basin was substantiated in the hydrology department of the “Sredazgiprovodkhopok” institute as part of work on the Scheme for the integrated use and protection of water resources in the Syrdarya river basin in 1987. According to this rationale, the total resources of the river flow are estimated by 55 components, a list of which is given in Table 2.2.

Table 2.1. The list of hydrological posts where the accounting of the total river flow of the Amudarya River Basin is carried out

N	Water district, river posts
1	2
I.	Upper reaches
1	Pyandj - Nizhniy Pyandj/Lower Pyandj
2	Vakhsh - tributary to the Nurek reservoir
II.	Kafirnigan
3	Kafirnigan - Chinar
4	Semiganch - Semiganch
5	Ilyak - Naobadbalo
6	Varzob - Dagana
7	Luchob - Luchob
8	Khanaka - Alibegi
III.	Surkhandarya
9	Karatag - Shirkent
10	Tupolang - tributary to the Tupolang reservoir
11	Sangardak - Kineguzar
12	Khalkajar - the mouth of the river
13	Sherabad - Sherabad
IV.	Kashkadarya

14	Kashkadarya - Varganza
15	Jinidarya - Djauz
16	Akdarya - Khazarnova
17	Karasu - Ulyan
18	Tankhyzdarya - Katagan
19	Yakkabagdarya - Tatar
20	Tyrnabulak - Ishkant
21	Kichikjar - Kenjigali
22	Lyangar - Urtadarya
23	Kichik-Uradarya - Gumdulak
24	Katta - Uradarya - Bazartepe
V.	Zeravshan
25	Zeravshan - Dupuli
26	Magiadarya - Sudja
VI.	Rivers of Turkmenistan
27	Murgab + Kushka - Tahtabazar + railway
28	bridge Tedjen - Pulihatum
29	Murgab + Kushka - Tahtabazar + railway
	bridge Tedjen - Pulihatum
	Atrek - Kzilatrek
VII.	Rivers of Afghanistan
30	Kunduz - Girdab
31	Khulm - Tangikurgan
32	Balkhab - Rabatbala
33	Saripul - Saripul
34	Kaysar - Patababa

Table 2.2. The list of hydrological posts where the accounting of the total river flow of the Syrdarya River basin is carried out

N	Water district, river posts
1	2
I.	Upper reaches, Narin River
	Naryn - inflow to the Toktogul reservoir, including:
1	Naryn - Uchterek
2	Torkent - the mouth of the river
3	Uzunakhmat - the mouth of the river
4	Chichkan - the mouth of Balachichkan River
5	Karasu left mouth
6	Karasu right mouth
1	2
II.	FERGANA VALLEY

	Kara Darya is a tributary to the Andijan reservoir, including:
7	Karadarya - Uzgen
8	Yassi - above the mouth of Zerger river
9	Zerger - the river mouth of Tassai
10	Kurshab - Kochkorata
	Rivers between Naryn and Karadarya
11	Kugart – Mikhaylovsk village
12	Changet – Changet village
13	Tentyaksai Charpak Village
14	Maylisu - the mouth of Kayragach River
15	Shaydansai - Shaydan Village
	The rivers of the right bank of the Syrdarya
16	Padshaota - the mouth of Tostu River
17	Chartaksai - Karabag village
18	Chanach - Chanachsai
19	Kassansai - Kyzyltokay village
20	Uryukti - mouth
21	Alabuka - Ortotokay
22	Sumsaray - Sumsaray village
23	Koksareksai - Karakurgan village
24	Gavasai - Gava village
25	Almasai - Sabuzgan
26	Chadak - the mouth of Julaysai River
27	Sai of Ashtsamgar massif (Ashtsai, Digmays springs, etc.)
	The rivers of the left bank of the Syrdarya
28	Akbura - Tuleken village
29	Aravansai - the mouth of Karakol River
30	Karakol - mouth
31	Shankol - Shankol village
32	Kyrgyz - Kirgizata village
33	Abshirsai - Uchterek village
34	Isfayramsai - Uchkurgon village
35	Shakhimardan - Jhidalik village
36	Sokh - Sarykanda
37	Isfara - Tashkurgan village
38	Khojabakirgan - Andarkhan village
39	Aksu - Dazgon gorge
III.	CHAKIR (Chirchik, Akhangaran, Keles)
40	Akhangaran - the mouth of the Irtash River
	Chirchik - rivers, including:
41	Pskem - the mouth of Nauvalisai River
42	Koksu - mouth
43	Chatkal - Charvak village
44	Ugam - Hodjikent
45	Aksakatasai - Karamazar village
46	Aktash - Aktash village
47	Sai between Chirchik and Akhangaran rivers (Taganbashi, Akcha, Naugarzan, etc.)
48	Keles - mouth

IV	MIDDLE STREAM
49	Rivers of the Shahristan basin (Shirinsai, Shurbulak, etc.)
50	Zaamin - Duaba
51	Sanzar - Kirk village
52	Sai Farish massif (Madjerumsai, Sentyabsai, etc.)
V	ARTHUR (Arys, Turkestan)
53	Arys - Shaoulder
54	Bugun- Red Bridge
VI	LOWLANDS
55	Rivers of the South-West Karatau slope (Karatas, Bayaldyr, etc.)

*Abbreviations: v. - village, res. - resort, p. - post, r. - river, v. – village

An assessment of surface water resources in the Aral Sea Basin for Amudarya and Syrdarya was conducted with the participation of SIC ICWC specialists. The list of rivers and hydro-posts on them in the Amudarya and Syrdarya Basins (Tables 2 and 3) was taken as a basis and retrospective information was collected for the entire available period of flow accounting for all posts. Average monthly water discharge (m^3 / s) according to the Main Hydrological Characteristics for the Amudarya and Syrdarya Basins, produced in 1970, 1976 and 1980, and further for Hydrological Yearbooks (until 1988). Later information (until 2015) was provided by the department of water cadaster of Glavgidromet (Main Hydromed Department) of the Republic of Uzbekistan.

An analysis of the source tables with the collected data showed that there are gaps within the rows due to the lack of observational data in many posts. To fill these gaps, as well as to continue the series for those posts, the observations on which were stopped (for various reasons), a special algorithm for data recovery in the series was created.

For the restoration of data were selected pairs of rivers-analogues. Selection of rivers-analogues was made on the basis of the territorial location of the rivers within the same zone of formation of the flow, having similarities in the power sources of the flow (glacial, snow, rain or mixed feeding). For the selected pairs, correlation dependences were built between the values of the annual flow over the entire observation period. Using data from one river, the missing data from the other river for the same time interval were retrieved based on this relationship.

Based on the data collected and restored, the total resources of the rivers in the Aral Sea Basin with the division into the Amudarya and the Syrdarya River Basins were estimated. Figures 2.1 and 2.2 show the total annual flow hydrographs of the Amudarya and the Syrdarya Basins.

The analysis of the total hydrographs of the annual flow of all the rivers of the Amudarya and the Syrdarya Basins over the entire observation period allowed us to single out a certain cyclical nature of the variation of the annual flow in time. Thus, on

the hydrograph of the Syrdarya Basin (Fig. 2.2), seven 12-year cycles stand out quite clearly, beginning in 1928 and ending in 2009. On the hydrograph of the Amudarya (Fig. 2.1), four 19-year cycles stand out quite clearly, beginning in 1934 and ending in 2011.

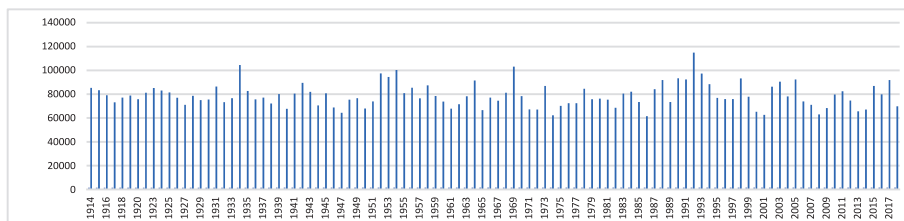


Fig. 2.1. Hydrograph of the Amudarya River

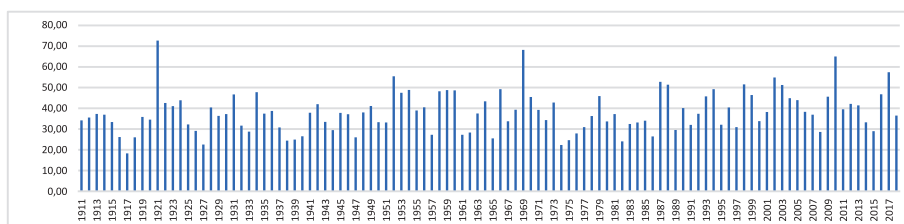


Fig. 2.2. Hydrograph of the Syrdarya River

As a result of the deepening of knowledge and methods of data analysis in hydrology, a methodology for assessing the average annual value of the total flow of rivers in a large basin – so-called flow rate, was developed. It is recommended to estimate the flow rate not by the average arithmetic value for the entire period of observations and not by the value of the flow of 50% security, but by the average arithmetic value of the series corresponding to two or three complete cycles of fluctuations in water content. This allows you to take into account all the years with certain characteristics - low-water and high water, on the decline and rise of water content, etc. On this basis, for the final (more objective) assessment of the magnitude of the flow rate for the rivers of the Syrdarya Basin, a series of data (seven 12-year cycles) from 1928 to 2009 was adopted; as well as for the rivers of the Amudarya Basin (four 19-year cycles) from 1934 to 2011.

The estimation of the flow rate is presented in tables 2.3 and 2.4. Thus, the average perennial value for Syrdarya is 37,203 mln. m³ / year and for Amudarya - 79,280 mln. m³ / year, and the total river flow amounted to 11,648 mln. m³ / year.

Table 2.3. Natural river flow in the Amu Darya Basin (Average long-term runoff for the period of four 19-year cycles of water-resistance for the period 1934-2011, km³/year)

River Basin	River flow formatted within the country					Total for the Amudarya Basin
	Kyrgyz Republic	Tajikistan	Uzbekistan	Turkmenistan	Afghanistan and Iran	
Panj	-	31.089	-	-	3.200	34,289
Vakhsh	1.604	18.400	-	-	-	20,004
Kafirnigan	-	5.452	-	-	-	5,452
Surkhandarya	-	0.320	3.004	-	-	3,324
Kashkadarya	-	-	1.232	-	-	1,232
Zerafshan	-	4.637	0.500	-	-	5,137
Murgab	-	-	-	0.868	0.868	1,736
Tedjen	-	-	-	0.560	0.561	1,121
Atrek	-	-	-	0.121	0.121	0,242
Rivers of Afghanistan	-	-	-	-	6.743	6,743
Total for the Aral Sea Basin (km ³)	1,604	59,898	4,736	1,549	11,593	79,280
(%)	2,0	75,6	6,0	1,9	14,6	100

Table 2.4. Natural flow of the Syrdarya Basin (Average long-term runoff for seven 12-year water cycles in the period 1928-2009, km³ / year)

River Basin	River flow formatted within the country				Total for the Syrdarya Basin
	Kyrgyz Republic	Kazakhstan	Tajikistan	Uzbekistan	
Naryn	14,544	-	-	-	14,544
Karadarya	3,921	-	-	-	3,921
Rivers between Naryn and Karadarya	1,760	-	-	0,312	2,072
The right bank of the Fergana Valley	0,780	-	-	0,408	1,188
The left bank of the Fergana Valley	3,500	-	0,855	0,190	4,545
Rivers of the middle course	-	-	0,150	0,145	0,295
Chirchik	3,100	0,749	-	4,100	7,949
Akhangaran	-	-	-	0,659	0,659
Keles	-	0,247	-	-	0,247
Arys and Bugun	-	1,183	-	-	1,183
Rivers downstream	-	0,600	-	-	0,600
Total for the Syrdarya River Basin (km ³)	27,605	2,426	1,005	6,167	37,203
(%)	74,2	6,5	2,7	16,6	100

Annual water resources in accordance with fluctuations of water content vary from low-water years (95% probability) to high-water years (5% probability) within the following limits: for Amudarya 58.6-109.9 km³ and Syrdarya 23.6-51.1 km³.

2.2. TRANSBOUNDARY SURFACE WATER RESOURCES IN THE ARAL SEA BASIN

The main legal document, which gives the concept of “transboundary waters“, and which was adopted as a basis is the “*Convention on the protection and use of transboundary watercourses and international lakes*”, UN, Helsinki, March 17, 1992. Article 1 (p. 2) of the Convention defines transboundary waters as follows:

“Transboundary waters” means any surface or groundwater that denotes, crosses the border between two or more states or is located on such borders ...”

Thus, based on this concept, it is possible to adopt a simplified methodological approach to the division of river waters into transboundary and local national waters. Only with the help of GIS (geographic information system ArcView), it is possible to build a hydrographic map and impose state borders on it. Those rivers that cross or met borders and are transboundary. As part of the ICWC assignment, this methodological approach was adopted in 1998-2000 as a **basic one**.

It should be noted that the above methodological technique is still controversial. The problem is how to assess the tributaries of transboundary rivers that do not cross the borders of states, but flow into transboundary rivers and affect their quantitative and qualitative parameters. The ownership of the territory of the flow formation zone to a state does not mean that the volume of water formed in this territory is the property of that state. If the formed volume of water flows on the river having transboundary course, this water should be considered transboundary. To avoid further confusion, it is necessary to clarify the original properties of transboundary waters. Water in rivers is not at rest, that is, the same bodies of water are formed in the territory of one country located in the upper part of the river basin, and flowing along the river pass through the territory of all countries within the basin. Thus, the water resources of the river, changing their location, “periodically” become the property of one or the other state. Therefore, they should be treated as joint property.

Based on the above, two options for the assessment of transboundary waters should be identified:

- Basic (strictly defined by the Helsinki Convention) - only rivers crossing borders;
- Proposed - consideration of rivers of all orders flowing into Transboundary Rivers.

The author, together with SIC ICWC experts in 1998-2000, presented the distribution of runoff by formation zones in states using GIS technologies. For this purpose, a map was developed using GIS (ArcView Geographic Information System), representing the spatial location of all sources listed in Tables 2.1 and 2.2.

Table 2.5. Division of the rivers of the Amudarya River Basin into transboundary and local ones based on the crossing of state borders

N	Water district, river post	Cross-border	Local	State
1	2	3	4	5
I.	Upper reaches			
1	Pyandj - Nizhny Pyandj	+		
2	Vakhsh - tributary to the Nurek reservoir		+	TAJ
II.	Kafirnigan			
3	Kafirnigan - Chinar	+		
4	Semiganch - Semiganch		+	TAJ
5	Ilyak - Naobadbalo		+	TAJ
6	Varzob - Dagana		+	TAJ
7	Luchob - Luchob		+	TAJ
8	Khanaka - Alibegi		+	TAJ
III.	Surkhandarya			
9	Karatag - Shirkent		+	TAJ
10	Tupolang - tributary to Tupolang reservoir		+	UZB
11	Sangardak - Kineguzar		+	UZB
12	Khalkajar - Mouth		+	UZB
13	Sherabad - Maidan		+	UZB
IV.	Kashkadarya			UZB
14	Kashkadarya - Varganza		+	UZB
15	Jinidarya - Djauz		+	UZB
16	Kichik-Uradarya - Gumdulak		+	UZB
17	Akdarya - Khazarnova		+	UZB
18	Karasu - Ulyan		+	UZB
19	Tankhyzdarya - Katagan		+	UZB
20	Yakkabagdarya - Tatar		+	UZB
21	Tyrnabulak - Ishkant		+	UZB
22	Kichikjar - Kenjigali		+	UZB
23	Lyangar - Urtadarya		+	UZB
24	Katta-Uradarya - Bazartepe		+	UZB
V.	Zeravshan			
25	Zeravshan - Dupuli	+		
26	Magiandarya - Sudja		+	TAJ
VI.	Rivers of Turkmenistan			

27	Murgkhab + Kushka - Tahtabazar + railway bridge	+		
28	Tedjen - Pulikhatum	+		
29	Atrek - Kizilatrek	+		
VII.	Rivers of Afghanistan			
30	Kunduz - Girdab		+	AFG
31	Khulm - Tangikurgan		+	AFG
32	Balkhab - Rabatbala		+	AFG
33	Saripul - Saripul		+	AFG
34	Kaysar - Patababa		+	AFG

Topographic base with a scale of 1:200,000 was used for mapping. A layer with rivers were applied to cover the layer showing the location of state borders. The result is an electronic map showing the location of the state borders and the main rivers of the basin. Identification of transboundary sources (rivers) was carried out based on crossing state borders (basic version). The results of the visual analysis of the basic version are given in tables 2.5 and 2.6.

Table 2.6. Division of the rivers of the Syrdarya Basin into transboundary and local ones based on the crossing of state borders

N	Water district, river post	Cross-border	Local	State
1	2	3	4	5
I.	Upper reaches of Naryn River			
	Naryn - inflow to the Toktogul reservoir, including:	+	-	-
1	Naryn - Uchterek	+	-	-
2	Torkent - river mouth	-	+	KYG
3	Uzunakhmat - mouth of Ustasai river	-	+	KYG
4	Chichkan river - the mouth of Balachichkan river	-	+	KYG
5	Karasu left - mouth	-	+	KYG
6	Karasu right - mouth	-	+	KYG
II.	FERGANA VALLEY			
	Karadarya - the flow to the Andijan reservoir, including:	+	-	-
7	Karadarya - Uzgen	+	-	-
8	Yassi - upper mouth of Zerger river	-	+	KYG
9	Zerger - mouth of Tassai river	-	+	KYG
10	Kurshab - Kochkorata	-	+	KYG
	Rivers between Naryn and Karadarya rivers			

11	Kugart – Mikhailovsk village	+	-	-
12	Changet – Changet village	-	+	KYG
13	Tentyaksai - Charpak village	+	-	-
14	Mailisu - mouth of Kayragach river	+	-	-
15	Shaydansai - Shaydan village	+	-	-
	The rivers of the right bank of the Syrdarya			
16	Padshaat - the mouth of Tostu river	+	-	-
17	Chartaksai - Karabag village	+	-	-
18	Chanach - Chanachsai	+	-	-
19	Kassansai -Kyzyltokay village	+	-	-
20	Uryukta - river mouth	-	+	KYG
21	Alabuka - Ortotoksai	-	+	KYG
22	Sumsaray - Sumsaray	+	-	-
23	Koksareksai - Karakurgan village	+	-	-
24	Gavasai - Gava village	+	-	-
25	Almasai- Sabuzgan	-	+	KYG.
26	Chadak - the mouth of Julaysai river	-	+	UZB
27	Sai Ashtsamgar massif (Ashtsai, Digmaysai)	-	+	TAJ
	The rivers of the left bank of the Syrdrya			
28	Akbura - Tuleken village	+	-	-
29	Aravansai - the mouth of Karakol river	+	-	-
30	Karakol - river mouth	-	+	KYG
31	Shankol - Shankol village	-	+	KYG
32	Kyrgyzata - Kyrgyzata village	+	-	-
33	Abshirsai - Uchterek village	+	-	-
34	Isfayramsai - Uchkurgon village	+	-	-
35	Shakhimardan - Jidalik village	+	-	-
36	Sokh - Sarikanda village	+	-	-
37	Isfara - Tashkurgan village	+	-	-
38	Khojabakirgan - Andarkhan village	+	-	-
39	Aksu - Dazgon gorge	+	-	-
III.	CHAKIR (Chirchik, Akhangaran, Keles)			
40	Akhangaran - the mouth of Irtash river	-	+	UZB
	Chirchik - the sum of rivers, including:			
41	Pskem - the mouth of Nauvalisai river	-	+	UZB
42	Koksu- river mouth		+	UZB
43	Chatkal - Charvak village	+	-	-
44	Ugam - Hodjikent	+	-	-
45	Aksakatasai - Karamazar village	-	+	UZB

46	Aktash - Aktash village	-	+	UZB
47	Sai between the rivers Chirchik and Akhangaran (Taganbashi, Akcha, Naugarzan, etc.)	-	+	UZB
48	Keles - river mouth	-	+	KAZ
IV	Middle reach			
49	Rivers of the Shakhristan basin (Shirinsai, Shurbulak)	-	+	TAJ
50	Zaamin - Duaba station	-	+	UZB
51	Sanzar - Kirk village	-	+	UZB
52	Sai of Farish massif (Madjerumsai, Sentyabsai, etc.)	-	+	UZB
V	ARTHUR (Arys, Turkestan)			
53	Arys - Shaoulder	-	+	KAZ
54	Bugun - Red bridge	-	+	KAZ
VI	Lower reach			
55	Rivers of the South-Western Karatau slope (Karatas, Bayaldyr)	-	+	KAZ

Transboundary sources (rivers of all orders) were also identified based on their links to a river of the first order crossing the state borders (the proposed option). Taking into account the fact that small rivers of the second and third order bring their water to the transboundary rivers (rivers of the first order) and thereby affect the change in the volume of flow and water quality, then almost all rivers in the Syrdarya Basin should be attributed to the transboundary parts. In other words, all 100% of the river waters in the Amudarya and Syrdarya Basins are transboundary.

Summarized data show (Table 2.7) that 25.1% of the total surface resources of the Aral Sea basin is formed in the Kyrgyz Republic, 52% in Tajikistan, 9.6% in Uzbekistan, 1.2.1% in Kazakhstan, 1.2% in Turkmenistan, Afghanistan and Iran - 10%.

Table 2.7. Total natural river runoff by sources in the Aral Sea Basin (Multi-year runoff, km³ / year)

Country	River Basin		Aral Sea Basin	
	Syrdarya	Amudarya	km ³	%
Kazakhstan	2,426	-	2,426	2,1
Republic of Kyrgyzstan	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 for the Aral Sea Basin	37,203	79,280	116,483	100

(Source: SIC ICWC)

2.3. SYSTEM OF WATER RESOURCES MONITORING IN UZBEKISTAN¹⁴

The system of water resources monitoring in Uzbekistan practically covers all water resources, including those formed in the Amudarya and Syrdarya River Basins and their tributaries, and is implemented by the Hydrometeorological Center (Uzhydromet) at the Ministry of Emergency Situations, and on irrigation and other water management systems by the Ministry of Water Resources of the Republic of Uzbekistan.

Hydrometric stations with long-term observations of the formation of water resources are in the area of responsibility of Uzhydromet. Uzhydromet is a specially authorized state body for solving problems in the field of hydrometeorology in the republic. The tasks of the hydrometeorological service include the development and improvement of the state meteorological observation system, the provision of hydrometeorological support to economic sectors, conducting scientific research, improving short-term and long-term weather forecasts, monitoring available water resources, and monitoring climate change. In addition, this organization conducts meteorological and agrometeorological observations in the territory of Uzbekistan.

The area of responsibility of the Ministry of Water Resources includes hydro posts for recording the use of water resources in irrigation and water management systems. The tasks of the Ministry of Water Resources are to summarize the forecasts of water use and water consumption, the development and monitoring of the balance of water resources, the identification of limits for water intakes of the basin irrigation systems, economic sectors and some particularly important water facilities.

The main purpose and objectives of hydrometeorological monitoring are to provide users with hydrometeorological data and prepare such information based on prognostic and analytical information.

Uzhydromet is an integral part of one of the links of the United Nations - the World Meteorological Organization (WMO), whose main objective is to observe the weather and climate, to cooperate in collecting and exchanging data on meteorological, hydrological and other environmental observations. Since 1967, Tashkent has been one of 29 regional meteorological centers, which collects meteorological information, prepares and distributes weather maps and forecasts in the countries of Central Asia, the Middle East and the Asian part of Russia. This is the responsibility of Uzhydromet in the World Weather Watch (WMO) system.

Currently, in Uzbekistan, unlike other countries in Central Asia, the majority of meteorological stations and hydrological posts have been preserved and functioned. Meteorological, hydrological and agrometeorological observations have been carried out on the territory of the Republic since 1921. Ecological monitoring of the state of water bodies, air and soil has been carried out since 1972.

¹⁴ This section was prepared on the basis of a joint project of UNDP, UNEP and Hydromet "Program of preparation of Uzbekistan to access resources of the Green Climate Fund (GCF)"

The hydrological network of Uzbekistan consists of:

- 66 river and 3 lake posts belonging to 16 hydrological stations
 - 12 river and 5 lake posts belonging to 3 lake stations
 - 38 river and 2 lake posts belonging to 13 territorial departments of hydrometeorology
 - Cross-border monitoring posts (10)
 - Posts whose information is used in the preparation of hydrological forecasts and international exchanges (16)
- Information posts (25)
- Other posts (80)

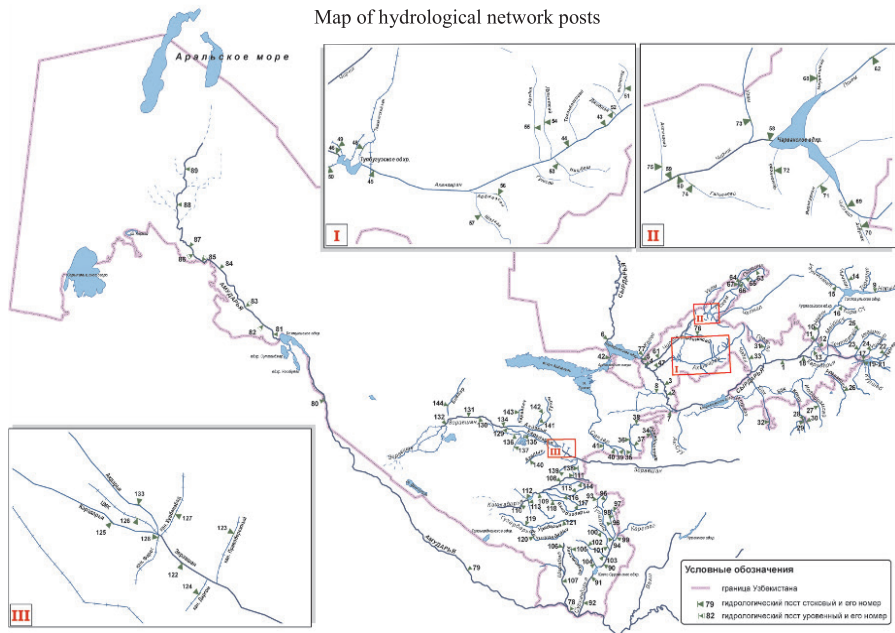
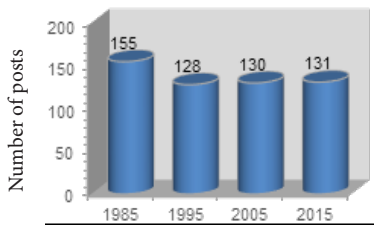


Fig. 2.3. Hydrological network of Uzhydromet for monitoring in Uzbekistan (<https://www.meteo.uz/#/ru/open-data/meteostations>)

The state of the meteorological network:

The meteorological network has 81 stations. At one of these stations, observations are carried out according to the M-I program (meteorological station of the first level). At 80 stations, work is carried out according to the program M-II (meteorological station of the second level). All 80 stations operate in the traditional mode. Only at Chimgan station an automatic meteorological station is installed.

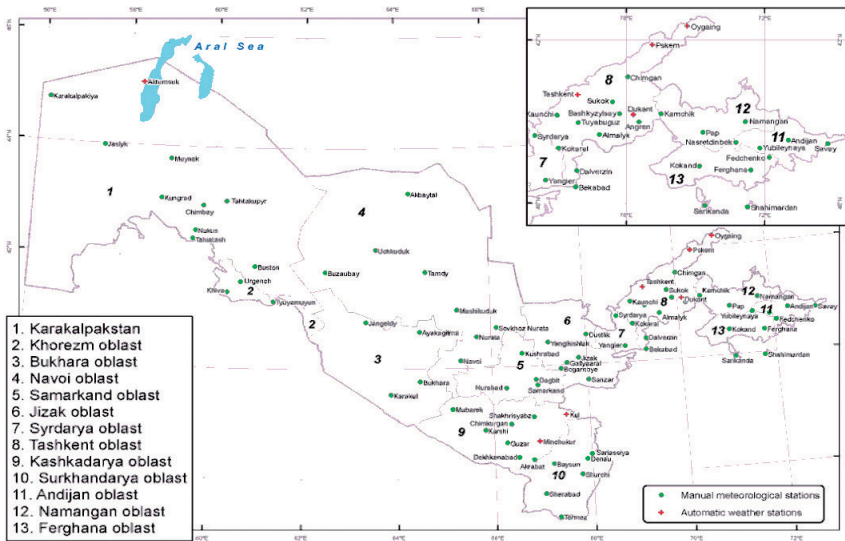
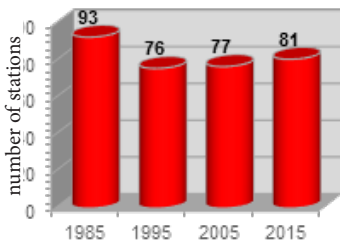


Fig. 2.4. Meteorological stations in Uzbekistan (<https://www.meteo.uz/#/ru/open-data/meteostations>)



In Uzbekistan, a total of 60 stations and 30 posts conduct agrometeorological observations; 12 meteorological stations monitor the evaporation of water from the surface; 6 meteorological stations monitor solar radiation. There is also a radar network of Uzhydromet for sounding of clouds - 3 Doppler type radars; and also the aerological network of Uzhydromet, which is currently completely absent.

Three meteorological stations are part of the State Observation System; 12 meteorological stations are included in the regional network of stations; 21 international exchange stations monthly prepare and transmit reports to the All-Russian Scientific Research Institute of Hydrometeorology and Information and Information Technologies of Roshydromet.

Uzhydromet constantly monitors avalanche danger and mudflow activity. According to Uzhydromet, avalanche danger in the mountainous territory of Uzbekistan falls on January, February and March; mudflow activity occurs in April May and June. Up to 85% of the mudflow activity is caused by heavy rainfall.

In addition to ground-based observations of climatic indicators, Uzbekistan purchased in 2010 and launched in 2012 a system for receiving satellite data from TERRA and AQUA satellites.

2.4. CLIMATE CHANGE

In most parts of Uzbekistan, the climate is continental, dry (arid), with a small amount of annual precipitation (100 - 200 millimeters). Cold air masses freely penetrate into the southernmost parts of the country, where minimum temperatures in winter can reach - 25° C. In the northern part of Uzbekistan (Ustyurt Plateau), the absolute minimum temperature is - 39.7° C (February 1969).

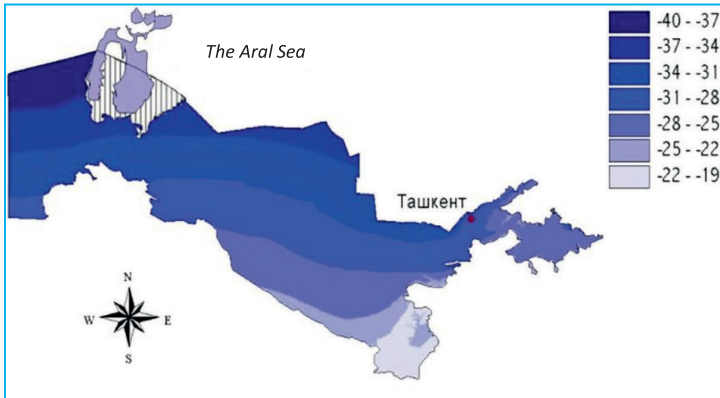


Figure 2.5. Temperature in winter. (Third National Communication for the United Nations Framework Convention on Climate Change in Uzbekistan, 2016).

During the warm period of the year, a high level of solar radiation creates the conditions for the formation of vast areas of intense water use and in the summer in the central desert regions of Uzbekistan extreme temperatures reach + 45-49 °C.

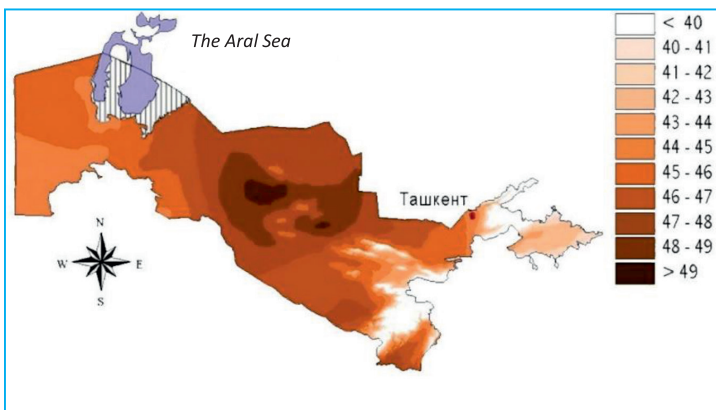


Figure 2.6. Temperature in the summer period. (Third National Communication for the United Nations Framework Convention on Climate Change of Uzbekistan, 2016).

Uzbekistan is one of the most vulnerable to climate change countries. The average annual increase in air temperature in Uzbekistan occurs due to high natural variability, which causes significant interannual fluctuations. Rates of warming exceed the

average rates observed on a global scale. The most significant increase in the average annual air temperature was observed in Tashkent and Fergana (1.8 ° C and 1.6 ° C, respectively). On average, Uzbekistan has a warming rate of 0.27 ° C for 10 years.

Throughout the territory of Uzbekistan and in all seasons of the year there is an increase in the number of significant positive temperature anomalies. The highest rates of increase in the number of days with “abnormal heat” were recorded in the Aral Sea and in the lower reaches of the Amu Darya River.

The following climate change trends in the Republic of Uzbekistan should be noted:

- Increase of duration of dry hot period.
- Increase of number of days with heavy precipitation and high variability of precipitation.
- Reduction of snow reserves in the mountains and glaciers
- Increase of frequency of extreme events.
- Increase of mudflow hazard.
- Increase of evaporation in flat and foothill areas.
- Increase of frequency of droughts and extremely low water levels in rivers.

The approaches, methods and tools of the UN Framework Convention on Climate Change (UNFCCC) are applied by experts to assess the vulnerability of natural resources and sectors of the economy of Uzbekistan in the context of the above climate changes.

The assessments were made by the Uzhydromet¹⁵ using an analysis of socio-economic and demographic indicators, information on land use and water management. In assessing the vulnerability of natural resources, various factors were compiled and formed into complexes — indicators of vulnerability. According to the data of the indicator complex, the most vulnerable to climate change group within the territory of the country includes the Republic of Karakalpakstan, the Khorezm and Syrdarya regions; medium vulnerable groups - Navoi, Djizak, Bukhara, Surkhandarya, Namangan, Kashkadarya and Tashkent regions; the low-vulnerable group includes Andijan, Fergana and Samarkand regions.

Analysis of changes in annual precipitation corresponds to the average in various regions of Uzbekistan from 1950 to 2017. It shows very weak declining trends. The most pronounced tendencies of decrease in precipitation are noted on the southern plains of Uzbekistan (in the Bukhara and Kashkadarya regions).

United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement and Uzbekistan

Uzbekistan shares the opinion of the international community regarding the need to make efforts to control global climate change in accordance with the capabilities and

¹⁵ Third National Communication for the United Nations Framework Convention on Climate Change of Uzbekistan, 2016

responsibilities of each country on a reasonable and fair basis.

Uzbekistan signed the UNFCCC in 1993 and ratified the Kyoto Protocol in August 1999. Uzbekistan ranks first among the CIS and Eastern European countries in the number of registered UNFCCC projects for the implementation of clean development mechanisms. Under the UNFCCC, parties to the Convention are required to submit their national communications periodically with information on the implementation of the decisions of the Convention.

The national focal point for the UNFCCC is the head of the Uzbek Hydromet service at the Ministry of Emergency Situations.

The first national communication was made in 1999 as part of the UNDP/GEF project “Uzbekistan - Country Study on Climate Change” and presented at the 5th Conference of the Parties in Bonn. The first national report included inventory data on greenhouse gas emission in 1990 – 1994 period, materials for calculating emission trends, an assessment of Uzbekistan’s climate change vulnerability, and a general description of mitigation and adaptation measures.

The second national communication was prepared in 2008 within the framework of the GEF/UNEP project “Uzbekistan: preparation of the Second national communication on the UNFCCC”. The following results were presented: the database on greenhouse gas emissions was improved and supplemented; the uncertainty of the inventory was reduced; the assessment of mitigation capacity, vulnerability and adaptation capacity of various sectors of the economy was presented; priority strategic directions and adaptation measures were identified; potential risks and needs for the development of early warning systems for climate hazards were assessed; systematic observations were analyzed for compliance with the requirements of the Global climate observing system and the principles of climate monitoring.

The third national communication was published in 2016 and maintained the continuity of the strategic and conceptual provisions reflected in the first two reports and summarized the most recent information on climate change and the UNFCCC processes and included the results of the greenhouse gas inventory for 1990-2012 period; observed characteristics on climate change; assessment of vulnerability to climate change; analysis of current policies and measures to reduce greenhouse gas emissions and measures on adaptation to climate change.

The Paris Treaty was adopted on 12 December 2015 at the twenty-first session of the Conference of the Parties to the United Nations framework Convention on climate change, held in Paris from 30 November to 13 December 2015. In accordance with article 20, the Agreement was opened for signature at United Nations Headquarters in New York from 22 April 2016 to 21 April 2017 for States and regional economic integration organizations that are parties to the United Nations framework Convention on climate change. The Paris Agreement entered into force on 4 November 2016.

The main objective of the Paris Agreement is to strengthen the global response to the threat of climate change by limiting the warming of this century by 2 °C above the pre-industrial level and making efforts to reduce warming to 1.5 °C. In addition, the Treaty aims to strengthen the capacity of countries to deal with the effects of climate change.

To date, 180 countries, from 197 countries of the UN Convention, have ratified the Paris Agreement. The last one among the Central Asian countries who signed the Paris Agreement was Uzbekistan - on April 19, 2017. It was ratified it in November 2018.

Estimated Nationally Determined Contributions (ENDC) of Uzbekistan.

The Paris Agreement requires all parties to make appropriate efforts through “nationally determined contributions” (ENDC) and to intensify these efforts in subsequent years. The Treaty of Paris also requires that all parties regularly report on their emissions and their efforts to implement those ENDC.

Uzbekistan presented the Estimated Nationally Determined Contributions (ENDCs) on April 19, 2017. This document presented enhancement and action measures aimed at mitigating the effects of climate change.

Uzbekistan pursues a targeted policy of saving energy in sectors of the economy. *“The decrease in GDP of energy consumption by about 2 times as a result of the widespread introduction of advanced energy-saving technologies”*¹⁶ was identified by Uzbekistan as one of the targets for the period up to 2030.

Energy saving measures will reduce the consumption of primary energy, mainly natural gas. Investments in energy efficiency and renewable energy sources have a high priority from both economic (reduction in energy production costs) and climatic point of view (reduction in greenhouse gas emissions).

The Republic is successfully implementing measures to adapt and mitigate the effects of climate change, including the implementation of clean development mechanism projects under the Kyoto Protocol. During the entire period of the clean development project in Uzbekistan, certified reductions of 15,229,536 tons of CO₂ equivalent emissions were made and foreign private investment of \$ 24.4 million was attracted.

The gradual modernization of the industry and a number of other measures taken from 1990 to 2010 led to a decrease in the energy consumption of GDP by almost 2.5 times. Specific CO₂ emissions per unit of GDP have decreased by almost 50%.

Measures and actions aimed at saving energy resources have allowed Uzbekistan to stabilize the level of greenhouse gas emissions and reduce its share of emissions on a global scale. According to greenhouse gas inventories, the increase in their emissions

¹⁶ Report of the President of the Republic of Uzbekistan, Mr. Islam Karimov, at an expanded meeting of the Cabinet of Ministers on the basis of the socio-economic development of the country in 2015, and the most important priority areas of the economic program for 2016 (January 16, 2016).

from 1990 to 2010 was no more than 10%. Today, the annual increase in greenhouse gas emissions is less than 5 percent.

In the period from 2007 to 2012, in accordance with the decision of the Cabinet of Ministers (№ 30, 10.02.2007), 188 thousand units of vehicles were converted to gas fuel. The Resolution of the Cabinet of Ministers (№ 815, 11.10.2017) on additional measures for the transfer of vehicles in Uzbekistan to natural gas was adopted in 2017. According to data from the beginning of 2018, over 60% of the vehicles in Uzbekistan operate on low-carbon gas fuel.

The country pays great attention to the development of renewable energy sources, especially solar energy. The production and experimental use of solar hot water heaters for residential buildings and social facilities has been carried out for more than 10 years. A large-scale project was launched to build a whole range of photovoltaic power plants with a capacity of 100 MW each. It is planned to increase the share of solar energy in the total energy balance of the country to 6% by 2030.

Recommended way forward

As noted in the third national communication, which was published in 2016, priority areas for mitigation and adaptation to climate change include:

- Further stabilization of greenhouse gas concentrations in the atmosphere at a level that does not allow dangerous anthropogenic impact on the climate system, and at a time sufficient for natural adaptation of ecosystems to climate change, which will not jeopardize food production and ensure further economic development on a sustainable basis.
- Activation of innovative sources of financing projects aimed at reducing greenhouse gas emissions, also through the clean development mechanism. In the medium term, the priority sectors for the implementation of clean development projects will be: (i) traditional and renewable energy sources; (ii) oil and gas industry; (iii) chemical industry; (iv) community facilities; (v) agriculture.
- Improving the investment mechanisms for implementing the modernization program, technical and technological re-equipment of the economy, aimed at increasing the share of own financial resources for the introduction of efficient energy facilities, which achieve the goals of energy efficiency as an important factor in reducing greenhouse gas emissions.
- State support for the active participation of small businesses and private entrepreneurship in the process of waste disposal and processing using transformation technology.

National plans for long-term adaptation and low-carbon development and/or integration of measures and actions to combat climate change within the framework of sectoral development strategies and plans should be developed and implemented, and substantial technical and financial assistance from international funds and donors should be attracted.

National Plan for Adaptation to Climate Change in Uzbekistan

Adaptation to climate change is a priority in Uzbekistan's activities aimed at reducing vulnerability and ensuring the country's resilience to climate change. Adaptation measures cover a wide range of actions to protect communities from the adverse effects of climate change, such as extreme droughts and hydro-meteorological hazards associated with global changes in air temperature; increasing the resilience of strategic infrastructure and ecosystems for the conservation of agro-biodiversity; reducing the adverse impact of the Aral Sea disaster on the environment and the lives of millions of people living in the Aral Sea region, in particular, through well-designed target projects and programs supported by appropriate sources of funding. This will require substantial assistance from United Nations institutions, other international organizations and development partner countries.

The presented plan shows some adaptation measures for Uzbekistan for the period up to 2030. First, they include adaptation of the agriculture and water resources sector¹⁷:

- Improving the climate resilience of agriculture by diversifying of food crop production; conservation of genetic resources and species of indigenous plants and crops resistant to droughts, pests and diseases; Development of biotechnology and breeding of new varieties of crops, adopted to a changing climate.
- Improving irrigated land affected by desertification, soil degradation and drought, increasing soil fertility of irrigated and rainfed land.
- Further improvement of water management practices in irrigated agriculture with a wide use of innovative technologies and approaches on water management for water conservation, including the widespread introduction of drip irrigation systems.
- Improving pasture productivity and forage production in desert and foothill areas.

Adaptation of the social sector to climate change:¹⁸

- Raising awareness and improving access to information on climate change for all population groups;
- Development of early warning systems for hydro - meteorological phenomena and climate risk management;
- Prevention of the onset and exacerbation of diseases caused by climate change;
- Increased participation of the public, academic institutions, women and local communities in planning and management, taking into account approaches and methods of gender equality.

¹⁷ State program for further improvement of irrigated land and rational use of water resources for the period from 2013 to 2017; Decree of the President of the Republic of Uzbekistan No.III-1958, April 19, 2013; "Uzbekistan by 2030: Transition to the model of resource-saving growth", UNDP / CER (Center for Economic Research) project by 2015; Programs of measures to reduce energy consumption, the introduction of energy-saving technologies in economy sectors and social sphere for 2015-2019; Decree of the President of the Republic of Uzbekistan No.III-2343, May 05, 2015; and other documents.

¹⁸ Law of the Republic of Uzbekistan "On the sanitary-epidemiological safety of the population, No 451, August 6, 2015.

Mitigating the consequences of the Aral Sea disaster¹⁹:

- Preservation of the existing fragile ecological balance in the Aral Sea region, combating desertification, improving the management system, efficient and rational use of water resources;
- Creating conditions for reproduction and preservation of the gene pool and public health in the Aral Sea region, development of social infrastructure, an extensive network of medical and educational institutions;
- Creation of basic social and economic mechanisms and incentives for improving the quality and standard of living of the population, developing basic infrastructure and a communication system;
- Conservation and restoration of biodiversity of flora and fauna, including through the creation of local water bodies in the Aral Sea region;
- Expanding the attraction of foreign investments for the implementation of measures and actions to mitigate the consequences of the Aral Sea disaster;
- Conservation and restoration of forest resources, including afforestation of the dried bottom of the Aral Sea.

Ecosystem adaptation:

- Restoration of forests in the mountainous and foothill areas, preservation of native species in semi-desert and desert areas;
- Preservation, restoration and maintenance of ecological balance in protected natural areas;
- Improving sustainability of principles of fragile desert ecosystem management.

Adaptation of strategically important facilities and production capacities:

- Introduction of adaptation criteria in state investment projects for construction, modernization, operation and maintenance of infrastructure in various sectors of the economy;
- Reconstruction and modernization of the irrigation and drainage infrastructure of the water management sector
- Expansion of sectoral programs for municipal and industrial wastewater treatment to ensure the quality of water for drinking water supply and sanitation;
- Modernization of measuring stations on natural water streams, improving monitoring and forecasting of water resources;
- Improving the monitoring system of the ameliorative state of irrigated lands and soil fertility;
- Use of technology to protect coastal and river infrastructure, etc.

¹⁹ Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 255, of August 29, 2015 “On a comprehensive program of measures to mitigate the consequences of the Aral Sea disaster, rehabilitation and socio-economic development in the Aral Sea region for 2015-2018”. In February 2017, President of the Republic of Uzbekistan Shavkat Mirziyoyev approved an action strategy in five priority areas of development in the Republic of Uzbekistan for 2017-2021. This document emphasizes the importance of taking systemic measures to mitigate the negative impacts of global climate change and the drying up of the Aral Sea on agricultural development and people’s livelihoods. In this context, the President of Uzbekistan approved the State Program for the Development of the Aral Region for 2017-2021.

Financing climate programs in Uzbekistan

In Uzbekistan, great attention is paid to the mobilization and effective use of investment resources and technical assistance from development funds, donors and partners to address priorities, including programs and projects aimed at preventing and reducing greenhouse gas emissions and adapting to the negative effects of climate change. According to the Ministry of Finance, in 2008-2013 Uzbekistan received 860.4 million US dollars as grants and technical assistance, which is equivalent to 0.3% of GDP and 1.5% of the state budget for this period. To date, the annual volume of assistance in absolute terms has increased by 3.3 times and amounts to about 200 million US dollars per year.

The governments of some developed countries, international organizations, financial institutions and the private sector act as donors in Uzbekistan. The Global Environment Facility (GEF) funds a large portfolio of climate projects. With financial support from the GEF (grants), about \$ 50 million was invested in 16 projects covering the following objectives: climate change, biodiversity conservation and land degradation prevention. A large number of projects, both investment and technical assistance projects, are funded by the World Bank (WB), the Asian Development Bank (ADB), the Islamic Development Bank (IDB), the European Bank for Reconstruction and Development (EBRD).

Also significant financial assistance in Uzbekistan is provided by: the UNFCCC Adaptation Fund, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Food and Agriculture Organization (FAO), the United Nations Development Program (UNDP), the United Nations Environment Program (UNEP), World Health Organization (WHO), etc. About \$ 24.4 million of private foreign investment was attracted as part of the implementation of the Kyoto Protocol's clean development mechanism.

The Green Climate Fund (GCF), founded in 2010 (with a capital of \$ 100 billion a year since 2020) is the financial mechanism of the UNFCCC and provides financial assistance to developing countries in the form of grants for projects ranging from \$ 10 million (micro-projects) to \$ 250 million (medium-size projects) aimed at adapting to the adverse effects of climate change and reducing greenhouse gas emissions. A project of the German Agency for Cooperation/UNDP/UNEP/WRI called "Training Program of Uzbekistan for access to the resources of the Green Climate Fund" was launched in the country to develop a national institutional architecture necessary for effective, productive and sustainable management of climate finance resources through improving the capacity of national authorities, including:

- Creating an enabling environment for private sector involvement in climate change;
- Strengthening national technical capacity to assess the effectiveness of climate change adaptation and mitigation measures;
- Development of financially attractive project proposals.

Understanding the importance and necessity of financing climate programs is gradually penetrating the practice and activities of state structures and private business in Uzbekistan. The mechanisms and structure of work with international donors are being improved as well as the level of coordination, accountability and management of foreign aid funds in the country in order to increase the efficiency of international assistance. At the same time, it is necessary to implement the existing international experience to develop additional mechanisms for attracting both international and state financing tools for climate programs in order to make this process sustainable and self-sufficient.

Uzbekistan has a positive experience in attracting finance from the Green Climate Fund. The Financing Agreement of Uzbekistan entered into force on April 28, 2017 for the project “Climate Adaptation and Mitigation Program for the Aral Sea Basin” (CAMP4ASB) with a total value of \$ 68.8 million - for two countries, Tajikistan and Uzbekistan (including the grant of 19, 0 million from the GCF through the World Bank).

The goal of the Program is to increase regionally coordinated access to improved knowledge on climate change for key stakeholders (policy makers, communities and civil society) from the participating countries of Central Asia, as well as to increase investment and build the capacity of countries that will decide together climate issues that are common to these countries. The project consists of three components. The first component focuses on providing regional climate knowledge services, technical support, as well as carrying out construction work, purchasing goods (including software and hardware) and training at the regional and national levels to develop unified integrated regional analytical platform for developing sustainable solutions and tools to reduce emissions and improve data, information and knowledge on climate change. The second component focuses on regional climate investment and the provision of technical assistance and assistance in the planning, implementation and climate investment management. The second component consists of the following two elements: (i) investments; and (ii) capacity building and community support. The third component focuses on regional and national coordination, consisting of the following two subcomponents: (i) regional; and (ii) national coordination.

In response to a request from the government of Uzbekistan, the project included Bukhara and Navoi regions, the Republic of Karakalpakstan and Khorezm region. The executor of the project - the Agency for Agrarian restructuring - has started the implementation of the project: the first sub-loan agreements were signed in 2016.

To finance climate-related development, over \$ 1 billion were invested annually in adaptation and mitigation projects in Uzbekistan from 2013 to 2016. These investments were the largest among countries in Eastern Europe, the Caucasus and Central Asia (EECCA) (the average amount invested in EECCA countries was \$ 303 million per year per country). Japan has invested in projects to support two large gas power plants an amount equal to 51% of the total investment in the period. However, even without these two projects, a significantly large amount of funds for climate-related

development (about \$ 500 million a year) was attracted to the country. For example, agriculture and the water sector for climate projects together received approximately \$ 245 million per year from 2013 to 2016, including a number of projects on adaptation to climate change.

Uzbekistan has mobilized a significant amount of domestic funds for climate-related projects and for a wide range of development activities. The Fund for Reconstruction and Development, which was established in 2006, by 2018 has accumulated \$ 17 billion of assets. Most of the assets were managed by the Central Bank of the Republic of Uzbekistan. The Fund has provided finance for several climate-related projects. In addition, the centralized power supply operator, Uzbekenergo, has provided its periodic investment in improving energy efficiency and infrastructure of the energy sector for \$ 5 billion (starting from 2011).

2.5. RENEWABLE GROUNDWATER RESOURCES AND THEIR USE IN UZBEKISTAN

On the territory of the republic there are 97 deposits of groundwater, 19 of them are classified as protected natural areas - zones of formation of fresh groundwater deposits.

Groundwater resources are unevenly distributed throughout the republic and more than 30% of the population experience an acute shortage of quality water and remain in the category of low water supply. Fresh groundwater reserves (mineralization up to 1 g / l) are concentrated mainly in Tashkent (28.5%), Samarkand (13.7%), Surkhandarya (13.1%), Namangan (12.8%) and Andijan (12.3%) regions. Bukhara and Navoi regions are not provided with fresh groundwater (less than 0.3%), and in the Republic of Karakalpakstan and Khorezm region fresh groundwater is completely depleted.

As of 01.01.2017, the natural resources of fresh and slightly saline groundwater are 27584 million m³. The bulk of the natural groundwater resources (84.7%) is formed in the fold-mountain hydrogeological area and only 15.3% of the land resources are formed in the platform hydrogeological area. Most of the groundwater deposits have a fairly strong hydraulic relationship with surface runoff. This is manifested by a reduction in surface runoff due to excessive groundwater abstraction. Considering this, and based on the capacity of the equipped wells, the state commissions approved reserves for each field permitted for the intake. Forecasted fresh groundwater resources suitable for use in industries (with a salinity of less than 1 g / l) make up only 40.4% of the total natural groundwater resources - or 9,424 million m³. The total value of approved operating reserves is 6134 million m³, and of these, the total annual selection is 5320 million m³. The use of operational reserves by regions of the republic is shown in Fig.2.8²⁰.

In the republic there are 119 cities, 1064 urban-type settlements and 11088 rural settlements. Of these, 69 cities (58%), 335 urban-type settlements (31%) and 2,902 rural settlements (26%) are supplied with drinking water due to proven groundwater reserves. The remaining settlements are provided with water from other sources of water supply (surface water, unapproved reserves, wells, water lines, etc.).

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²⁰ Scheme of integrated use of water resources of the Republic of Uzbekistan until 2027. Summary explanatory note. Association "Vodproekt" of the Ministry of Water Resources of the Republic of Uzbekistan. Tashkent. 2017. 169 pp.

Table 2.8. Groundwater reserves and their use in Uzbekistan (mln. m³ / year)

Year	Regional deposits	Deposits approved for use	Actual water intake	Including, used by targets					
				Drinking water supply	Industry	Irrigation	Vertical drainage	Trial pumping	Etc.
1990	18455	8700	8100	4600	900	1800	450	100	250
2008	18200	7500	6063	2613	560	1500	1300	45	45
2011	17900	6515	5372	2300	560	1260	1200	30	22
2017	9424	6134	5320	3120	1030	1100	-	-	70

During 2008-2016, the selection of fresh and brackish groundwater, from both approved and unapproved reserves, tended to decrease due to a reduction in the use of these waters in irrigated agriculture and pumping of vertical drainage wells.

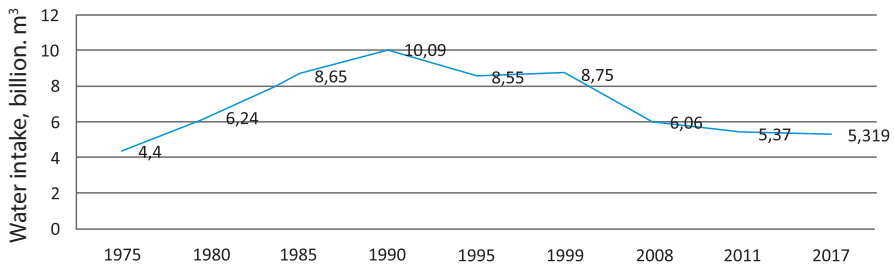


Figure 2.7. Dynamics of total water intake from groundwater in Uzbekistan

As can be seen from Figure 2.7, the intensive development of industry and agriculture over the past two decades has had a negative impact on the state of fresh groundwater, which led to a significant reduction in their reserves and depletion of individual water deposits due to unauthorized construction of water intake facilities and uncontrolled water withdrawal.

Use of operational groundwater reserves by regions (mln. m³/year)

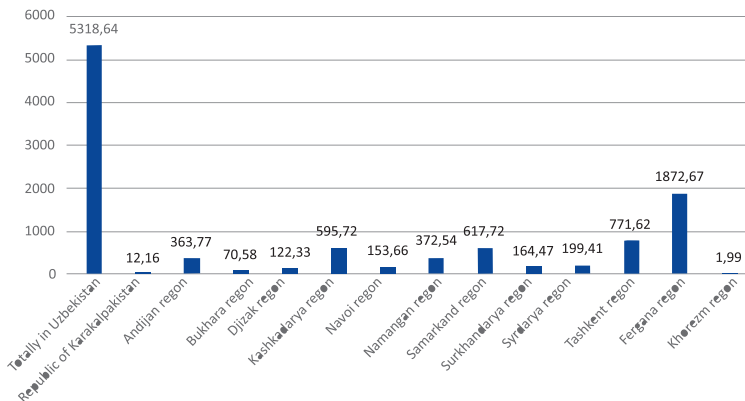


Figure 2.8. Use of operational groundwater reserves by regions

Due to the unsatisfactory condition of the diverting network of surface waters and drainage systems, the intensive rise of the groundwater level, and the lack of systematic hydrogeological monitoring, in some territories of the republic there is a flooding of some cities and other settlements.

The current groundwater monitoring system does not allow timely and fully assess the role of negative factors affecting the pollution of aquifers, depletion of groundwater and flooding of the territories of settlements.

In some regions, in addition to the existing shortage of drinking water, modern technologies are not sufficiently introduced and the existing capacity for the production of the necessary equipment and run desalination plants is not implemented.

Inventory of more than 10 thousand wells for water availability, carried out in February-March 2017, and showed that these negative factors continue to affect the state of groundwater. So the inventory results revealed:

- Uncontrolled groundwater abstraction from more than 60 percent of the wells and continued pollution and depletion of their reserves;
- 59 percent of groundwater abstracted from non-approved reserves;
- Existence of a real threat of irretrievable loss of more than half of the available fresh groundwater resources in the coming decades.

Taking into account the need to address the above problems urgently, a resolution of the President of the Republic of Uzbekistan “On measures to streamline the control and accounting of the rational use of groundwater resources for 2017-2021” was adopted on May 4, 2017.

In particular, the decree of July 1, 2017 introduced the procedure according to which:

- Production wells drilled without obtaining permission in accordance with the established procedure, but taking into account compliance with technical requirements, are subject to registration by the relevant water users and water consumers for further use in accordance with the established procedure;
- Production wells drilled without a permit in accordance with the established procedure and in violation of technical requirements are subject to liquidation in the established order taking into account the connection of the relevant water users and water users to alternative water sources;
- Issuance of a hydrogeological conclusion on drilling water wells in the prescribed manner to legal entities and individuals is carried out exclusively by the subordinate hydrogeological enterprises of the State Committee of the Republic of Uzbekistan on geology and mineral resources;
- Permission to drill water wells is issued by the State Committee of the Republic of Uzbekistan on Geology and Mineral Resources in the presence of a conclusion of the state ecological expertise of the State Committee of the Republic of Uzbekistan on ecology and environmental protection.

The decree defines the responsibilities of state bodies to ensure proper control and accounting for the rational use of groundwater, as well as water users and water users - for the rational use of water resources, maintaining proper accounting of the volume of water taken, and preventing their pollution and depletion.

The program of measures approved by the decree for 2017–2021 on streamlining the control and accounting of the rational use of groundwater reserves, including:

- A set of measures to streamline the control and accounting of the rational use of groundwater resources;
- Target parameters for growth of approved freshwater reserves;
- Parameters for expanding the network of groundwater monitoring observation posts;
- Measures to strengthen the material and technical base of hydrogeological enterprises of the state Committee of the Republic of Uzbekistan on Geology and mineral resources, construction and arrangement of production bases of territorial hydrogeological stations of the State Committee of the Republic of Uzbekistan on Geology and mineral resources;
- Parameters of construction and overhaul of drainage and observation wells and reservoirs in cities and district centers.

About 396 billion UZS will be allocated to finance the Program at the expense of the State budget, international financial institutions and local budgets.

In addition, for the organization of industrial production of desalination plants of domestic production and equipping of the corresponding settlements with them, it is planned to carry out experimental work by the end of 2017 in the Republic of Karakalpakstan, and Bukhara, Navoi and Khorezm regions.

Along with this, in order to provide enterprises of the State Committee of the Republic of Uzbekistan on geology and mineral resources and the Ministry of Water Resources of the Republic of Uzbekistan with specialized personnel, starting from the 2017/2018 academic year, the Tashkent Institute of Irrigation and Land Reclamation plans to organize training on “Reclamation and Hydrogeology”.

The implementation of this decree will allow:

- First - to introduce effective mechanisms for monitoring and accounting for the rational use of groundwater;
- Second - to improve the efficiency of hydrogeological work on the growth of fresh groundwater reserves and to ensure the water supply of an additional 7 cities, 21 villages and 426 villages;
- Third - to organize effective monitoring of the state of groundwater, taking into account the expansion of their network by 1,155 wells and the installation of 500 units of modern automated monitoring systems for their condition;
- Fourth - to prevent flooding of 132 cities and regional centers by increasing the

number of drainage wells by 715 units and the length of reservoirs by 280 km and, thus, qualitatively improve the living conditions of people in many localities of our country.

A difficult problem is the methodology of groundwater assessment. Groundwater is an integral part of the general land water resources. As a rule, they are of local importance. However, the formation, movement, level regime and quality of groundwater are determined by natural factors, taking into account anthropogenic influence, and in no way depend on any administrative boundaries. On this basis, a significant part of the groundwater of the Aral Sea Basin is transboundary (according to estimates of Sorokin I.A., the Central Asian Research Institute of Irrigation, 1996-1997), approximately 30% of the region's groundwater reserves can be classified as transboundary). Such as:

- Fergana Valley and exit from it, where there is always a huge mutual influence of groundwater of Kyrgyzstan, Tajikistan and Uzbekistan on each other and on the surrounding territory, as well as on the flow of the Syrdarya River and its main tributaries - Karadarya and Naryn (including Asht, Burgandy, Lyailyak, Matchinsk and other massifs);
- Chirchik valley with the influence of water from Uzbekistan, Kazakhstan and Kyrgyzstan on each other;
- Zone of the Tyuyamun reservoir and channels diverting from it (Turkmenistan and Uzbekistan);
- The foothill zone of the Golodnaya Steppe with intermittent groundwater from Tajikistan and Uzbekistan;
- The area of groundwater border of Kashkadarya and Chardjou regions and a number of others.

2.6. RETURN WATER

Return waters are an additional source of resources, but due to the relatively high salinity, they are also a source of environmental pollution. Today, about 88% of this water is collector-drainage water, and the rest is agricultural and industrial wastewater. It is known that along with the development of irrigation, the volume of return water increases; the most intensive growth was in 1970-1990. But, due to the decrease in water intake, since 2000, the formed volume of return water began to decrease, and some of its suitable part is used again in agriculture for irrigation (Fig. 2.9 and 2.10). Conditions for the use and management of renewable water is a priority issue, which has recently been the central area of activity of national water organizations.

Return water - water after use.

88% of the total return water is generated in the irrigation systems. They consist of waste surface water flowing from the fields into the collector network, and drainage water from filtration underground flow. 12% - waste water after use in industry, municipal services in cities and rural areas.

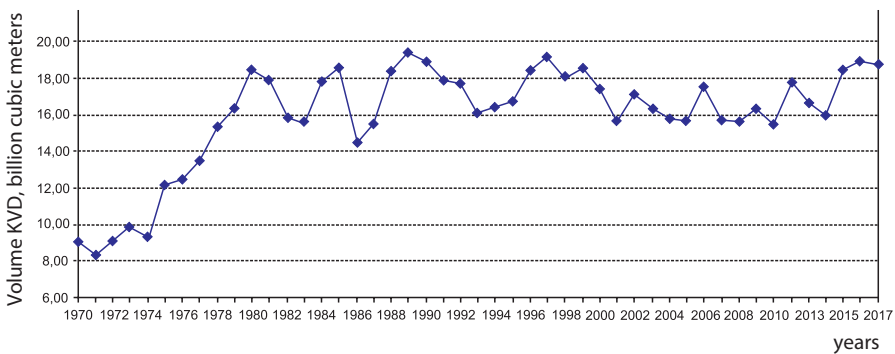


Figure 2.9. Dynamics of formation of drainage and wastewater in the Amudarya Basin

Estimates of return water, made by the author during his work in SIC ICWC, based on the materials of the CAWATER database show that according to the data of the early 1990s, the total volume of return water in the Syrdarya Basin was about 16.9 km³ per year, of which drainage water was 92%. The rest of the volume falls on wastewater. Similarly, for the Amudarya Basin, the total volume of return water according to the data of the early 1990s was about 19.5 km³ per year, of which 95% was drainage water.

In 2017, with a decrease in the total volume of return water by more than 15%, the share of wastewater in the total volume of return flow increased and amounted to 10%. According to administrative affiliation, the shares of generated return waters in the Aral Sea Basin were distributed as follows (Tables 2.9 and 2.10):

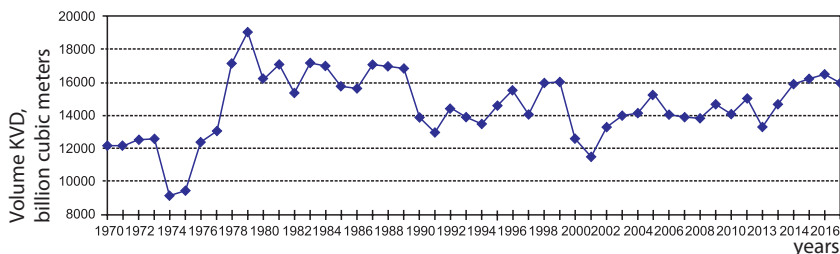


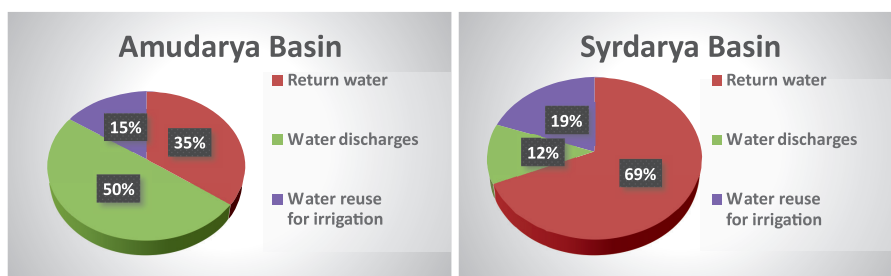
Figure 2.10. Dynamics of formation of drainage and waste waters in the Syrdarya Basin

Table 2.9. Formation of collector-drainage waters in the Aral Sea Basin (km³ / year)

Country	the Syrdarya Basin		the Amudarya Basin	
	1990-1995	2010-2017	1990-1995	2010-2017
Evaluation period	1990-1995	2010-2017	1990-1995	2010-2017
The total amount generated by the return flow, km ³ per year	16,9	16,5	19,5	18,9
Including, from the total volume:				
Kazakhstan	16%	22%	-	-
Republic of Kyrgyzstan	14%	6%	-	-
Tajikistan	7%	8%	12%	11%
Turkmenistan	-	-	19%	27%
Uzbekistan	63%	64%	69%	62%

(Source SIC ICWC, 1998 and 2017)

In the Syrdarya Basin, 68.5% of the generated return water is discharged into the rivers, 19.4% is reused for irrigation and 12.1% is diverted to natural depressions.



At the same time, in the Amudarya Basin, 34.9% of the return water is discharged into the rivers, 15.3% is reused for irrigation and 49.8% is diverted to natural depressions.

The condition for the use and management of renewable water is a priority issue that has recently been at the center of the activities of regional and national organizations. In Uzbekistan, the volume of Collector-Drainage Water (CDW) suitable for reuse in irrigation is about 4.2 km³ per year.

Table 2.10. Abstraction of formed return waters in the Aral Sea Basin (average for 2010-2017). km³ / year

Country	Collector-drainage water for irrigation *)	Wastewater from industrial enterprises and municipalities	The total volume of return water	Discharge and water use		
				Into rivers	In natural depressions	Re-use for irrigation
Kazakhstan	3,3	0,3	3,6	2,6	0,5	0,5
Kyrgyz Republic	0,8	0,2	1,0	0,9	0	0,1
Tajikistan (total)	2,9	0,5	3,4	2,9	0	0,5
Including the Syrdarya River Basin	1,1	0,2	1,3	1,1	0	0,2
Amudarya River Basin	1,8	0,3	2,1	1,8	0	0,3
Turkmenistan	4,6	0,5	5,1	0,3	4,0	0,8
Uzbekistan (total)	20,2	2,1	22,3	11,2	6,9	4,2
Including the Syrdarya River Basin	9,6	1,0	10,6	6,7	1,5	2,4
Amudarya River Basin	10,6	1,1	11,7	4,5	5,4	1,8
Total in the Aral Sea Basin	31,8	3,6	35,4	17,9	11,4	6,1
Including the Syrdarya River Basin	14,8	1,7	16,5	11,3	2,0	3,2
Amudarya River Basin	17,0	1,9	18,9	6,6	9,4	2,9

*) Considering the wells of vertical drainage

As a result of the stochastic use of return water for irrigation, land salinization occurs (see the next section, Land Reclamation). A huge amount of return water is discharged into the rivers without any limits and restrictions, which makes good fresh water brackish, which is difficult to use for the needs of industry or drinking water supply. Changes in the quality of the Amudarya River along its length are shown in Fig. 2.11.

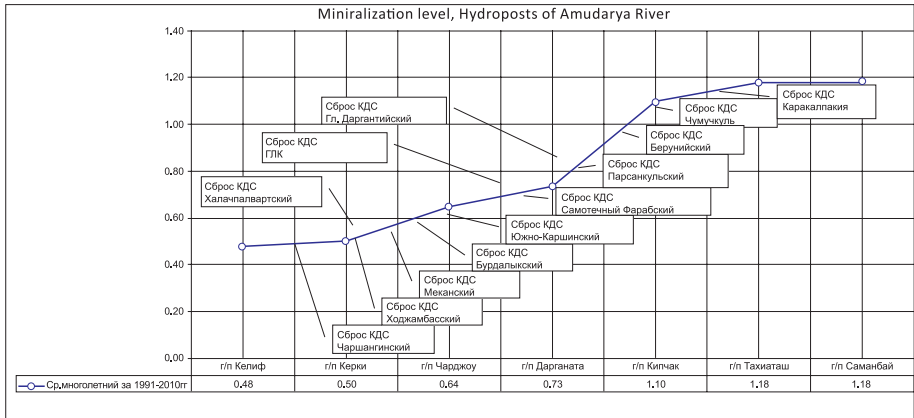


Figure 2.11. Growth of water salinity along the Amudarya River (Water quality in the Amudarya and Syrdarya River Basins. Analytical report. SIC ICWC, UNECE, and CAREC, Tashkent 2011)

Similarly, the dynamics of the quality of the Syrdarya River along its length is shown in Fig. 2.12.

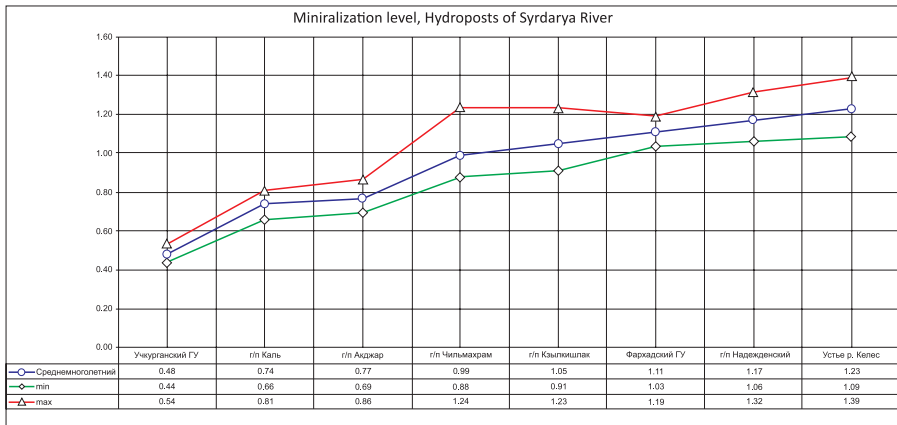


Figure 2.12. The increase of mineralization of water along the Syrdarya River (Water quality in the Amudarya and Syrdarya Basins. Analytical report. SIC ICWC, UNECE, CAREC, Tashkent, 2011)

The problem of diversion of return water to rivers, as well as water bodies created by them, should be considered from the perspective of green growth. To improve the quality of the waters of the main rivers of the region, the following measures can be proposed:

- Limiting discharges of return water into the river and the volume of discharges of certain pollutant ingredients for various sections and zones;
- Introducing the “polluter pays” principle in the interstate practice (for violating

these limits);

- Strengthening water quality control measures;
- Determination of the value of environmentally sound sanitary passes for different years of water content and different periods along rivers of interstate importance;
- Development of methods and tools for monitoring the quality of water resources;
- Equity participation of interested states in financing and performing work on the prevention and elimination of the effects of water pollution in rivers of interstate importance.

The origin of return waters is due to the peculiarities of the arid climate in our region, as well as land reclamation measures. More in the next section.

Land Reclamation

A specific feature of the state of irrigated land in Uzbekistan is the effect caused by natural conditions (primary salinization) due to weak natural drainage, when mineralized groundwater rises and causes salinization of the soil. During irrigation, the so-called “secondary salinization” occurs due to high evaporation losses with high capillary soil capacity, which leads to an increase in the volume and level of saline groundwater. Nearly 57.8% of irrigated land in Uzbekistan is prone to salinization. Soil salinization in Uzbekistan has three main sources:

- Salt content in irrigation water,
- Initial salt content in the soil,
- Inflow of underground pressure water and enrichment of the aeration zone with saline groundwater.

Table 2.11. Soil classification according to the degree and chemistry of salinization (Above the line - the sum of salts, below the line - toxic salts) - (Pankova E.I. et al., 1996)

Chemistry of salinity (ion ratio, mEq / 100 g of soil)

Neutral salinization (pH<8.5)			
The degree of soil salinity	chloride, sulfate chloride Cl:SO ₄ >1	chloride – sulphate Cl:SO ₄ =1-0.2	sulfate Cl:SO ₄ <0.2
Toxicity threshold (non-saline soil)	<0,1	<0,2	<0,3(1,0)***
	<0,05	<0,1	<0,15
	-0,2	-0,4(0,6)***	0,3(1,0)-0,6(1,2)***
Slightly	0,05-0,12	0,1-0,25	0,15-0,3
	0,2-0,4	0,4(0,6)-	0,6(1,2)-0,8(1,5)***
Moderately	0,12-0,35	0,6(0,9)***	0,3-0,6
	0,4-0,8	0,25-0,5	0,8(1,5)-1,5(2,0)***
Strongly	0,35-0,7	0,6(0,9)-1,0(1,4)***	0,6-1,5
	>0,8	0,5-1,0**	>1,5(2,0)***
Very high	>0,7	>1,0(1,4)***	>1,5
		>1,0	
Alkaline salinization (pH>8.5)			

The degree of soil salinity	chloride- alkali**** alkali-chloride Cl:SO ₄ >1 HCO ₃ >Ca+Mg HCO ₃ >Cl	chloride- alkali**** alkali-chloride Cl:SO ₄ <1 HCO ₃ >Ca+Mg HCO ₃ >Cl	ulphate - chloride - carbonate HCO ₃ >Cl HCO ₃ SO ₄ HCO ₃ <Ca+Mg
Toxicity threshold (non-saline soil)	<0,1 <0,1 0,1-0,2	<0,15 <0,15 0,15-0,25	<0,2 <0,15 0,2-0,4
Slightly	0,1-0,15 0,2-0,3	0,15-0,25 0,25-0,4	0,15-0,3 0,4-0,5
Moderately	0,15-0,3 0,3-0,5	0,25-0,4 0,4-0,6	0,3-0,5 not found
Strongly	0,3-0,5 >0,5	0,4-0,6 >0,6	not found
Very high	>0,5	>0,6	

* The sum of toxic salts is equal to the sum of ions, expressed in %. Salt-affected soils = (Cl + Na + Mg + SO₄SAS + HCO₃SAS) %. Cl, Na, Mg ions belong to the category of toxic ones; HCO₃ Salt-affected soils- (Ca-HCO₃).

The calculation of the amount of toxic ions is carried out in mEq, then these ions are converted to percentages and added together.

** Indicators on the amount of toxic salts in chloride-sulfate types of salinization for the category of strongly and very strongly saline soils are rounded for usability to 1.0-1.5%.

*** Figures in brackets correspond to the degree of salinity in the amount of gypsum-bearing soils, which include soils containing more than 1% CaSO₄ * H₂O; According to water extracts, these soils usually contain more than 10-12 mg / eq. CA and SO₄ (non-toxic).

**** The degree of soda salinization is assessed by indicators of chloride alkaline.

Salt accumulation in soil and groundwater occurs mainly in areas of insufficient drainage and adversely affects the growth and development of crops. Strongly saline lands, and there are more than 100 thousand hectares in the republic, give on average 30–45% less yield per hectare, moderately saline 15–30% and even slightly saline 5–15%.

The degree of salinization of land is determined by the content of toxic salts in the soil - according to the indicators given in Table 2.11.

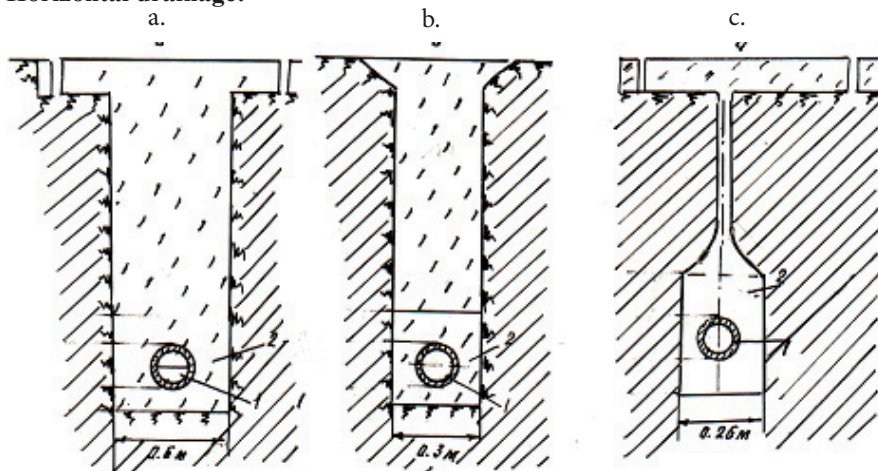
The main method of combating salinization is flushing the soil on the background of artificial or natural drainage. In the long term, it is necessary to strengthen the efficiency of the artificial drainage system in order to ensure sufficient drainage of the root zone where its natural abilities are limited, as well as to ensure the discharge of water used for flushing.

Drainage in the arid and semi-arid zones, within which unfavorable ecological and land reclamation processes occur, is designed to regulate and control the water - salt balance of the irrigated area and the water - salt soil regimes. Drainage is also widely used to regulate the water regime of flooded and wetlands, which are formed during the development of irrigated agriculture.

During the reclamation of saline and wetlands of Uzbekistan, horizontal (open and closed) and vertical drainage found the greatest use.

Horizontal drainage in accordance with the natural and economic conditions of Uzbekistan is built on an area of just over 2500 thousand hectares, and its regulatory part is mainly represented by closed tubular drainage, and the conductive (drainage) part is represented by open collectors (Fig. 2.13).

Horizontal drainage:



a-trench; b-narrow trench; c-trenchless. 1- perforated pipe 2- sand and gravel sprinkling 3- backfill soil

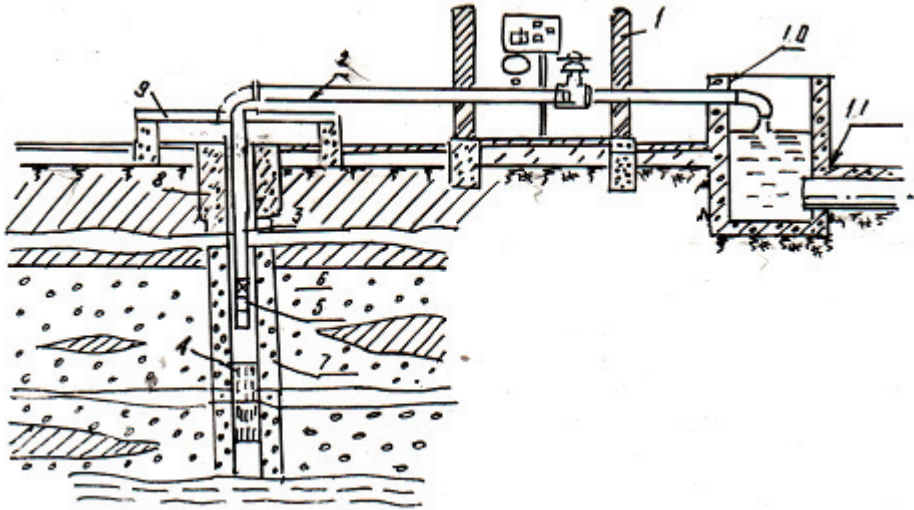
Figure 2.13. Scheme of the horizontal drainage design (Dukhovny, Yakubov et al. 2004)

A closed horizontal drainage is a perforated pipeline (made of ceramic, plastic, asbestos-cement or other pipes with a diameter of 0.07–0.3 m) laid under the ground to a depth of 2–4.0 m and surrounded by a protective filtering layer, mainly from natural sandy and sand and gravel materials with a thickness of 0.15–0.18 m. In the 1980s – 1990s, artificial protective filtering materials were used (synthetic fibers, nonwoven, needle-punched slubbers), as well as their combination with natural filter mixtures. (Dukhovny, Yakubov, et al., 2004).

The flow of water into the drain occurs by gravity under the action of pressure, formed due to the difference in the levels of groundwater at the interdiction and in the cavity of the perforated pipeline. To monitor the state of drainage and carry out maintenance work on a closed horizontal drainage, special structures (observation wells, estuaries) are provided. The international distance is determined by the hydrogeological and economic conditions and the design features of the water receiving part of the drains and is not less than 50 m.

Vertical drainage was built in Uzbekistan on an area of more than 400 thousand hectares, and is a system (Fig. 2.14) of boreholes with water intake and drainage parts of water-lifting equipment; the buildings of the station for the control of instrumentation, automation and remote control equipment; power lines, transformer substation and access roads.

Vertical drainage:



1 is the main building for management; 2-pressure pipeline; 3- production column; 4- filter column; 5-pump; 6- electric motor; 7- gravel sprinkling; 8-conductor; 9: support frame; 10- water intake well; 11- water discharge

Figure 2.14. Scheme of vertical drainage design (Dukhovny, Yakubov et al. 2004)

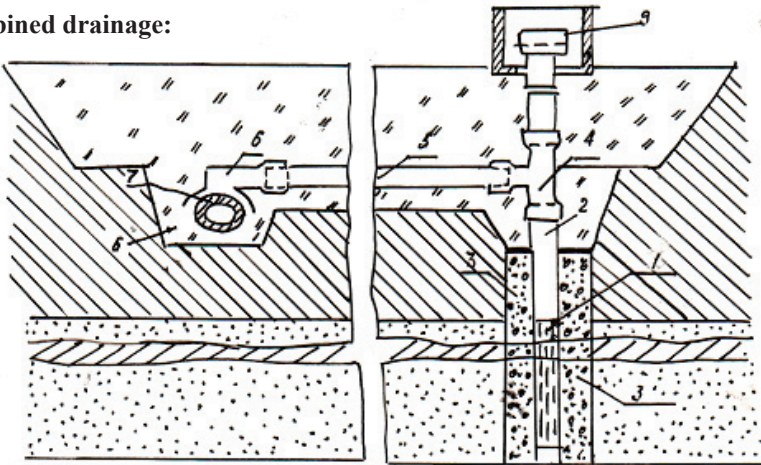
Vertical drainage wells, usually 0.9-1.2 m in diameter, are designed to affect the upper tier of groundwater and are therefore drilled to a depth of 50-100 m. The water intake part of the wells is located in well-permeable sand and gravel deposits and is equipped with a filter frame protected by sand and gravel filter dusting. The water-lifting equipment is placed in the operational column of pipes placed above the filter frame. Steel casing, thin-walled welded, polymer and asbestos-cement pipes with a diameter of up to 0.4 m were usually used as a production column. Perforated pipes of the same materials or factory-made filters were used for the filter frame. Well maintenance area depends on hydrogeological and economic conditions and can reach 100-150 ha.

Combined drainage (Fig. 2.15) is a system of horizontal drains (collectors) placed in a weakly permeable top fine-grained and vertical self-draining wells, the water intake part of which is installed in a well permeable underlying layer. In such a system, the pressure arising during irrigation, accompanied by the rise of groundwater, is transferred to the lower well-permeable layer and forms an inflow to vertical wells and self-discharge into the horizontal drainage network. Accordingly, self-draining wells placed along the drains, increasing its effect, can significantly expand the inter-well distances. To increase the water capacity, wells with a diameter of 500 mm of combined drainage (to a depth of not more than 30 m) are drilled and covered with plastic pipes with a diameter of 100 mm with perforation in the lower part, placed in a well-permeable underlying layer.

This type of drainage was installed on the area of 35-40 thousand hectares in Kashkadarya region. As a filter protection, a sand-gravel mixture of a special composition is used, which is poured into the annular space between the water-lifting column and the walls of the well. The distance between the wells installed along the drains depends on hydrogeological conditions and is 100-200 m.

The choice of one or another type of drainage from the above was made on the basis of the analysis of hydrogeological features of a particular area. Horizontal drainage is mainly suitable for conditions of homogeneous soil structure with a filtration coefficient of 0.01 to 1 m / day or more, in the absence of a well-permeable layer, especially in the close occurrence of a water seal (up to 5 m). It is also effective in conditions of heterogeneous structure of soils with low-power top fine-grained soils (3-4 m), when it becomes possible to open well-permeable underlying layers (sand, gravel, etc.) and lay horizontal drains in them.

Combined drainage:



1: filter column; 2: water column; 3: filter sprinkling wells; 4: tee; 5: drain pipe; 6: bandage with tap; 7: drain pipe; 8: filter sprinkling drains; 9: wellhead

Figure 2.15. Scheme of vertical drainage design (Dukhovny, Yakubov et al. 2004)

Vertical drainage is promising under conditions of a predominantly heterogeneous soil structure with thick surface fine earths (15-45 m), underlain by well-permeable sand-gravel layers with a capacity of more than 5 m and water conductivity more than 100 m² / day. It can be effective even at lower water conductivity under conditions of low permeability of surface fine earths (less than 0.1 m / day) or pressure of groundwater of underlying layers. Power limitations of the fine surface soil are due to the fact that, with capacities less than 15 m under vertical drainage conditions, spatial unevenness is created over the depth of the groundwater, the speed of their decrease and the rate of desalinization of the soil, and the resistance of the surface fine earth increases dramatically and is lost hydraulic connection of groundwater of surface fine-earth with groundwater underlying layers.

Combined drainage is promising in conditions of heterogeneous soil structure composed of low-permeable cover (0.01-0.5 m / day) fine earth with a capacity of 5 to 15 m and well-permeable pressure or non-pressure underlying layers with a water conductivity of more than 10 m² / day. The inapplicability of the combined drainage in the conditions of thin cover fine-earths is explained by the fact that laying its horizontal element (3-4 m deep) directly into the underlying well-permeable layers eliminates the need for its vertical element (wells). With capacities of fine earths at a depth of more than 15 m, its resistance begins to increase and the overflow coefficient decreases (the ratio of the volume of water from the top layer of the surface fine earth to the total consumption taken by drainage). Under the conditions of low permeability of surface fine earths (less than 0.1 m / day), when the drainage capacity of the horizontal network can be neglected, it can be replaced with an unperforated “deaf” conduit that only transports the drainage flow coming from self-flowing wells.

It should be noted that the construction of drainage systems in Central Asia was widely developed in 1960-1990, when, among other things, in Uzbekistan, intensive development of new lands and reconstruction of the ameliorative network on old irrigated lands were carried out. Today in Uzbekistan, drainage systems operate on an area of more than 2,950 thousand hectares (Table 2.12).

In order to control the ameliorative state of the irrigated lands, control of salinization and exploitation of the collector-drainage network, reclamation expeditions were created in each region. Up to now, these organizations exploit collector-drainage networks (CDN) and are responsible for the successful reclamation of irrigated lands. However, in the first 15 years of independence, due to the unsatisfactory economic situation in the water sector, the collector-drainage network began to degrade and fail in many areas.

Table 2.12. Saline land areas and drainage provision in the Republic of Uzbekistan (Data from SIC ICWC and Central Asian Research Institute of Irrigation, 2016)

Regions	Irrigated area	Area under drainage	Areas strongly and medium-saline	Recommended leaching rates, thousand m ³ / ha		
	thousand hectares	thousand hectares	thousand hectares	Slightly saline	Moderately saline	Highly saline
Karakalpakstan	515,2	371,3	241,6	2,5-3,0	3,5-4,0	5,0-5,5
Andijan	264,9	182,1	4,6	1,8-2,0	2,5-3,0	3,5-4,0
Bukhara	275,1	232	70	2,5-3,0	3,5-4,0	4,5-5,0
Djizak	288,9	266	83,7	2,0-2,5	3,0-3,5	4,0-4,5
Kashkadarya	515,5	307,6	56	2,0-2,5	3,0-3,5	4,0-4,5
Navoi	133,3	107,4	13,4	2,5-3,0	3,5-4,0	4,5-5,0
Namangan	276,4	137,4	7,6	2,0-2,5	3,0-3,5	4,0-4,5

Samarkand	379,2	125,1	0,3	2,0-2,5	3,0-3,5	4,0-4,5
Surkhandarya	325,6	205	31	2,0-2,5	3,0-3,5	4,0-4,5
Syrdarya	246,7	289,6	54	2,0-2,5	3,0-3,5	4,0-4,5
Tashkent	406,5	236,2	1,7	2,0-2,5	3,0-3,5	4,0-4,5
Fergana	362,9	231,3	30,4	2,0-2,5	3,0-3,5	4,0-4,5
Khorezm	247,3	266,3	115,2	2,5-3,0	3,5-4,0	4,5-5,0
Total in Uzbekistan	4237,5	2957,3	709,5			

According to the Decree of the President of the Republic of Uzbekistan in 2007, a specialized Fund for Improvement of Irrigated Lands Reclamation was established under the Ministry of Finance, at the expense of which the State Program on Improvement of Irrigated Lands Reclamation for the period 2008-2012 was implemented. More than **500 million US dollars** were spent on the implementation of the Program's activities, including the construction, reconstruction and rehabilitation of collector-drainage systems.

A special system "Uzmeliomashlizing" was created to perform such large amounts of work. From 2008 to 2012, the system provided 1450 units of new special equipment, including 600 excavators, 180 bulldozers and 670 other mechanisms to enterprises participating in irrigation and reclamation activities under preferential leasing conditions.

As a result of the work performed in the period from 2008 to 2012, the ameliorative state of irrigated lands on an area of more than 1 million 200 thousand hectares was improved, and the optimal groundwater level was ensured. At the same time, the area of irrigated land with the groundwater level up to 2 m depth decreased by 117.6 thousand ha. On an area of 105 thousand hectares of strongly and moderately saline land, a reduction in salinization to indicators of lightly saline and non-saline lands was ensured.

By a resolution of the President of the Republic of Uzbekistan in 2013, a new set of measures for the period 2013-2017 was defined. More than 1.2 billion USD were allocated for these purposes. Within the framework of this state program, the technical condition of land reclamation facilities was improved and the regulatory outflow of collector-drainage water from an area of 669 thousand hectares was provided, and the reclamation state of 1 million 132 thousand hectares of irrigated land was generally improved.

On November 27, 2017, President of the Republic of Uzbekistan Sh. M. Mirziyoyev signed the Resolution "On the State Program for the Development of Irrigation and the Improvement of the Ameliorative Status of Irrigated Lands for the Period 2018-2021". The program assumes the construction and reconstruction of 2,227 km of collector-drainage networks, 238 vertical drainage wells, repair of 34.8 thousand km of collector-drainage networks and 1,087 vertical drainage wells at the expense of the Land Reclamation Fund.

2.7. DRAINAGE REGULATION AND WATER RESERVOIRS AND HYDRO POWER ENERGY

In Uzbekistan, 48 large reservoirs are built and operated (the largest ones include reservoirs with a capacity of more than 10 million m³). The total capacity of all reservoirs exceeds 24 billion m³, including 15.5 billion m³ in the Amudarya Basin and over 8.5 billion m³ in the Syrdarya Basin. Taking into account the dead volume – the useful capacity of reservoirs in Uzbekistan is 19.2 billion m³. Including 11.86 billion m³ in the Amudarya Basin and 7.35 billion m³ in the Syrdarya Basin (see table 2.13 below with technical characteristics of reservoirs).

The main task of creating reservoirs is to regulate the flow of the river, which is subject to natural fluctuations. Flow regulation is the process of its redistribution by the reservoir in accordance with the requirements of the water complex (energy, water supply, irrigation, shipping, flood control, fisheries, etc.). River runoff accumulates in the reservoir during periods when the natural inflow of water exceeds its needs, and is consumed during periods when the need for water exceeds the inflow.

Reservoirs - as storage tanks are very important for Uzbekistan - as for the flow of water along the main rivers, there is a great dependence on the upper neighbors, on the territory of which the main river flow is formed. In addition, the regulation of the flow of the main rivers of the region by the largest reservoirs in Kyrgyzstan and Tajikistan occurs in the energy regime, which creates an additional artificial water shortage in the summer season - the peak of irrigation. Seasonal control reservoirs on the territory of Uzbekistan make it possible to some extent compensate for the water deficit in the summer.

Uzbekistan has rich hydropower resources. The volume of hydropower resources, technically suitable for development, is 27.4 billion kilowatt-hours of annual electricity generation. At the same time, only 6.5 billion kilowatt-hours, or 23.7 percent of the country's hydropower potential, have been developed.

Considering that hydropower resources are natural, renewable and ecologically clean sources, the all-round increase in their use corresponds to the current development strategy of the republic. This ensures guaranteed coverage of growing electricity needs for industrial and utility enterprises, agriculture and the population of the regions, contributes to saving and rational use of organic fuel in the country and reducing emissions of harmful substances into the environment.

Uzbekistan's hydropower industry currently includes 36 hydroelectric power plants, of which 25 were commissioned 40 to 80 years ago, have largely worked out their technical resources, and require equipment modernization and reconstruction of facilities.

On May 2, 2017, the Decree of the President of the Republic of Uzbekistan №PP-2947 on the Program of measures for the further development of hydropower for 2017-

2021 was adopted in order to ensure the effective use of the hydropower capacity of the republic, increase the share of renewable hydropower resources in electricity production, and create new environmentally friendly generating capacities, implement technical and technological re-equipment of existing hydroelectric power plants.

On 2 May 2017, the Resolution of the President of the Republic of Uzbekistan No. PP-2947 was adopted on the implementation of measures for the further development of hydropower in 2017-2021 in order to effectively use the hydropower potential of the republic, increase the share of renewable hydropower resources in the structure of electricity generation, create new environmentally friendly capacities, technical and technological re-equipment of existing hydroelectric power plants.

The following important tasks are assigned to JSC “Uzbekgidroenergo”:

- Implementation of a unified technical policy in the field of electric power generation at hydroelectric power stations, ensuring safe and efficient operation of hydraulic structures, as well as centralized technological management of hydropower facilities;
- Development and implementation of hydropower development programs based on the integrated development of hydropower capacity and ensuring increase of hydropower share in the energy balance of the republic;
- Implementation of investment projects for the construction of new and modernization of existing hydroelectric power plants on the basis of modern and comprehensively grounded scientific and technical solutions in the design and construction of large, medium, small and micro hydroelectric power plants;
- Development of cooperation with international companies and financial institutions to attract foreign investment and advanced technologies in the implementation of projects for the construction of new and modernization of existing hydroelectric power plants;
- Ensuring careful attitude towards the water potential of the republic, preserving the existing flora and fauna during the construction and operation of hydraulic structures, as well as effective water management, taking into account climatic, natural and other features of the republic;
- Implementation of training, retraining and advanced training of personnel with higher and secondary specialized, professional education in the field of hydropower on a system basis.

In Uzbekistan, the operation of reservoirs is considered from the standpoint of consumer priorities and, only incidentally, from the standpoint of energy. This approach has several reasons:

- The water resources used by hydropower plants are classified as renewable - hydropower plants do not consume water and, practically, do not degrade its quality.
- The cost of electricity generated by hydropower plants is the lowest — even compared to currently known alternative methods of generating electricity.

- The cost of the hydroelectric power station itself with its equipment is about the same as the creation of a reservoir or hydroelectric complex on canal drops. Therefore, the combination of hydroelectric power plants with reservoirs, waterworks and differences in channels, is economically viable.
- Hydroelectric power stations at reservoirs perform the functions of regulating the frequency of the current in the power grids, ensuring the quality of electric power, and save non-renewable energy resources.

In Uzbekistan, the creation of reservoirs since ancient times was carried out in order to develop irrigation, and their energy use was provided for under the irrigation regime. To fulfill both the requirements of irrigation and energy today is technically impossible. Therefore, throughout the history of water resources development, this has been and remains as the subject of inter-sectoral and interstate contradictions.

In 2017, all power plants of the republic produced 60.7 billion kWh of electricity, while the increase compared to 2016 was 2.9%.

52.1 billion kW/h was produced at the power plants of “Uzbekenergo”, or it is 85.9% of the total production in the republic, “Uzbekgidroenergo” produced the rest. 48.0 billion kW/h was supplied to consumers, including 12.5 billion kW/h to the population. The export of electricity was carried out for 1.85 billion kW/h, and an increase was 23.6%. As part of the cooperation, electricity was imported from Kyrgyzstan for 1.2 billion kW/h (in exchange for water).

Table 2.13. Large reservoirs (with a useful volume of more than 10 million m³) and hydropower plants in Uzbekistan

Amudaryya River Basin

Reservoir name, Hydroelectric power station	Purpose	Commissioning date	Reservoir volume million m ³		Installed capacity of hydropower plants MWth / number of units, pcs	Water source	Project organization	Departmental affiliation
			Full	Dead				
IN OPERATION								
Tuyamuyun	Irrigation, Energy	1980	7800	2550	150/6 units	Amudaryya	Central Asian branch of the Institute "Hydroproject"	Lower-Amudaryya BM irrigation systems, the Management of hydropower plants
Tudakul	Irrigation	1986	1150	600	N/A	BAK	Institute "Uzgiprovodkhoz"	Amu-Bukhara irrigation systems BM
Talimarjan	Irrigation	1985	1525	125	N/A	KMK	Institute "Uzgipromeliiovodhoz"	Management of KMK operation
South-Surkhan	Irrigation	1967	800	100	N/A	Surkhandarya	Institute "Sredazgirovodkhopok" ("Uzgipromeliiovodkhoz")	management of South Surkhan reservoir operation
Tupolang	Irrigation, Energy	1988	500	30		Tupolang	Institute "Uzgirovodkhoz"	
Shurkul	Irrigation	suspended in 1985	Projected 394, actual-170	Projected-17,0, actual-17	N/A	Zeravshan	Institute "Uzgirovodkhoz"	Amu-Bukhara irrigation systems BM

Kuyamazar	Irrigation	1958	310	47	N/A	BAK/ Zeravshan	Institute "Uzgirovodkhoz»	Interregional management of operation of ABMK
Akdarya	Irrigation	1983	112,5	2,5	N/A	Akdarya	Institute "Samarqandgip- rovodkhoz»	Zarafshan irrigation systems BM
Kattakurgan	Irrigation	1953	900	24	N/A	Zeravshan	"Sazvosproiz" trust restructured to the Institute "Sredazgiprovodkhhlopok»	Zarafshan irrigation systems BM
Karaulube/ Karaultepa	Irrigation	1987	53	3	N/A	Zeravshan	Institute " Uzgirovodkhoz»	Zarafshan irrigation systems BM
Kamashi	Irrigation	1987 after reconstruction	25,0	1,2	N/A	Karabagdarya	Institute " Uzgirovodkhoz»	Amu-Kashkadarya irrigation systems BM
Kattasai	Irrigation	1961	55	15		Kattasai		
Pachkamar	Irrigation	1968	260	10	N/A	Guzardarya	Institute " Uzgirovodkhoz»	Management of Pachkamar reservoir operation
Dekhkhanabad	Irrigation	1991	18,4	3	N/A	Kichik- Uradyarya	Institute " Uzgirovodkhoz»	Amu-Kashkadarya irrigation systems BM
Chimkurgan	Irrigation	1963	500	0/50	N/A	Kashkadarya	Institute "Uzgiromelovodkhoz" (Sredazgiprovodkhhlopok)	Management of operation of Chimkurgan reservoir
Gissar	Irrigation, Energy	1988-2011	170	8,4	45 (2)	Aksu, Kashkadarya	Institute " Uzgirovodkhoz»	Management of Gissarak reservoir operation
Uchkizil	Irrigation	1957	160	80	N/A	Zang Channel	Institute " Sredazgiprovodkhhlopok»	Amu-Surkhan BM of irrigation systems

Aktubinsk I-stage	Irrigation	construction is suspended, for constant operation is not accepted	120	20	N/A	Zang Channel	Institute "Uzgirovodkhoz»	Amu-Surkhan BM of irrigation systems
Degrez	Irrigation	1961	12,75	0,55	N/A	Tupalang river through Khazarbag vil.	the project team of Surkhandarya region	Amu-Surkhan BM of irrigation systems
Karasu	Irrigation	1988	27,6	2,2	N/A	Karasu	Institute "Samarqandgirovodkhoz»	Zarafshan BM of irrigation systems
Karatobinsk	Irrigation	1982	19,0	0,56	N/A	Karatepasai	Institute "Uzgirovodkhoz»	Zarafshan BM of irrigation systems
Tusunsai	Irrigation	1990	42,0	5,5	N/A	Tusunsai	Institute "Uzgirovodkhoz»	Zarafshan BM of irrigation systems
Mejdurechensk	Irrigation		450	50	N/A	Amudarya		
Akbay	Irrigation	1963	110	20	N/A	Kashkadarya		

Basin of the Syrdarya River

Reservoir name, Hydroelectric power station	Purpose	Commissioning date	Reservoir volume million m ³		Installed capacity of hydropower plants MWth / number of units, pcs	Water source	Project organization	Departmental affiliation
			Full	Dead				
IN OPERATION								
Djizak	Irrigation	1973	100	4	N/A	Sanzar	Institute "Uzgiprovodkhoz"	Zarafshan BM of irrigation systems
Zaamin	Irrigation	1987	51	21	N/A	Zaamin	Institute "Uzgiprovodkhoz"	Lower -Syrdaya BM of irrigation systems
Charvak	Irrigation, Energy	1963-1972	2006	426	620,5/4 units	Chirchik	Central Asian branch of the Institute "Hydroproject"	Chirchik-Akhangaran BM irrigation systems, SJSC "Uzbekenergo"
Tyuyabuguz (Tashkent sea)	Irrigation	I- stage -December 1961. II- stage -December 1963	250	26,0	N/A	Akhangaran	Institute "Uzgipromeliovodkhoz" (Sredazgiprovodkhlpok)	Management of operation of the Tashkent reservoir
Akhangaran	Irrigation	1989	198	13	N/A	Akhangaran	Institute "Sredazgiprovodkhlpok" ("Uzgipromeliovodkhoz")	Chirchik-Akhangaran BM of irrigation systems
Farkhad	Irrigation, Energy	1942-48	350	330	126/4 units	Syrdarya	SAOGIDEP	SJSC " Uzbekenergo»
Kassansai	Irrigation	I stage - 25.04.1957 g / II stage - G. 26.01.1968	165	10	N/A	Kassansai	Phase I - "Sazvodproiz" trust II stage- Sredazgiprovodkhlpok	Naryn-Syrdarya BM of irrigation systems

Karkidon	Irrigation	1967	218,4	7,0	N/A	Kuvasai and UFK	Institute "Uzgirovodkhoz»	Management of the main canal systems in Fergana valley
Andijan	Irrigation, Energy	1978	1900	150	140/4 units + 50(2) = 190	Karadarya	Institute "Uzgiromelirovodkhoz" (Sredazgirovodkhllopok)	Management of Andijan reservoir operation
Varzik	Irrigation	1992	18,2	0,4	N/A	Channel "Galaba"	Institute "Ferganagiprovodkhoz»	Naryn-Syrdarya BM of irrigation systems
Iskier	Irrigation	1978	18,5	0,6	N/A	Namangansai	Institute "Uzgirovodkhoz»	Naryn-Syrdarya BM of irrigation systems
Hodjikent	Energy	1976	31	22	165/3 units	Chirchik		SJSC "Uzbekenergo»
Gazalkent	Energy	1977-1981	16	9	120/3 units	Chirchik		SJSC "Uzbekenergo»
Kurgantepinsk	Irrigation	1978	28,7	0,3	N/A	Arabtepasai, Kemklisai		
Rezaksai	Irrigation	2010	300	2	N/A	Syrdarya	Institute "Sredazgirovodkhllopok" ("Uzgiromelirovodkhoz")	
Djidalisai	Irrigation	2011	44	1	N/A	Chadaksai	Institute "Uzgirovodkhoz»	Management of operation of Djidalisai reservoir
Chartak	Irrigation	2013	30	9	N/A	Chartaksai	Institute "Uzgirovodkhoz»	Management of operation of the Chartak reservoir
Armasai	Irrigation		1000	130		Syrdarya	Institute "Uzgirovodkhoz»	Management of operation of the Armasai reservoir
Tavaksai	Energy	1932-1941			73,6 (4)	Chirchik (derivately)		SJSC "Uzbekenergo»
Chirchik HPP m.a.Loginova (Komsomol) №7	Energy	1932-1956			86,4 (4)	Chirchik (derivately)		SJSC "Uzbekenergo»

Akkavak -1 (№15)	Energy	1941-1951			36,8 (1)	Chirchik (derivately)		SJSC "Uzbekenergo»	
Akkavak-2	Energy	1943-1946			9 (2)	Channel Bozsuz		SJSC "Uzbekenergo»	
Kibray (No. 11)	Energy	1942-1943			11,2 (1)	Channel Bozsuz		SJSC "Uzbekenergo»	
Katerin (No. 3)	Energy	1930 - 1936			13,2 (4)	Channel Bozsuz		SJSC "Uzbekenergo»	
Salar (№12)	Energy	1943-1944			11,7 (1)	Channel Bozsuz		SJSC "Uzbekenergo»	
Bozsuz HPP	Energy	1923-1936			4 (4 units)	Channel Bozsuz		SJSC "Uzbekenergo»	
Sheykhanitaur (№21)	Energy	1951-1955			3,6 (3)	Bozsuz Channel (Anchor)		SJSC "Uzbekenergo»	
Burdjar HPP	Energy	1933-1937			6,6 (2)	Channel Bozsuz		SJSC "Uzbekenergo»	
Aktepa HPP	Energy	1936-1943			15 (1)	(Burdjar)		SJSC "Uzbekenergo»	
Lower-Bozsuz HPP 1	Energy	1943-44			10,2 (1)	Channel Bozsuz		SJSC "Uzbekenergo»	
Lower -Bozsuz HPP 2	Energy	1950			7,2 (3)	(Aktepa)		SJSC "Uzbekenergo»	
Lower -Bozsuz HPP 3	Energy	1945-1955			11,2 (2)	Channel Bozsuz		SJSC "Uzbekenergo»	
Lower -Bozsuz HPP 4	Energy	1948-1954			17,6 (2)	Channel Bozsuz		SJSC "Uzbekenergo»	
Lower -Bozsuz HPP 6	Energy	1950-1954			4,4 (2)	Channel Bozsuz		SJSC "Uzbekenergo»	
UNDER CONSTRUCTION									
Centralno- Fergana	Irrigation			350		BAK, BFK	SAOGI DEP		
Sardob	Irrigation			922		UGK	Institute «Sredazgiprovochkhlopok» («Uzgiipromeliorovodkhoz»)		

Zarkent	Irrigation	1st stage in 1983 Under construction	25	0,5		Karakorumsai	Institute "Uzgirovodkhoz»	
PLANNED								
Pskem	Irrigation, Energy		500		450	Pskem	Central Asian branch of the Institute "	
Kamolot	Energy	2011-			8	Chirchik (derivation)	Hydroproject»	

2.8. PROTECTION OF WATER RESOURCES

The Decree of the President of the Republic of Uzbekistan “On the improvement of the system of public administration in the field of ecology and environmental protection” (April 21, 2017) in order to ensure the effective implementation of state policy, improve the system of public administration and implement control in the field of ecology, environmental protection (including water resources), rational use and reproduction of natural resources, as well as to implement the Action Strategy for the five priority areas of development of the Republic of Uzbekistan. This decree stipulated the re-organization of the State Committee of the Republic of Uzbekistan on Nature Protection into the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection under the Cabinet of Ministers of the Republic of Uzbekistan. The tasks of the committee include environmental protection, monitoring compliance with legislation in the field of the protection and use of natural resources, training of specialists.

The issues of protection of water and water bodies are regulated by the Law “On Water and Water Use” of May 6, 1993, as amended and supplemented in subsequent years (1997–2017), and other, primarily, environmental protection legislation. During the years of independence, important legislative, organizational and socio-economic measures to ensure environmental safety were developed and implemented in the Republic of Uzbekistan. More than 15 laws directly regulating relations in the field of nature protection and rational use of natural resources and more than 30 legislative acts have been adopted and are in force in the republic. They define the mechanisms and conditions for the use of certain types of natural resources, as well as the procedures of implementation of the state environmental expertise, the formation of various categories of protected natural areas and the establishment of special regimes of use and other issues.

The main legislative framework to date:

- Law of the Republic of Uzbekistan «On Nature Protection» of December 9, 1992;
- Law of the Republic of Uzbekistan «On Ecological Expertise» of May 25, 2000;
- Law of the Republic of Uzbekistan «On introducing changes and amendments to the Law of the Republic of Uzbekistan» On regulatory legal acts» of December 24, 2012;
- Law of the Republic of Uzbekistan «On Sanitation and Epidemiological Safety of the Population» of August 26, 2015;
- Law of the Republic of Uzbekistan “On Environmental Control” of August 26, 2015.

The “Regulations on water protection zones of reservoirs and other water bodies, rivers, main canals and collectors, as well as sources of drinking and domestic water supply, medical and cultural and recreational purposes in the Republic of Uzbekistan” approved by the Cabinet of Ministers of the Republic of Uzbekistan on April 7, 1992 are of great importance regarding the water protection issues.

The aforementioned decree of the President of Uzbekistan on April 21, 2017 ordered to urgently prepare new pollution control mechanisms that meet modern realities.

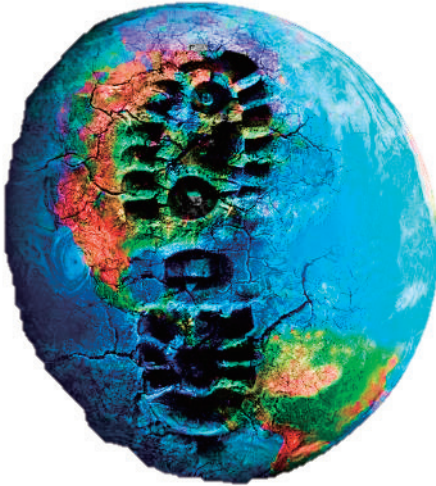
One of the first in this direction was the Resolution of the President of the Republic of Uzbekistan “On measures to further improvements in the system of protection of water bodies” of September 25, 2017. It is aimed at preventing illegal work on clearing the riverbeds and strengthening their banks, mining nonmetallic minerals, preventing their negative impact on the environment, as well as ensuring safe operation of transport and hydraulic infrastructure facilities, improving the environmental situation.

To date, the established area of water protection zones for rivers in Uzbekistan is 155,416.5 hectares. In terms of potable quality groundwater deposits, the total area of the protection zone is 350,919 hectares in Djizak, Surkhandarya, Namangan, Andijan, Samarkand, Kashkadarya, Fergana and Tashkent regions.

Table 2.14. Water protection zones of the rivers of the Republic of Uzbekistan

№ п/п	River basin	Location	The territory of the water protection zone, hectares
1	Kashkadarya River	Kashkadarya region	13106,9
2	Zarafshan River	Navoi region	29789,3
3	Chirchik River	Tashkent region	9160,6
4	Surkhandarya River	Surkhandarya region	9208,0
5	Karadarya River	Andijan region	7540,7
6	Naryn River	Namangan region	4310,7
7	Amudarya River	Surkhandarya region, Khorezm region, Republic of Karakalpakstan	50054,0
8	Syrdarya River	Andijan, Fergana, Namangan, Tashkent, Syrdarya regions	32246,3

2.9. THE CRISIS OF THE ARAL SEA AND WAYS OF SOLUTION



It is usually said that the Aral Sea disaster was the result of a centralized (socialist) political system that is inherent in developing countries. This is partly the case; however, the same happens in rich (capitalist) countries. For example, today the world is watching the changes in the Salton Sea Lake in the United States, whose ecosystem is also dying, despite the country's huge economic potential. Another example is the ecological crisis in the Urmia Lake in Iran, where Muslim traditions defines the right attitude to the water use - different from the socialist or capitalist ideology.

Mismanagement, based on the loss of human honor, morality and conscience, is the main cause of environmental tragedies, such as the Aral Sea, Salton-si, etc.

The reason for such environmental crises is not only the level and path of development of the country, but primarily, the insufficient responsibility of man and society towards nature.

The seat of the trouble is that the environment is declared as the common property of people, and is considered as the collective type of property. But, in fact, the life of society follows the economic (commercial) interests of the political elite of human society. Humanity still considers economic benefits as a priority and starts to think about ecology only when the nature takes revenge.

The direct answer on the question of what caused the death of the Aral Sea is the development of agriculture and industrialization. These are the main factors that led to the environmental crisis of the Aral Sea. Of course, the leaders of the republics of Central Asia and the Soviet Union understood and knew that the Aral Sea would disappear if all waters were taken from rivers for the purpose of development in the 1930s and 80s. But the huge withdrawal of water from the two main rivers lasted until 1990 (the last year of the Soviet Era).

In 1949 for the first time only it was loudly announced about the possible death of the Aral Sea. Academician of the Academy of Sciences of Uzbekistan ASKO, who participated in the design of the Karakum canal, in the anniversary collection dedicated to the 25th anniversary of the Uzbek SSR wrote about the program of redistribution of the Amu Darya runoff in the framework of Stalin's plan to transform the nature of the USSR: "As a result of such redistribution of water in the Aral lowland, eventually the

Aral Sea will disappear. The regime of water sources will be changed with the help of reservoirs, which, being located in the upper and middle reaches of rivers, will have a positive impact on the climate. The sea mirror, which evaporated useless water in the Western part of the lowland, will move to the East, closer to the mountains, which should certainly humidify the climate of the foothills” (where the main population of the region is located).

Speech of Usman Yusupov, First Secretary of the Central Committee of the Communist Party of Uzbekistan at the Third Session of the USSR Supreme Soviet on May 26, 1939: “Uzbekistan has large land funds that are not cultivated due to the lack of irrigation. Meanwhile, the available water resources are not sufficiently used. For example, rivers such as the Syrdarya, Amudarya: their waters are almost completely useless and are impractically flow to the Aral Sea. ”

The report of Usman Yusupov, First Secretary of the Central Committee of the Communist Party of Uzbekistan, “On Irrigation Construction in Uzbekistan”, 1939: “We cannot tolerate the fact that the abundant Amudarya River falls into the Aral Sea and our lands in Samarkand and Bukhara regions are not irrigated enough. Our task as genuine Bolsheviks is to change the existing situation and bridle the Syrdarya and the Amudarya Rivers, strongly hold them in our hands, make their waters serve the interests of socialism, the growth of the material level of the population and the development of the country.”

The construction of a huge artificial canal in the world (Karakum) and the creation of massive irrigated arrays in the region of Central Asia in accordance with the Stalin’s plan on the nature remaking (approved by the USSR Council of Ministers on October 20, 1948) was declared as a victory over the desert! However, after 40 years, nature took revenge and instead of the conquered desert created a new one – Aralkum.

Anthropogenic factors (the main ones are intensive irrigation and the development of hydropower), together with natural factors (climate aridity - a combination of high air temperatures, high evaporation and low precipitation) led to the death of the Aral Sea. The less water flowed into the sea along the Amudarya and Syrdarya, the less became its depth and volume of water, the faster it warmed up, evaporation went easier, which accelerated its drying.

The government of the USSR under the influence of the scientific community tried to find a solution to save the Aral. In the 1980s, a project to restore the dying Aral Sea was developed to transfer water from Siberian Rivers, but these plans were never implemented.

With the proclamation of independence, the Central Asian countries abandoned the outdated socialist economy and began to pursue a policy of forming a market economy based on sustainable principles and to pay more attention to environmental stabilization.

The Aral Sea, which was unique, beautiful and one of the largest closed reservoirs of the world, was practically on the verge of total disappearance during one generation, which turned out to be an unprecedented calamity and irreparable damage to the life of the population, ecosystem and biodiversity of the Aral Sea region and its surrounding areas.

Having a significant water surface (over 69.79 thousand km²) and a water volume of about 1080 km³, the Aral Sea served until the mid-1960s as a climate-regulating water body and mitigated the sharp fluctuations in weather in the Central Asian region. The air masses, mainly entering from the west to the region, warmed up in the winter, and cooled down over the Aral Sea during the summer. Due to this temperature regime, moisture transported by air flows fell as precipitation over the Tien Shan and Pamir mountains in the autumn-winter period, replenishing snow reserves and the volume of glaciers.

The average annual water balance of the Aral Sea was calculated by Asarin A.E. for the period 1926-1969 (before a sharp decline of the sea level) and was as follows:

Water Inflow:	km³	mm
Precipitation	8,7	130
Surface runoff	54,5	820
Level changes	0,6	9
Water Outflow:		
Evaporation from the water surface	63,8	955

Since 1960, due to the intensive irrigation and hydropower development with the use of water and land resources of the Aral Sea Basin, the total water consumption in the Amudarya and Syrdarya Basins began to increase rapidly due to regulation and irrevocable removal 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, starting from 1960, the negative water balance of the sea became the norm and in the period from 1970 to 1990 the annual balance deficit exceeded 30 km³. Formation of such a large sea balance deficit is largely determined by climatological factors - in the 70s, the water content of the Amudarya and Syrdarya Rivers was 20-25% lower than a multiyear average and the total renewable water resources of the Aral Sea turned out to be 20-25 km³ / year less than before [Seversky I.V., 1999].

Water balance of the Aral Sea, km³/year

Period, years	Water Inflow		Evaporation water loss	Balance
	River flow	Precipitation		
1911-1960	56,0	9,1	66,1	-1,0
1961-1970	43,3	8,0	65,4	-14,1
1970-1980	16,7	6,3	55,2	-32,2
1981-1990	3,9	6,2	43,7	-33,6
1991-1994	21,0	4,6	33,6	-8,0
1995-2002	4,81	3,5	28,6	-20,29

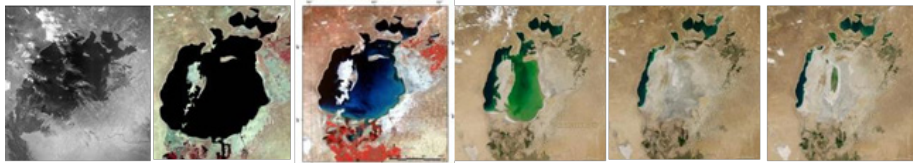


Figure 2.16. Images of the Aral Sea from space from 1964 to 2016 (<http://cawater-info.net>)

The Aral Sea was divided into North and South in 1989 as a result of a decrease in water level and the drying of the Berg Strait. By the end of the 1990s, the Large (Southern) Aral had turned into a hyper saline (salt) water body. Salinity in 1997 was 57‰ (ppt). In 1997, the reservoir was connected to the mainland of the Barsakelmes Island, in 2001 to the Vozrojdenie Island.

In 2003, the southern Aral Sea was divided into Eastern and Western parts, which are connected by the narrow Uzun-Aral Strait, located at an altitude of 29 m above sea level. This arrangement does not allow water to mix from two reservoirs. In 2004 from the Eastern part of the separated small lake, Toshibas that was previously the eponymous gulf of the Aral Sea. In 2005, the Small Aral Sea was fenced off from the Big Kokaral dam – in Kazakhstan. Both reservoirs were finally disconnected.

The Kokaral dam crossing the Berg Strait between the Northern Aral Sea (Small Sea) and the Southern Aral Sea (Large Sea) is designed to regulate the water level in the Small Sea. The length of the dam is 13 034 m, width - up to 100-150 m. The height of the dam crest — 6 m (45.5 m abs.), the filling of the Small Sea is expected to mark 42.2 m abs. On the dam constructed culvert with nine spillways with a capacity of 600 m³/s, designed to protect it from destruction by dumping excess water flowing through the Syrdarya to the southern Aral.



Photo 2.1. Kokaral dam with a regulatory structure (view from the south). Photo: IFAS in Kazakhstan

Today, the surface area of the Aral Sea remains is less than 10% of the 1960 level. The remaining part is distributed among three water bodies – the Western sea with an area of 3.27 thousand km², the Eastern sea with an area of 0.96 thousand km², and the Small (Northern) Aral with an area of 3.4 thousand km². Accordingly, the volume of water decreased by almost 40 times.

The Aral Sea at present

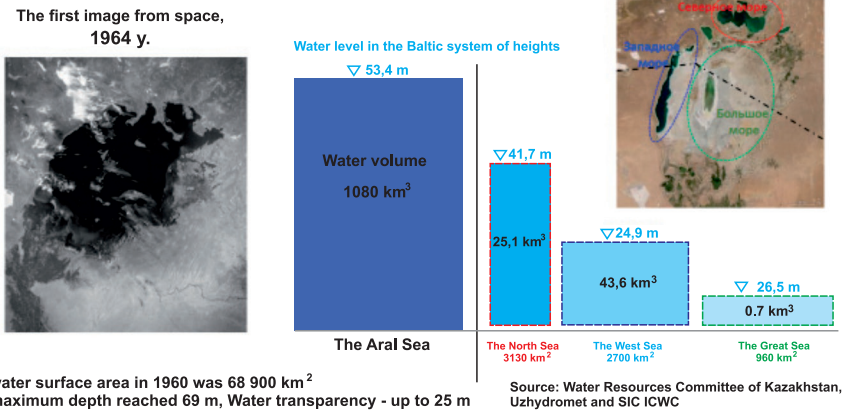


Figure 2. 17. Data on the volume and level of water in the Aral Sea

Against the background of global climate change, the disappearance of the Aral Sea has led to the fact that since the 1980s the rate of warming in the region of its basin exceeds the rate of global warming by more than 2 times. In general, it can be clearly

said that as a result of climate change in the region there are:

- Increasing the intensity of the dry hot period, which led to an increase in evaporation across the plains and foothills.
- High variability of precipitation with increasing number of days with heavy precipitation.
- Increased frequency of extreme events, drought and water scarcity.

Due to changes in the temperature regime, the structure of atmospheric moisture transfer over the territory of Central Asia has also changed. At the same time, precipitation began to fall mainly in the warm period of the year, which led to a reduction in the volume of mountain glaciers of the Pamir and Tien Shan (pace. 0.2-1% per year). There are trends in the reduction of snow reserves in the basins of Mountain Rivers in the region, which leads to a deterioration in the conditions of water supply to agriculture.

The results of Uzhymet forecasts show that by 2050 the volume of river flow in the Amudarya River Basin will be reduced by 10-15% and the Syrdarya – by 2-5%. The number of low-water years and the number of years with drought will increase with the loss of runoff up to 25-40%, which will cause a sharp increase in water demand and a tightening of water scarcity. This will require an increase in irrigation standards by 2030 by 5%, by 2050 by 7-10% and by 2080 by 12-16%. If the demand for water is not met, it can cause crop losses, which, in the context of demographic growth, will pose a serious risk to food security and hinder sustainable development.

The drying up of the Aral Sea caused desertification in the center of the great deserts of - Kyzylkum and Karakum, where another new desert – Aralkum was formed. The danger of this new desert is that the seabed, which was in its natural state a kind of “desalination plant”, now acts as an artificial “anthropogenic volcano”, throwing into the atmosphere huge masses of salts and fine dust. The effect of pollution is enhanced by the fact that the Aral Sea is located, as already noted, on the route of a powerful jet air flow from West to East. This contributes to the removal of aerosols in the high layers and their rapid spread in the Earth’s atmosphere.



Field surveys of the dried seabed show that among the soils there are the most widely developed tenardite loose sands (which are easily carried by the wind), which are formed during dehydration of the former bottom. They occupy about 250 km² of dry land (i.e. more than 50%). Observations have shown that 1.5-2 cm of this soil cover is deflated per year. At the same time, in place of blown-down loose sand, a new one appears, which is again carried by the wind into the atmosphere. In the photo (by V. Sokolov) a powder on the seabed covered with a saxaul is a zone of 50-70 km adjacent to the Muynak city.

In 2006, researchers of SIC ICWC developed the “Erosion risks map of the Aral Sea region”, according to which it was established that the total area with the high risk of environmental hazard was 785 thousand hectares of dried sea bottom in Uzbekistan (Fig. 2.18). By 2017, the total area of the sea drying zone increased by another 500 thousand hectares. It is impossible to protect areas of erosion risks with an area of more than 1.2 million hectares with technically accessible methods by Uzbekistan.

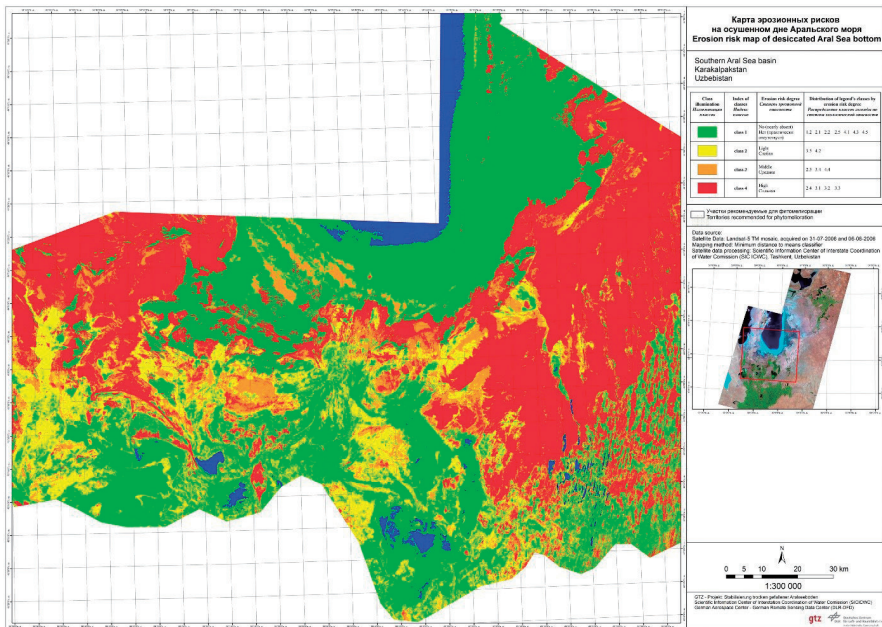


Fig. 2.18. Erosion risk map in the Southern Aral Sea (SIC ICWC, 2006).

The Aral Sea zone was distinguished by a unique diversity of the animal and plant world, only the number of saigas reached 1 million heads, the floristic composition was 638 species of higher plants. However, due to the disappearance of the sea and the degradation of its ecosystems, the number of plants growing here and the population of wild animals are rapidly decreasing. 12 species of mammals, 26 species of birds and 11 species of plants were on the verge of extinction.



Fig. 2.19. Degradation of the habitats of the fauna in the Aral Sea region

Until the 1960s, the Aral was the largest fishery reservoir in Central Asia with an annual catch of up to 40 thousand tons of fish (mainly carp, but also sturgeon). For comparison: all reservoirs of Uzbekistan (with the exception of fish ponds) produce about 8 thousand tons of fish annually. Since 1980, the Big Aral has completely lost its fishery importance.

As a result of the loss of sea transport value, the decline of fisheries, livestock and other types of farming, the reduction of pastures and the loss of land productivity, tens of thousands of people have lost their traditional sources of livelihood. According to SIC ICWC estimates, conducted in 2003, the total socio-economic losses from an environmental disaster in the Southern Aral Sea region amount to \$ 144.83 million per year, similarly in the Northern Aral Sea Region to \$ 47.96 million per year.



Fig. 2. 3. Photo of the Aral Sea from the international space station in July 2018

Pollution of water and a large amount of salt and dust removal from the bottom of the dried sea contribute to the growth of a number of somatic diseases among the Aral Sea population, such as anemia, kidney, blood, gastrointestinal, respiratory, cardiovascular, gallstone and other diseases. Children are especially affected by the dangerous environmental situation. The content of dioxin in the blood of pregnant women and the milk of nursing mothers in Karakalpakstan is 5 times higher than in Europe.

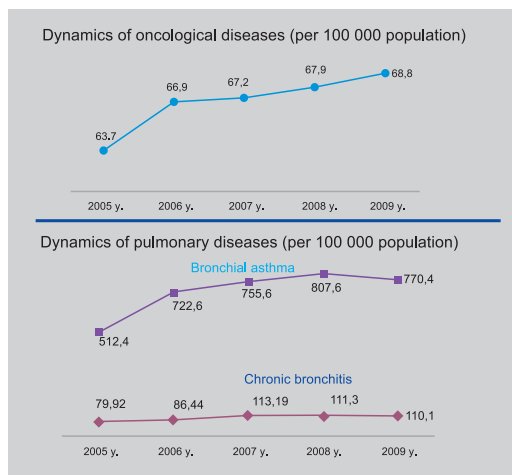


Figure 2.20. Dynamics of population morbidity in the Republic of Karakalpakstan

According to WHO experts, about 23% of all diseases and 25% of all cancer cases are due to environmental factors. The independent international humanitarian organization MSF (Médecins Sans Frontières - Doctors Without Borders) conducted a survey in 2001–2002 and revealed a high prevalence of multidrug-resistant tuberculosis in the Republic of Karakalpakstan (13% of new and 40% of repeated cases).



Fig. 2.4. Western Aral - March 2018 Photo: Sokolov V.



Fig. 2.5. West Aral, November 2018. Photo: Sokolov V.

THE RECOGNITION OF THE TRAGEDY OF THE ARAL SEA AS THE GLOBAL SCALE PROBLEM

Since the 1990s, Kazakhstan and Uzbekistan, as the most severely affected countries by the Aral Sea disaster, have been constantly drawing the attention of the world community to the Aral sea problem and its close relationship with regional and global security issues from the rostrum of the United Nations and other international and regional organizations.

In 1992, the President of Kazakhstan, Nazarbayev N., appealed to the leaders of the Central Asian countries: *“The environmental disaster caused by the death of the Aral Sea is planetary in nature, so Kazakhstan is taking the initiative to hold a conference of Heads of state interested in the elimination of the disaster.”*

On August 28, 1992, the International Scientific and Practical Conference on Aral and Aral Sea problems was held in Nukus, which adopted an Appeal to the Presidents, Parliaments and the Public of Central Asia and other CIS countries on the need to create an International Fund for Aral and to sign an Agreement on Aral Basin, legal and regulatory documents on water management.

On March 26, 1993, at the meeting of the Heads of Central Asian States in Kyzyl-Orda, the Heads of the Central Asian states adopted an Agreement on joint actions to solve the Aral Sea and Aral Region problems on ecological rehabilitation and socio-economic development of the Aral region and signed the Regulation on the International Fund for Saving the Aral Sea (IFAS), which was the date of establishment of IFAS. President of the Republic of Kazakhstan, Nazarbayev N., was elected as the President of IFAS.

On July 13, 1993, at the first meeting of the ICSA in Tashkent city, the Concept of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan was adopted to solve the problems of the Aral Sea and the Aral Sea Region, taking into account the

socio-economic development of the region (basic provisions). In this document, it was convincingly declared that “the restoration of the sea in full up to the 53 level (water level in 1960) requires the submission of 65 cubic meters annually of water without delta requirements to the Aral Sea. Hence the complexity of the implementation of such a proposal. But self-preservation of the sea is not getting rid of all the troubles that have already enveloped the environment, and the process of desertification is intensively continuing, alienating the sea from the settlements further and further, all the more damaging to the economy and aggravating the already difficult living conditions of the population.”



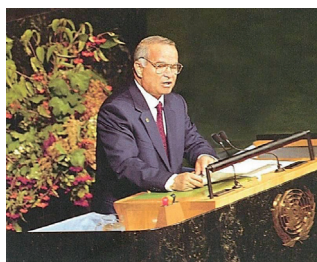
*UN Secretary-General, Ban Ki-moon
(April 4, 2010):*

“Having seen the consequences of the ecological crisis in the region, I was personally convinced of the complexity of the ecological situation in the Aral Sea region. This is a serious warning for all mankind. This global problem should be addressed jointly by all states in the region.”

Source: Agency of Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan

The most important task of the present time is to reduce the detrimental impact of the Aral crisis on the environment and the livelihoods of millions of people living in the Aral Sea region, including through deeply thought-out, targeted and secured projects with appropriate sources of funding.

At the 48th session of the UN General Assembly in New York on September 28, 1993, the First President of Uzbekistan, Karimov I. A., said: *“Given the truly global scale of the catastrophe, Uzbekistan would welcome the creation of a special UN Commission on the Aral, which, in coordination with the governments of the region and through the UN capabilities, would attract international efforts and funds to address this ecological catastrophe.”*



At the initiative of the First President of Uzbekistan, Karimov I., as an official document of the 68th session of the UN General Assembly in September 2013, the “Program of measures to eliminate the consequences of drying up the Aral Sea and preventing ecosystem disasters in the Aral Sea region” was distributed, which included the implementation of the following key measures:

1. Creating conditions for living, reproduction and preservation of the gene pool in the Aral Sea region.
2. Improving the management system and rational use of water resources. Maintenance of the system of natural water bodies in the water area of the Aral Sea.
3. Implementation of large-scale measures to plant forests on the dried bottom of the Aral Sea and prevent desertification in the region.
4. Conservation of biodiversity, restoration of biological resources, protection of flora and fauna.
5. Further improvement of the institutional framework and strengthening cooperation among the countries of the region within the framework of IFAS.

In April 2010, UN Secretary-General, Ban Ki-moon, accompanied by the Prime Minister of the Republic of Uzbekistan, familiarized himself with the environmental situation in the Aral Sea region.

In September 2015, the President of Kazakhstan, Nazarbayev N. spoke at the 70th session of the United Nations General Assembly on the adoption of the development agenda: *“The problems of the disappearing the Aral Sea pose a threat not only to our region, but to the whole world. As a result of its drying, the wind annually raises up to 75 million tons of dust and poisonous salt, which have already been found in Europe and Antarctica. With the support of the World Bank, we managed to restore the northern part of the Aral Sea. We are actively cooperating with the UN and the international community in the rehabilitation of the zone of the former Semipalatinsk nuclear testing area. The countries of Central Asia are awaiting assistance to combat these environmental problems in the region.”*



UN Secretary-General Antonio Guterres
(June 10, 2017):

“Let the Aral Sea be a symbol of the destruction of the planet by humanity, and let it be a lesson for all of us to mobilize the entire international community to implement the Paris Climate Agreement ... so that tragedies like the one I saw in Uzbekistan would not be repeated.”

In September 2015, the President of Kazakhstan, Nazarbayev N. spoke at the 70th session of the United Nations General Assembly on the adoption of the development agenda: *“The problems of the disappearing the Aral Sea pose a threat not only to our region, but to the whole world. As a result of its drying, the wind annually raises up to 75 million tons of dust and poisonous salt, which have already been found in*

Europe and Antarctica. With the support of the World Bank, we managed to restore the northern part of the Aral Sea. We are actively cooperating with the UN and the international community in the rehabilitation of the zone of the former Semipalatinsk nuclear testing area. The countries of Central Asia are awaiting assistance to combat these environmental problems in the region.”



On September 19, 2017, President of the Republic of Uzbekistan, Shavkat Mirziyoyev spoke at the 72nd session of the United Nations General Assembly: “In my hands is the map of the tragedy of Aral. I think comments are unnecessary.

Overcoming the consequences of the desiccation of the sea today requires active consolidation of international efforts.”

In June 2017, UN Secretary-General Antonio Guterres visited Karakalpakstan during his visit to Uzbekistan. On June 10, Guterres flew around the Aral Sea in a helicopter, and also visited Muynak, where he talked with local people.

On September 19, 2017, President of Uzbekistan, Shavkat Mirziyoyev spoke at the 72nd session of the UN General Assembly, describing key areas of domestic and foreign policy of Uzbekistan. Touching upon the complex and global topic of water resources, Shavkat Mirziyoyev once again emphasized the need for a compromise approach to this problem under the auspices of the UN, taking into account the interests of all countries in the region.

The President of Uzbekistan drew the attention of the world community to the tragedy of the Aral Sea, for clarity, showing the map of the dried sea. He urged to continue the program of assistance to residents of the region affected by this natural disaster, and together solve the emerging environmental problem.

2.10. INTERNATIONAL FUND FOR SAVING THE ARAL SEA



During the meeting of the President of Kazakhstan, Nursultan Nazarbayev and the President of Uzbekistan, Shavkat Mirziyoyev on March 23, 2017 in Astana, it was said: - *“once again we came to a common opinion that the International Fund for Saving the Aral Sea is a key platform that contributes to the solution of this problem and enhance collaboration amongst countries”*.

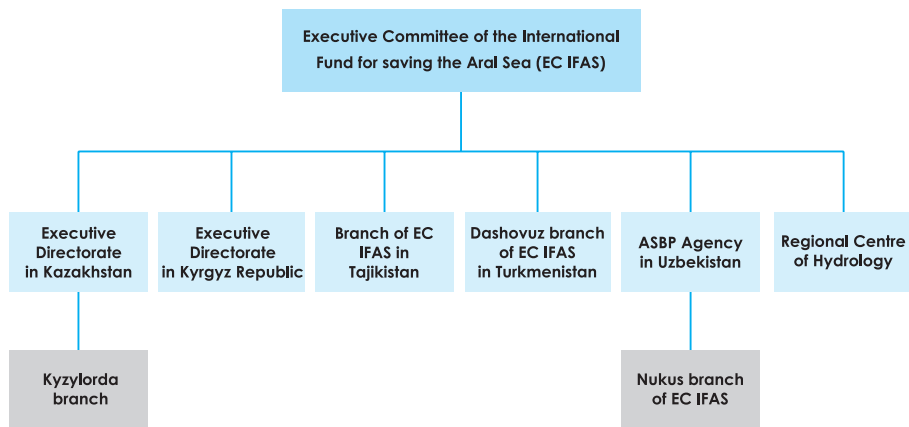
The President of the Republic of Uzbekistan, Shavkat Mirziyoyev and the President of Turkmenistan, Gurbanguly Berdimukhamedov noted at the meeting on March 6, 2017: *“There is a need to restore the ecosystem of the Aral Sea Basin, improve the socio - economic and environmental situation in the Aral Sea Region, and ensure the rational use of water resources and a high level of environmental protection in the region”*.



IFAS structure was approved on the basis of Agreement between the Republic of Kazakhstan, Kyrgyz Republic, Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan on the status of IFAS and its organizations in Ashgabat (signed on April 9, 1999).

IFAS consists of six main units (Figure 2.22):

- The Board of IFAS
- Audit Commission
- Executive Committee of IFAS (EC IFAS)
- Branches of the EC IFAS in the Central Asian States
- ICWC, ICWC Secretariat, Scientific-Information Center of ICWC (SIC ICWC), and two BWOs
- Interstate Commission on Sustainable Development (ICSD), its Secretariat, Scientific and Information Center at the Institute of Deserts of Turkmenistan (SIC ICSD).



EC IFAS location by countries and years



Figure. 2.21. The structure of the International Fund for Saving the Aral Sea

Council of Heads of State Founders of IFAS. The Council is the supreme body of IFAS, the Council meetings are held as agreed between the Heads of State.

The President of Fund. IFAS is headed by the President, elected alternately from among the Presidents of the Central Asian States for a term of 3 years. In the 25-year history of the Found, its Presidents were:

President of the Republic of Kazakhstan, Nazarbayev N. (1993-1996)

President of the Republic of Uzbekistan, Karimov I. (1997-1999)

President of Turkmenistan, Niyazov S. (1999–2001)

President of the Republic of Tajikistan, Rakhmonov E. (2002–2008), (the term is extended due to the refusal of the Kyrgyz Republic to accept the leadership in IFAS)

President of the Republic of Kazakhstan, Nazarbayev N. (2009-2012)

President of the Republic of Uzbekistan, Karimov I. (2013-2016)

Since 2017 President of Turkmenistan, Berdymukhamedov G.

Board of IFAS. The Fund is managed by the Board, which consists of Deputy Prime Ministers of the founding States. The Board of the Found meets at least twice a year. The founding States may propose additional meetings of the Board. The last Board

meetings were held in Ashgabat on January 30 and August 23, 2018. Deputy Prime, Minister Mirzayev Z. is the Board member from Uzbekistan.

Audit Commission. The Commission was charged with function of check of financial activity of the Fund. However, due to the fact that the Fund does not accumulate the total funds of the founding states, and each founding state finances its projects as its contribution to the activities of the Fund, to date, the Commission exists, but its meetings are not held.

Audit Commission is appointed by one representative from each founding state at the level of Deputy Ministers of Economy and Finance, responsible for budget contributions to the Fund. From Uzbekistan as a member of the Commission was appointed Deputy Finance Minister, Karimov A.

Executive Committee of IFAS - is a permanent body of the Fund and is developed by the decision of the President of the Fund. It is based on the basis of rotation in the country presiding in the Fund. The Executive Committee of IFAS consists of 10 members - two representatives from each founding state. The management of the Executive Committee is carried out by the Chairman, who is appointed by the President of the Found in consultation with the Heads of the Founding States of the Found.

Currently, the Chairman of the Executive Committee of IFAS is Guzgeldi Bayidjanov (previously held the position of the Minister of Water Resources of Turkmenistan). During the presidency of Turkmenistan in the Fund, Ilkhom Juraev was appointed as a member of the Executive Committee from Uzbekistan (previously held the position of Deputy Head of the “Uzvodremekspluatatsiya” Republican Association at the Ministry of Water Resources).

The provision on the Executive Committee of IFAS is approved by the decision of the President of the Found. The main tasks of the Executive Committee of IFAS are:

- practical implementation of the decisions of the Heads of the States
- implementation of relevant projects and programs in the Aral sea basin
- coordination of activities of branches located in the founding states to promote activities of ICWC and ICSD
- cooperation with international organizations, donor countries, environmental and other funds to enhance activities on combating environmental issues
- fundraising and project and program management
- preparation of documents and Board meetings of IFAS, as well as conferences and meetings of Heads of the States on the Aral Sea issues.

The Executive Directorate of the International Fund for Saving the Aral Sea in the Republic of Kazakhstan is an international organization with the main goal of solving the problems of the basin of the Aral Sea and Aral Sea region at Kazakhstan part to improve the livelihood of people living in the Aral Sea region by

improving environmental and social conditions. The Executive Directorate of IFAS in the Republic of Kazakhstan promotes the implementation of projects in water, environmental and socio-economic areas.

GEF IFAS Agency is a structural unit and a working body of the International Fund for the Aral Saving. In its activities, it is guided by the Regulations of 2016, the Regulations on the Executive Committee of IFAS, approved by the President of the Foundation, Decisions of the President of the Foundation, Decisions of the Board of the Foundation, orders and instructions of the Executive Committee of IFAS, and the legislation of the Republic of Uzbekistan.

The GEF IFSA Agency is accredited by the Ministry of Foreign Affairs of the Republic of Uzbekistan as a representative office of the international intergovernmental organization of the Executive Committee of IFAS.

GEF IFAS Agency provides project management in the Aral Sea Basin, implemented through various sources of funding and contributions for these purposes, including those allocated from the budget of the Republic of Uzbekistan (as a contribution of the Republic of Uzbekistan to IFAS).

Interstate Commission for Water Coordination (ICWC) was established in accordance with the Agreement “On cooperation in joint management, regulation, use and protection of interstate water sources” of February 18, 1992. For more details on the ICWC and its activities, see Section 4.9. The executive bodies of the ICWC are the Basin Water Organization (BWO) “Syrdarya” (Tashkent) and “Amudarya” (Urgench), the Secretariat of the ICWC (Dushanbe), the Scientific Information Center ICWC (Tashkent) and the Coordination Metrological Center (Bishkek).

The Interstate Commission for Sustainable Development (ICSD) was established in accordance with the “Agreement on joint actions to solve the problem of the Aral Sea and the Aral Sea region, and on ecological rehabilitation and ensuring the socio-economic development of the Aral region” of March 26, 1993, Kzyl-Orda.

The main goal of the Commission is to develop proposals for the improvement and socio-economic development of the Aral region, social protection of the population living in the region, organization of research and development work, ensure environmental cooperation between the Central Asian countries. The Commission consists of 15 members - 3 from each Central Asian country (Ministers of Environmental Protection, Deputy Ministers of Economy, representatives of science and other industries), appointed by the governments of the countries. The chairmanship is executed by the Ministers of Environmental Protection on a rotational basis for 2 years.

Regional Center of Hydrology - goals and objectives:

- Developing solutions for the Board of IFAS regarding the Aral Sea Basin issues
- Improving the system of hydrological forecasting and data exchange between

- National Hydrometeorological Services and strengthening regional cooperation
- Implementation of measures to create a network on hydrometeorological monitoring (stations, posts)
 - Expansion of interaction with international organizations, donor countries and other funds.

Table 2.16. Chronology of key activities and events of IFAS, as well as meetings of the Heads of Founding States

Date	Venue	Event	Documents Accepted
1988	Moscow (USSR)	Resolution of the Central Committee of the CPSU and the Council of the Ministers of the USSR "On measures to fundamentally improve the ecological and sanitary situation in the Aral Sea region, increase the efficiency of use and enhance the protection of water and land resources in its basin"	The report of the Government Commission on "The current state and proposals for a radical improvement of the ecological and sanitary-epidemiological situation in the Aral Sea region and the lower reaches of the Amudarya and Syrdarya rivers" was prepared.
10.08.1992	Almaty (Kazakhstan)	President of the Republic of Kazakhstan N.Nazarbayev received the Secretary General of the International Red Cross and Red Crescent Society, M. Stenbek	The environmental disaster caused by the drying up of the Aral Sea is planetary in nature, so Kazakhstan has taken the initiative to hold a conference of Heads of state interested in the elimination of the disaster»
28.08.1992	Nukus (Uzbekistan)	International scientific-practical conference on problems of Aral Sea and Aral Sea region (Priaralye).	Appeal to the Presidents, parliaments and public of the Central Asian States and other CIS countries on the need to establish an International Fund for combating the Aral Sea problems and sign an agreement on the Aral Sea basin, legal and regulatory documents on water resources management
04.01.1993	Tashkent (Uzbekistan)	The meeting of the Heads of State: President of the Republic of Kazakhstan N.A. Nazarbayev, President of the Republic of Kyrgyzstan A.Akaev, Chairman of the Supreme Council of the Republic of Tajikistan E.Sh.Rakhmonov, President of Turkmenistan S.A.Niyozov, President of the Republic of Uzbekistan I.A. Karimov	Joint Communique of the Heads of State of Central Asia - The decision to establish the International Fund for the Aral Sea
26.03.1993	Kyzylorda (Kazakhstan)	Meeting of the Heads of Central Asian States	The Interstate Council on the Aral Sea Basin Problems (IASA) was established, consisting of 25 people (five from each state). IASA has created a permanent working body - the Executive Committee (EC IASA), located in Tashkent. In addition, the Commission on Sustainable Development (CSD) and the Interstate Commission for Water Coordination (ICWC) were formed under the ICAS The Regulations on the International Fund for Saving the Aral Sea (IFAS) were approved, the Foundation Board was established consisting of 10 people (2 from each state) and the President of the Foundation, Nazarbayev N.A. Agreement on joint actions to solve the problems of the Aral Sea and the development of the Aral region was adopted
19.04.1993	Almaty (Kazakhstan)	Decision of the Board of IFAS	Executive Directorate of IFAS was established in Almaty

13.07.1993	Tashkent (Uzbekistan)	The first working meeting of ICAS	<p>The structure and the Regulations on the Executive Committee of the ICAS were approved</p> <p>“The main provisions of the concept of the states of Central Asia to address the problems of the Aral Sea and the Aral Sea Basin taking into account the socio-economic development of the region” were approved</p>
11.01.1994	Nukus (Uzbekistan)	-The Second Session of ICAS and the Meeting of Presidents of Central Asian States	<p>The “Program of specific actions to improve the environmental situation in the Aral Sea basin for the next 3-5 years was approved, taking into account the socio-economic development of the region” (ASBP-1)</p> <p>The Regulation on the Interstate Council on the Aral Sea Basin Problems was approved.</p> <p>Ilamanov A. - Minister of Land Reclamation and Water Management of Turkmenistan was appointed to be the Chairman of the Executive Committee of the ICASA in combination for one year</p> <p>Bobko Yu. V. was appointed to be the First Deputy Chairman of the Executive Committee of the ICASA - Technical Director (on a permanent basis)</p> <p>The issue of forming capitals of the International Fund for Saving the Aral Sea was discussed.</p>
18.07.1994	Ashgabat (Turkmenistan)	Third meeting of ICAS	<p>The terms of reference for the “Program of specific actions” (ASBP-1) were approved for funding from donor funds</p> <p>The Regulation on the Commission on sustainable development (CSD) was approved.</p>
3.03.1995	Dashhovich (Turkmenistan)	The fourth meeting of the ICAS and the next meeting of the Presidents of Central Asian States on the Aral problems	<p>The Joint Statement of the Presidents of the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan was adopted.</p> <p>It was decided to conduct the International Conference on the Aral Sea problems with the support of the UN on September 18-20, 1995 in Nukus.</p> <p>Rajapov M.R., Deputy Chairman of the Cabinet of Ministers of Turkmenistan was appointed to be the Chairman of the EC ICASA for part-time for a period of one year.</p>
20.09.1995	Nukus (Uzbekistan)	United Nations International Conference on Sustainable Development of the Aral Sea Basin States with the participation of the Heads of Central Asian States	<p>Nukus Declaration of Central Asian States and International Organizations on the Sustainable Development of the Aral Sea Basin</p>

19.04.1996	Kyzylorda (Kazakhstan)	Fifth Meeting of ICAS	<p>The draft Agreement between the Governments of the Central Asian states “On the status of the ICAS, IFAS and their organizations” was approved. This project was then sent to the parliaments of the countries for consideration by the relevant commissions for subsequent signing by the Governments of the Central Asian states</p> <p>The draft of the International Convention on the Sustainable Development of the Aral Sea Basin was reviewed.</p>
28.02.1997	Almaty (Kazakhstan)	Meeting of the Heads of Central Asian States on the Aral Sea Basin problems	<p>It was decided to reorganize the structure of the IFAS</p> <p>It was decided to elect the President of the Republic of Uzbekistan, I.A. Karimov as the President of IFAS.</p> <p>R.A. Gimiyatullin was appointed as the Chairman of the Executive Committee of IFAS</p> <p>Almaty Declaration - it was decided to develop a comprehensive program on environmental safety, which will be including the problems of the Aral Sea, the creation of a nuclear-free zone in Central Asia and the fight against the leakage of nuclear technologies and raw materials</p>
26.01.1998	Tashkent (Uzbekistan)	Decision of the President of IFAS - President of the Republic of Uzbekistan	<p>The Agency for the Management of the Implementation of the Aral Sea Basin Projects and the GEF (Agency GEF IFSA) was established in Tashkent</p>
09.04.1999	Ashgabat (Turkmenistan)	Meeting of the Heads of Central Asian States on the Aral Sea Basin problems	<p>It was decided to appoint S.A. Niyazov, President of Turkmenistan, to be the President of IFAS.</p> <p>T. Altyev was appointed to be the Chairman of the Executive Committee of IFAS</p> <p>The Agreement between the Governments of Central Asian States on the Status of IFAS and its Organization was approved.</p> <p>Ashgabat Declaration</p>
28.12.2001	Tashkent (Uzbekistan)	Meeting of the Heads of Central Asian States on the Aral Sea Basin problems	<p>Tashkent Statement of the Heads of Central Asian States</p>
28.02.2002	Almaty city (Kazakhstan)	Meeting of the Heads of Central Asian States on the Aral Sea Basin problems	<p>Decision to appoint the President of the Republic of Tajikistan to be the President of IFAS F. Sh. Rakhimov</p> <p>S.M. Aslov was appointed to be the Chairman of the Executive Committee of IFAS</p>

06.10.2002	Dushanbe (Tajikistan)	Meeting of the Heads of Central Asian States on the Aral Sea Basin problems	The decision on approval of the main directions of the "Program of specific actions to improve the ecological and socio-economic situation in the Aral Sea basin for the period 2003-20010. (ASBP-2) » Decision on the terms of office of the President of IFAS Dushanbe Declaration
25.08.2008	Tashkent city (Uzbekistan)	The decision of the Heads of State-Founders of IFAS «On the election of the President of the International Fund for the Aral Saving»	The President of the Republic of Kazakhstan Nursultan Nazarbayev was elected as the President of IFAS
17.10.2008	Almaty city (Kazakhstan)	The decision of the President of IFAS, the President of the Republic of Kazakhstan N. Nazarbayev	Sagit Ibatullin was appointed to be the Chairman of the Executive Committee of IFAS
11.12.2008	NY (USA)	63rd session of the UN General Assembly	UN Resolution on granting IFAS observer status in the UN General Assembly was adopted.
28.04.2009	Almaty city (Kazakhstan)	Summit of Heads of State Founders of IFAS	Joint Statement by the Heads of State of Central Asia - A decision to develop an Action Program to assist the countries of the Aral Sea basin for the period 2011-2015 (ASBP-3) was approved
4.04.2010	Muynak (Uzbekistan)	UN Secretary-General Ban Ki-moon visits the Aral crisis zone	Seeing the consequences of the ecological crisis in the region, I saw the complexity of the ecological situation in the Aral Sea region. This is a serious warning to all mankind. This global problem should be solved jointly by all States of the region».
31.07.2013	Almaty (Kazakhstan)	Decision of the Heads of the Founding States of IFAS "On the Election of the President of the International Fund for Saving the Aral"	The chairmanship of the Fund was passed to Uzbekistan - the President of the Republic of Uzbekistan Islam Karimov was appointed as the President of IFAS
2.08.2013	Tashkent (Uzbekistan)	Decision of the President of IFAS - President of the Republic of Uzbekistan I.Karimov	Appoint Deputy Minister of Agriculture and Water Management of Uzbekistan Shavkat Khamrayev as Acting Chairman of the Executive Committee of IFAS
16.09.2013	NY (USA)	68th session of the UN General Assembly	Proposal on "The program of measures to eliminate the consequences of drying up the Aral Sea and preventing the catastrophe of ecosystems in the Aral Sea region" was distributed as an official document of the 68th session of the UN General Assembly - under the initiative of the President of the Republic of Uzbekistan I.A. Karimov, current President of IFAS
28-29.10.2014	Urgench (Uzbekistan)	International Conference on «Development of Cooperation in the Aral Sea Basin Region on Mitigating the Impacts of an Environmental Catastrophe»	Final document

1.08.2016	Tashkent (Uzbekistan)	Decision of the Heads of the Founding States of IFAS "On the Election of the President of the International Fund for Saving the Aral"	The chairmanship of the Fund was transferred to Turkmenistan – the President of Turkmenistan Gurbanguly Berdimuhamedov was appointed as the President of IFAS
10.06.2017	Muynak (Uzbekistan)	UN Secretary-General Antonio Guterres visits the Aral crisis zone	«Let the Aral Sea be a symbol of the destruction of the planet by humanity, and let it be a lesson for all of us to mobilize the entire international community in the implementation of the Paris climate agreement. so that tragedies like the one I saw in Uzbekistan did not repeat»
18.06.2017	Ashgabat (Turkmenistan)	Decision of the President of the International Fund for Saving the Aral Sea - President of Turkmenistan Gurbanguly Berdimuhamedov	Guizgeldy Bajjanov was appointed as the Chairman of the Executive Committee of IFAS
19.09.2017	NY (USA)	72nd Session of the United Nations General Assembly	President of the Republic of Uzbekistan Sh. Mirziyoyev: "In my hands is the map of the tragedy of Aral. I think comments are unnecessary. Overcoming the consequences of the drying up of the sea today requires active consolidation of international efforts."
7-8.06.2018	Tashkent Muynak (Uzbekistan)	International Conference «Joint actions to mitigate the effects of the Aral disaster: new approaches, innovative solutions, investments»	Tashkent Resolution
24.08.2018	Turkmenbashi (Turkmenistan)	Summit of Heads of State Founders of IFAS	- Joint Communiqué - Draft concept of ASBP-4 - Draft concept of a special UN program for Aral

During the existence of the IFAS (see the chronology in Table 2.16), three programs have been implemented to solve the problems of the Aral.

THE FIRST PROGRAM OF THE ARAL SEA BASIN (ASBP-1)

The ASBP-1 was implemented under the auspices of the International Fund for Saving the Aral Sea established in 1993 from 1995 to 2003. Nine programs were implemented during the first stage of the ASBP-1 with technical and financial assistance from the World Bank:

1. Regional Water Management Strategy
2. Improving the efficiency of water resources management and ensuring the stability of dams and reservoirs
3. Hydrometeorological services and regional environmental information system
4. Water Quality Management, Drainage Program in Uzbekistan
5. Restoration of wetlands and flow regulation of the Amudarya and Syrdarya
6. Clean water and health
7. Management of the upper catchment
8. Automatization of water infrastructure
9. Capacity building.

The total cost of these programs was \$ 60.8 million, of which only \$ 22.25 million was attracted and implemented with the assistance of the World Bank.

Table: Progress in the implementation of the ASBP-1, in mln.USD (World Bank, 1997)

The name of the program	Total estimated cost	Actually distributed	Allocated	Results
1.1. Regional Water Management Strategy	8,000	1,745	1,445	The main provisions of the regional strategy and WARMIS
1.2. Improving the efficiency of water resources management; 1.3. Ensuring the sustainability of dams and reservoirs	2,000	0,300	-	Development proposals
2. Hydrometeorological services and Regional Environmental Information System	3,000	-	-	Development proposals
3.1. Water Quality Management	7,500	0,675	0,675	Remote sensing technology
3.2. Drainage program in Uzbekistan	5,000	1,750	1,750	Development proposals
4. Restoration of wetlands and runoff regulation of the Syrdarya	6,700	3480	1640	Feasibility Study for Sudochie Lake Similar for the North Sea

5. Clean Water and Health	13,000	5940	2930	Water supply system project in Nukus, Dashkhovuz, Kzyl-Orda
6. Management of the upper water collection	3,000	0,600	0,500	Development proposals
7. Automatization of water infrastructure	1,500	0,300	0,100	Preliminary feasibility study of automation systems
8. Capacity Development	9,100	5,700	5,700	
Total	60,800	22,250	16,780	

The project on water resources and environment management, which was implemented with funding from the Global Environment Facility (GEF), the Governments of the Netherlands and Sweden was implemented in 1998-2003 as the second stage of the ASBP-1. The total budget of the project was 21.5 million US dollars, including 4.1 million dollars - financing of the countries of Central Asia. The project implemented six components:

Component A on *“Water Management and the Control of Soil Salinization and Mineralization of Water Resources”*. The component’s objective is to develop regional and national scenarios and strategies for sustainable water resources management and their distribution, taking into account environmental needs in the Syrdarya and Amudarya River Basins and to assist decision makers in five countries to prepare medium and long-term water management agreements on water management.

Component B on *“Informing the public”*. The purpose of the component is to assist in the development of public awareness, understanding of the need to conserve water, and foster a careful attitude towards water resources, which contributes to changing the attitude to water among consumers.

Component C on *“Dam and reservoir safety management”*. The component’s objective is to assess dam safety in the region; upgrading monitoring and warning systems at individual dams based on pilot projects; and preparation of projects for the development of urgent measures to restore dams.

Component D on *“Transboundary Water Monitoring”*. The goal of the component is to build monitoring capacity using independent structures of qualitative and quantitative parameters of river flow at 37 transboundary water gauging stations.

Component E on *“Restoration of wetlands”*. The purpose of the component is the restoration of the wetlands of Sudochie Lake, which is a nesting site for endangered species of migratory birds in the southern Aral Sea region.

Component F on *“Project Management Support”*

The implementation of the Water and Environmental Management Project was completed on October 31, 2003 by decision of the Board of the IFAS.

A large-scale project “Regulation of the Syrdarya riverbed and preservation of the northern part of the Aral Sea” (PRRSAM-1) was implemented in the Kazakh part of the Aral Sea region within the framework of the Aral Sea Basin Program (ASBP-1). The beginning of the project is November 2002. The World Bank borrowed funds in the amount of \$ 64.5 million and \$ 21.29 million were co-financed from the state budget. As a result of the implementation of the project RRSSAM-1 the followings were achieved:

1. The water-carrying capacity of the Syrdarya River increased from 350 to 700 m³/s;
2. Preservation of the northern part of the Aral Sea as a geographical and climate-forming object:

- The dried bottom of the sea was covered with a mirror of water of 870 km². (from 2 414 km² to 3288 km²);
- The volume of water in the sea increased by 11.5 km³ (from 15.6 km³ to 27.1 km³);
- Water salinity decreased from 23 to 17 g / l.

3. Improved water supply of irrigation and lake systems.

4. Safety of operation of the Shardarya Dam and stabilization of the operating mode of the Shardarya Hydroelectric Station (increased electricity generation in the winter);
5. Improved the ecological and socio-economic situation of the region and the population of the Aral Sea region:

- Development of local fish species has increased and favorable conditions have been created for sturgeon breeding;
- The volume of fish catch increased from 0.4 to 6.0 thousand tons and in the future it is expected to increase the fish catch to 11.0 thousand tons;

6. Reliability of existing facilities on the river, increased life of their operation, improved performance characteristics of waterworks;

7. The biodiversity of the Kazakh part of the Aral Sea region has been restored.

THE SECOND PROGRAM (ASBP-2)

ASBP-2 was developed in accordance with the Decision of the Heads of State adopted in Dushanbe on October 6, 2002. The implementation period was 2002-2010. The total cost of program was 1 993.9 million US dollars. The program itself was approved by the Board of IFAS on August 28, 2003. The program included the following fourteen priorities:

1. Development of coordinated mechanisms for the integrated management of water resources of the Aral Sea Basin

2. Rehabilitation of water facilities and improved use of water and land resources
3. Improving environmental monitoring systems
4. Disaster Management Program
5. Program of assistance in solving social problems of the region
6. Strengthening the material, technical and legal base of intergovernmental organizations
7. Development and implementation of regional and national environmental programs in the area of flow formation
8. Development and implementation of regional and national programs for the rational use of water in the sectors of the economy of the countries of Central Asia
9. Development and implementation of an international program of sanitary and environmental rehabilitation of human settlements and natural ecosystems of the Aral Sea region
10. Development of an international program for the restoration of environmental sustainability and biological productivity
11. The concept of sustainable development of the Aral Sea basin
12. Regional Action Program to Combat Desertification
13. Development of wetlands in the lower reaches of the Amudarya and Syrdarya rivers
14. Rationalization of the use of saline drainage water.

According to EC IFAS (Tajikistan), the program was implemented only partially, mainly by the countries themselves, for a total funding of about \$ 50 million.

Republic of Kazakhstan: The Executive Board of the International Fund for saving the Aral Sea in the Republic of Kazakhstan (IFAS) received the budget in the amount of 687.95 million tenge (about 4.9 million US dollars). These funds are mainly aimed at solving the priority environmental and social problems of the Aral and Kazaly districts of the Kyzylorda region. In 2002-2007, totally 51 projects were implemented in the region.

Kyrgyz Republic: The Executive Directorate of IFAS in the Kyrgyz Republic received a total of 8.3 million soms from 2002 to 2007 (230 thousand US dollars).

Republic of Tajikistan: The Executive Committee of IFAS and its branch in the Republic of Tajikistan allocated 2,272.30 thousand somoni in 2002 – 2007 (1.22 million US dollars), which were used to organize nine meetings of the IFAS Board, four donor meetings, the contents of the staff of the Executive Committee of IFAS, means of communication, e-mail, Internet, housing stock of members of the Executive Committee of IFAS, vehicles, publishing, public awareness, implementation of projects and programs for water supply, repair of water facilities, cleaning i.e. drainage network and charity purposes. Grant funds in the amount of \$ 182 thousand from the WB, ADB, UNESCO, WMO, JNR LTD companies, were spent to organize the activities of the Executive Committee of IFAS.

Turkmenistan: The Dashoguz branch of the Executive Committee of IFAS received funds from the state budget in the amount of 52793.83 million manats in 2002 - 2007

(10.15 million US dollars), which were used to maintain its staff and implement programs and projects of a socio-economic and environmental nature in the Turkmen part of the Aral Sea region.

Republic of Uzbekistan: The Nukus branch of the Executive Committee of IFAS received funds from the state budget in the amount of 15.57 million US dollars in 2002-2007 for its maintenance and implementation of programs and projects on water management, socio-economic and environmental issues in the Uzbek part of the Aral Sea region. One of the largest projects in Uzbekistan under this program was launched on the basis of the Order of the Cabinet of Ministers of the Republic of Uzbekistan No. 03 / 105-406 of April 10, 2002. In 2003, UzGIP LLC developed a “feasibility study for the creation of small local reservoirs in the Amudarya delta”. Within the framework of phase 1 of the project, the construction of the main facilities along the Mejdurechensk, Muynak, Rybachye reservoirs and the Djiltyrbas reservoir was ensured. Implementation of these works in 2004-2008 allowed to ensure the filling of the Mejdurechensk reservoir to 200 million m³, the Djiltyrbas reservoir - to 161 million m³, to improve the water supply to the Muynak and Rybachye reservoirs.

From 2000 to 2012, totally 11399.1 million soums (6.1 million US dollars) were allocated and spent from the state budget of Uzbekistan for the implementation of the project.

Executive Committee IFAS in Tajikistan attracted \$ 6.8 million for the implementation of projects and programs during 2003-2008. These projects were aimed at supporting water resources management at the regional level, increasing the capacity of basin organizations for their effective management. A Regional Center for Hydrology has been established to improve the forecasting system and data exchange between the countries of the region. A model law on the safety of hydraulic structures and a draft regional agreement on the safety of hydraulic structures has been developed.

THIRD PROGRAM OF THE ARAL SEA BASIN (ASBP-3)

On April 28, 2009, the Heads of Central Asian states made a joint statement, emphasizing the important role of IFAS in coordinating and addressing the fundamental aspects of cooperation to overcome the crisis of the Aral Sea Basin and strengthen cooperation with UN agencies and other international organizations. It was also decided to entrust the Executive Committee of IFAS together with the Interstate Coordination Water Commission, the Interstate Commission for Sustainable Development IFAS with the involvement of national experts and donors to develop an **Action Program for the period 2011-2015 (ASBP-3)**.

ASBP-3 was adopted on the basis of the decision of the Board of IFAS (December 10, 2010, in Almaty). The ASBP-3 included the implementation of about 300 national and regional projects for the amount of more than 15.0 billion US dollars.

As a contribution to this program, in accordance with the Order of the Cabinet of

Ministers of Uzbekistan No. 285-f of May 14, 2013, construction and reconstruction of the facilities of Phase II of the project “Creating small local water bodies in the Amudarya delta” were carried out:

1. Completion of the restoration and reconstruction of the Northern Dam.
2. Completion of the reconstruction of the Eastern Dam of the Mejdurechensk reservoir, taking into account measures to ensure the carrying capacity of 11 procopies.
3. Reconstruction of the Muynak canal (“Glavmyaso”) at a flow rate of 44 m³/s.

During the period of 2013-2015, a total of 13,629.73 million soums (**5.4 million US dollars**) were allocated and spent from the state budget of Uzbekistan for the implementation of the project.

In the framework of the “Comprehensive program to mitigate the consequences of the Aral catastrophe, rehabilitation and socio-economic development of the Aral Sea region for 2015-2018,” approved by Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 255 of August 29, 2015, totally 18.728.825 million soums (**4.4 million US dollars**) were allocated and implemented for the implementation of the project in 2016-2018.

In recent years, an intensive canyon formation process has been observed in the Amudarya delta. The reason is a decrease in the water level in the Aral Sea and the nature of the water supply along the Amudarya, when long periods with almost no water in the delta are interrupted by the flow of water up to 2,800 m³/s. The most dangerous of the canyons formed at present has approached the site of the destroyed bridge on the R-175 highway at a distance of about 2 km from the dams of the Mejdurechensk reservoir. To prevent further development of canyons in this direction, it is planned to cut off the channel of the canyon with a dam-road along Maypost and to build a drainage structure (water spillway) from the Maypost Lake directly into the channel of the Amudarya River (Akdarya).

To implement the measures within the framework of the project, the Decree of the President of the Republic of Uzbekistan No. 3874 of 07/19/2018 was adopted and work is being carried out on “Reconstruction of the dam-road along the Maypost Lake with the installation of a spillway structure in the Amudarya River (Akdarya) with measures to prevent the development of canyon-forming processes in the Domalak Lake. The total cost of these activity is 50.0 billion soums (6.1 million US dollars). According to the contract agreement between the Nukus branch of the EC-IFAS and the “Kuprikkurilish” Trust Unitary Enterprise, at present, work on the site is being carried out in 2 sites of the dam-road. Work on the spillway will be started in 2019.

In general, Uzbekistan consistently makes a significant contribution to IFAS. Thus, Decree of the Cabinet of Ministers of the Republic of Uzbekistan No. 255 of August 29, 2015 is currently being implemented (as a contribution to ASBP-3) as the “Comprehensive program to mitigate the consequences of the Aral disaster, rehabilitation and socio-economic development of the Aral Sea region for 2015-

2018”. The program includes 235 projects with the total budget of \$ 1920.8 million, of which \$ 736.4 million is the contribution of Uzbekistan from the state budget and \$ 1184.4 million - loans from international financial agencies. Under this program, a number of projects are being implemented in the following areas:

- Improving the management and rational use of water resources.
- Implementation of large-scale measures to plant forests on the dried bottom of the Aral Sea and prevent desertification in the region.
- Creating conditions for living, reproduction and preservation of the gene pool in the Aral Sea region.
- Conservation of biodiversity, restoration of biological resources, protection of flora and fauna.
- Improving institutional mechanisms

Partners in Kazakhstan also work within the ASBP-3 in a number of areas. Thus, the President of Kazakhstan in 2016 approved the “Road Map for the Development of the Aral Region’s Economic Sectors for 2017-2019”. It includes 84 projects for 114 billion tenge. Of these, 39 projects with budget of 11.4 billion tenge were implemented in 2017, 12 projects with budget of 6.1 billion tenge are transitional and planned to be completed in 2018. A total of 201 projects are planned for 2018 for 29.4 billion tenge. It is expected that 29 projects will be completed by the end of 2018. Eight projects are transitional, including the construction of a plant for the production of soda ash. The volume of investments attracted by the Aral region in 2017 exceeded the previous year’s figure and amounted to 158.3%. Half of all investments were made in rural areas and were aimed at the development of industry, transport, education and health care.

The volume of products produced by industrial enterprises of the region amounted to 102% of the previous year. In particular, 541 thousand tons of salt, 206.4 thousand tons of iodized salt, 2.9 thousand tons of fish, 163 tons of meat, 644 tons of bread and bakery products, as well as 135.4 thousand tons of quartz sand were produced.

The second direction in Kazakhstan is the implementation of the project on “Regulation of the channel of the Syrdarya River and the northern part of the Aral Sea” (RRSSAM-2).

In 2018, the second phase of the project was launched. The development of the second phase of RRSSAM was supported by the World Bank, which, together with the Government of the Republic of Kazakhstan, provided funds for preparatory work within the project. Eight components of the RRSSAM-2 were proposed after a full analysis of the state of the main waterway of the region - the Syrdarya River, water protection facilities, the ecological situation of the region.

These include restoration of the left-bank channel regulator of the Kyzylorda hydroelectric complex, straightening of the Syrdarya riverbed at two sites, construction of protective dams in two regions of the region, one road bridge, restoration of the

Kamyshlybash and Akshatau lake systems in the Aral region. Further, according to the plan, the reconstruction and expansion of nursery ponds in the Tastak district of the Kamyshlybash hatchery and the continuation of the reconstruction of the northern part of the Aral Sea are planned. The creation of a working center for water resources management in the Kazakhstan part of the Syrdarya River Basin is also planned.

At the first stage, four components will be implemented at 9.5 billion tenge from the republican budget. These are the most significant areas of work, as they are related to the safety of citizens during the flood period. For example, these are straightening the bed of the Syrdarya River in the Korgansha and Turumbet sites, the construction of protective dams in Kazaly and Karmakshy districts, and a road bridge near the village of Birlik.

The World Bank specialists will visit the region and study the extent of the need to implement other components of RRSSAM-2, and, perhaps, Kazakhstan will also receive support from this international financial institution - already within the framework of the ASBM-4.

The third direction is the contribution of the Republic of Kazakhstan to IFAS through the implementation of the portfolio of projects of the Executive Directorate of IFAS. The total amount of the project portfolio - a total of 32 projects - is about \$ 100 million.

Unfortunately, until today there is no in-depth analysis of the results of the three programs (ASBP) within the framework of IFAS. However, we can say that over the past 25 years, the provisions of the Concept to solve the problems of the Aral Sea of 1993 have practically become obsolete. Much has been done by countries to mitigate the consequences of the Aral Sea disaster, the socio-economic conditions in the countries of the region have changed, and the water situation in the region has changed dramatically. In the Aral Basin, as elsewhere in the world, the effects of climate change are observed. Many other factors also indicate that it is time to change practices for development of ecosystem resilience with economic growth.

One of the most important projects in the Program is the project on “Creating small local reservoirs in the Amudarya delta - Phase 2”. The total cost of the project is over 440 billion soums (about 60 million US dollars).

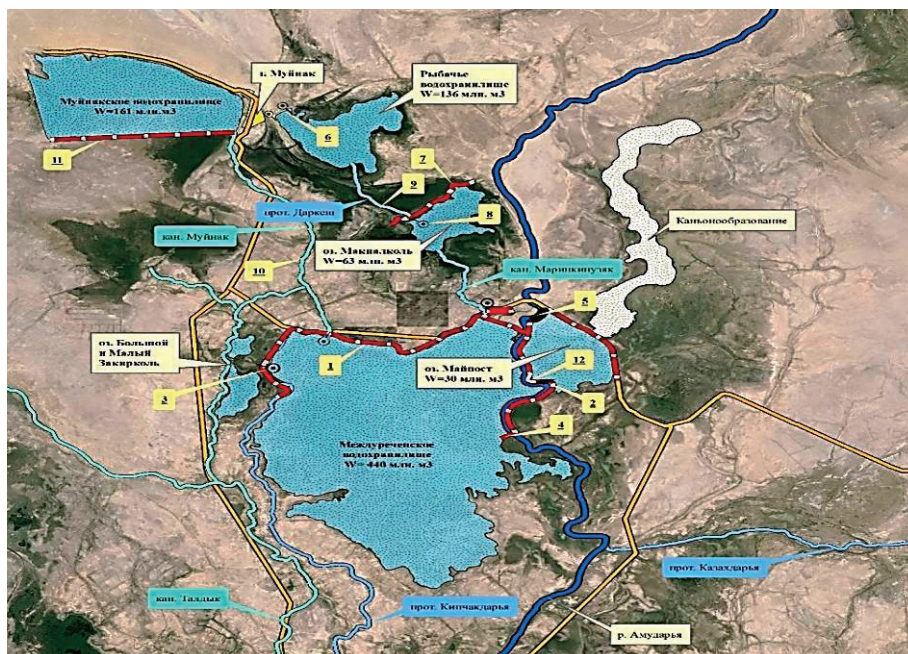


Fig. 2.22. The layout of the objects of the project “Creating small local reservoirs in the Amudarya delta - Phase 2”.

The composition of the components of the project (designer - Institute “Uzgiplomeliiovodkhoz”) includes 12 sites:

1. Completion of the restoration and reconstruction of the Northern Dam.
2. Completion of the reconstruction of the Eastern dam of the Mejdurechensk reservoir taking into account measures to ensure the carrying capacity of 11 pilot ditch.
3. Construction of a water outlet for irrigation of the Small and Big Zakirkol lakes and recharge of the Taldyk channel.
4. Reconstruction of the Shuak stopping-dam.
5. Reconstruction of the dam-road along the lake. Maypost with the installation of the spillway construction and measures to prevent the development of canyon-forming processes in Domalak Lake.
6. Completion of construction of diversion channels and fixing of the lower pools of the Fish Reservoir outlets.
7. Construction of the fencing dam of the lake Makpalkol.
8. Construction of the outlet from the lake Makpalkol.
9. Reconstruction of the Darkesh duct.
10. Reconstruction of the Muynak canal (Glavmyaso) at a flow rate of $44 \text{ m}^3/\text{s}$.
11. Construction of the southern dam of Muynak reservoir.
12. Construction of a lateral spillway from the Mezhdurechensk reservoir with a length of 600 m.



Fig. 2.6. Northern dam of Mejdurechensk reservoir, May 2017

The expected results from the project are:

- Improved water management in the central part of the Amudarya delta;
- An increase in the capacity of the Mejdurechensk reservoir to 440 million m³;
- Climate mitigation in zone of ecological disaster due to an increase in the water surface area from 32.6 to 47.0 thousand hectares;
- Improving the water supply of settlements of the Muynak district of Karakalpakstan in low-water years;
- Preservation of biodiversity and increase in the productivity of the biological resources of the Aral Sea region;
- Creation of conditions for fish farming, fishing, hunting, and distant livestock breeding, which will provide an opportunity to support livestock numbers and provide the population of adjacent areas with food.

The second phase of the project will be completed during 2018-2019, for which 57.282 billion soums were allocated from the state budget. The project will create fish-producing reservoirs with an area of 28.25 thousand hectares. There will also be created pastures on an area of 153 thousand hectares, suitable for grazing 75,000 head of cattle.

An effective method of combating salt-dust transfer, as well as to consolidate the moving Sands, localization of their negative impact on the environment, the rehabilitation of the environmental situation, the creation in the future of a stable base for pasture, is planting protective plantations using local trees and shrubs that can grow in severe soil and climatic conditions of deserts with poor rainfall.

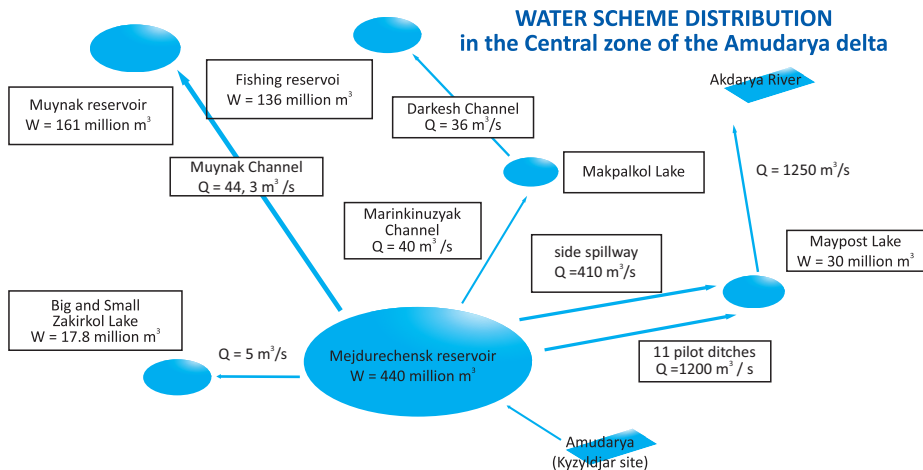


Figure 2.23. Parameters of facilities and water distribution scheme based on the results of the project

According to the observations of specialists, annual plantings reduce wind speed by 20.5%, two-year plantings - by 34.6%. At the age of 4-5 years, the natural grassy vegetation that appeared under the canopy of forest plantations, as well as the self-sowing of saxaul and salsola, will cause a sharp decrease in wind speed and deflation. Along with this, plantations perform a sand accumulating function.



Fig. 2.7. Construction of the eastern dam of the Mejdurechensk reservoir; March 2017

Tree-shrub vegetation accumulating sand is a buffer from the sand, releases oxygen and absorbs carbon dioxide. As shown by the study (Ashirbekov U., “The experience of afforestation on the dried bottom of the Aral Sea”, Journal: “Problems of Desert Development”, 2013), the maximum absorption of carbon dioxide produced by saxaul at the age of 4 years, and it is 1159 kg/ha in the release of oxygen in the volume of 835kg/ha. At the same age, the maximum properties and has salsola, which absorbs

1548 kg of carbon dioxide per hectare and releases 1166 kg of oxygen. Planting of desert plants, absorbing carbon dioxide and releasing oxygen (of course to a lesser extent than coniferous and deciduous trees) is the only powerful barrier to the movement of sand, creating a favorable microclimate for the development of flora and fauna in the protective zone.



Fig. 2.8. Surveying rods to monitor the level of water in Lake Ribachye (June 2017)

In order to improve the environmental situation in the Aral sea region and ecological improvement of the Aral Sea Basin, the States are carrying out significant work on the restoration of biodiversity and the Delta ecosystem, in particular, the planting of local trees and shrubs, the area of which over the past 20 years amounted to 483,000 hectares, which is equivalent to 9.4% of the total area of the dried bottom of the Aral sea. Forest plantations do not need care and due to the natural spread of seeds the areas covered by vegetation are expanding. This territory needs only protection from cutting down which is carried out by the state organizations of forestry (forestry establishment / station). Currently, in the area of these plantations the processes of salt and sand moving into the atmosphere have stopped; different species of wild animals



Fig. 2.9. Stopping Dam on the Maypost Lake (May 2017)

appeared – pheasants (*Phasianus Colchicus*), chukar (*Alectoris cnukar*), bustards (*Otididae*) hares (*Leporidae*), corsac foxes (*Vulpes corsac*), foxes (*Vulpes*), wolves (*Canis lupus L.*), saiga antelope (*Saiginae*), goitered Gazelle (*Gazella subgutturosa*), there are also Asiatic wild ass (*Equus hemionus*).

Work on the creation of forest plantations with the fixing of mobile sands on the dried bottom of the Aral Sea within the territory of Uzbekistan has been conducted since 1980. Since 2000, international organizations have joined this work, in particular the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the International Fund for Saving the Aral Sea, the World Bank, the Global Environment Facility (GEF), the Japan Ecological Fund, the Embassy of Japan, etc.) For example, in the Republic of Uzbekistan at the expense of various sources of financing, forest stands in the last 17 years have been produced on an area of 350,700 hectares. Forest melioration work on an area of 3, 21800 hectares has been done at the expense of the national budget, on 16,400 hectares - funded by GIZ (Germany), 1500 hectares - a non-governmental organization “Kofyutis” (France), 11,000 hectares - IFAS.

At the dry bottom of the Aral Sea and the adjacent territory in the Southern Aral Sea region, there are still about 350 thousand hectares suitable for forest plantations and fixation of movable sand dunes.

Part of a Comprehensive program 2015-2018 also includes two projects «Creation of protective forest plantations of local trees and shrubs in the area, «Akhanti» and on the ridge “Akkum” (drained bottom of the Aral sea)».

Project objectives: on the Akhantai section, reducing wind erosion, fixing moving sands and preventing salt and dust from entering Muynak and its surrounding settlements and farming zones.



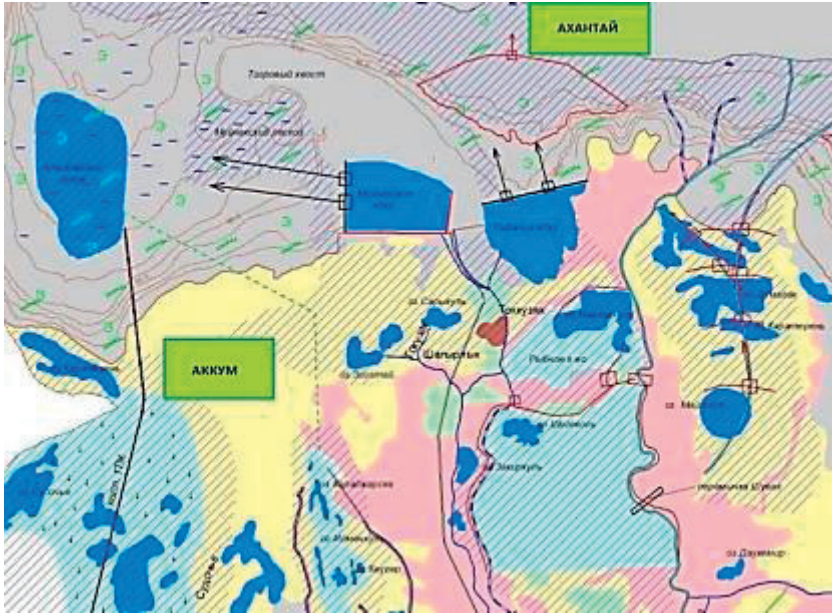


Fig. 2.29. The layout of forest plantations in the framework of the Comprehensive Program for the period 2015-2018

On the Akkum ridge: reduction of wind erosion, consolidation of moving Sands and prevent the ingress of salt and dust in the village of Karajar and lake Sudochie.



Photo 2.11. Fixing the moving sands with bundles of reeds (photo by V. Sokolov)

The project on the Akhantai site envisages the implementation of measures to create protective forest plantations on the dried bottom of the Aral Sea from local trees and shrubs on an area of **11,660 hectares**.

These events include:

- Afforestation of areas without fixation of the relief, which is performed on sandy plains by the method of arranging sand-accumulating furrows after 10 m, planting black saxaul seedlings and Richter's Salsola on them, and on the lowlands and grained sands inaccessible for mechanisms black saxaul seedlings are planted;
- Consolidation and afforestation of sands with fixation of the terrain, performed on raising dunes of sand by the method of arranging ordinary roofing systems on 2/3 of the gentle slopes after 3 m and planting along them the seedlings of saxaul and calligonum cuttings in the spring.

The project implementation period is 2017–2019. **The amount of funding** from the state budget - 1663.4 million soums.

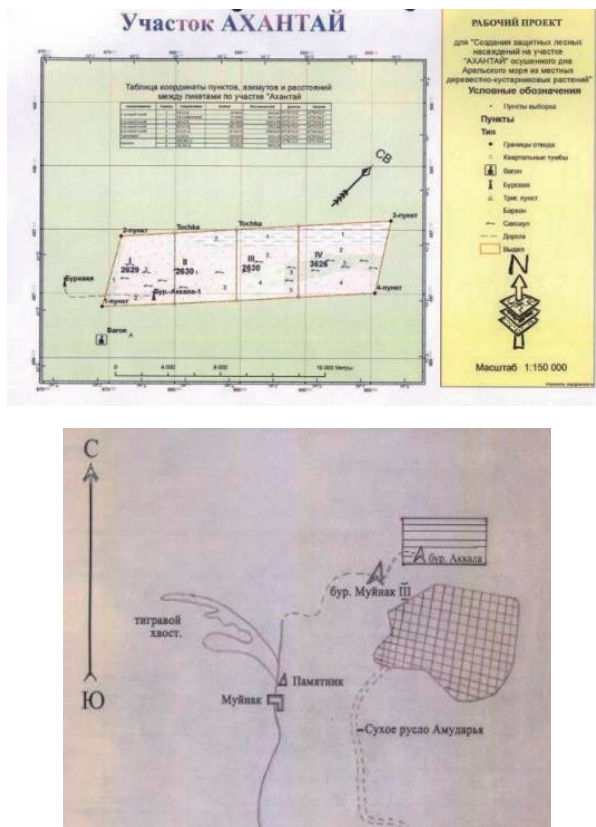


Fig. 2.25. Scheme of the location and scope of work on forest plantations on the Ahanti site

The project on the Akkum ridge envisages the creation on a dried bottom of the Aral Sea of protective forest plantations from local trees and bushes on an area of 8703.6 hectares. Project implementation period is 2017–2019. The amount of funding from the state budget - 759.3 million soums.

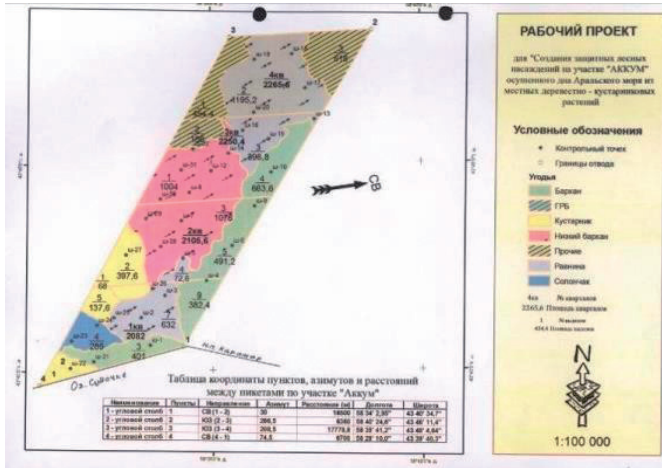


Fig. 2.26. Scheme of location and scope of work on forest plantations on the Akkum site

The project “Ornithological monitoring of water bodies of the South Aral Sea region”

The goal of the project is to study and assess the ecological status of delta reservoirs, components of biodiversity through the organization of ornithological expeditions, twice a year (during nesting and migration) by experts from the Agency for the Protection of Birds of Uzbekistan and the Institute of Biology of the Karakalpak Branch of the Academy of Sciences of the Republic of Uzbekistan. To implement the project, the GEF-IFAS Agency attracted grants from the OSCE and GIZ.

The main research objectives are:

- Collection of data on the species and quantitative composition of the avifauna of wetland systems:
- Identification of the main threats to habitat by type:
- Training and professional development of young specialists - biology students of Karakalpak State University.

The main focus of research is on rare and biomic species, as well as on large concentrations of waterfowl. Accounting is carried out using optical instruments (in the picture, members of the expedition of 2017 are watching the birds by binoculars). According to the results of the expeditions, by the end of 2019, a report on the state of flora and fauna will be prepared, and recommendations will be developed to improve the environmental situation in the Southern Aral Sea region.

In total, over 230 species of birds, including 12 endangered species in the world, as well as 3 species listed in the Red Book of Uzbekistan, were observed on Sudochie Lake during the period of observations in 2015-2016.

During migrations, waterfowl of 20 species form clusters of up to 86 thousand individuals on the lake. Lake Sudochie is a source of rich food for many species of migratory birds.

In recent years, the number of pink flamingos has increased significantly, which rest and nest during flights on Lake Sudochie. In May 2014, in the eastern part of the lake, a colony of 7 thousand pink flamingos and about 3 thousand nests was counted. This is the largest colony in Uzbekistan, it is 1.4% of the global population of flamingos. Colonies of pink flamingos are noted in many places of Karakalpakstan, such as Vozrajdenie Island, Muynak, West Karateren Lake, Shegekul (Mejdurechens Reservoir), Sarykamysh, Jaltibars Lakes, Amu Darya right bank.



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Source - Agency of Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan

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NEW INITIATIVES IN THE ARAL SEA REGION OF UZBEKISTAN

In February 2017, the President of Uzbekistan Shavkat Mirziyoyev approved the “Action Strategy for the Five Priority Development Areas of the Republic of Uzbekistan in 2017–2021”.

This document points out the importance of taking systemic measures to mitigate the negative impact of global climate change and the drying up of the Aral Sea on the development of agriculture and the livelihoods of the population. For this, the President of Uzbekistan approved the State Program for the Development of the Aral Sea Region for 2017-2021.

This program is a set of measures to fulfill the election promises of the President, and it provides for the implementation of 67 measures by attracting and absorbing more than 8.4 trillion soums. It aims to:

- implementation of comprehensive measures to create new jobs, ensure employment of the population, as well as increase the investment attractiveness of the region;
- developing the water supply system and increasing the level of providing the population with clean drinking water, improving sewage systems, sanitation and recycling of household waste;
- measures for the further development of the health system in the region and the preservation of the gene pool of the population;
- further implementation of measures aimed at improving the living conditions of the population living in the region;
- development of transport, engineering and communication infrastructures of the settlements in the region, improvement of the irrigation network and the introduction of modern energy-saving technologies.

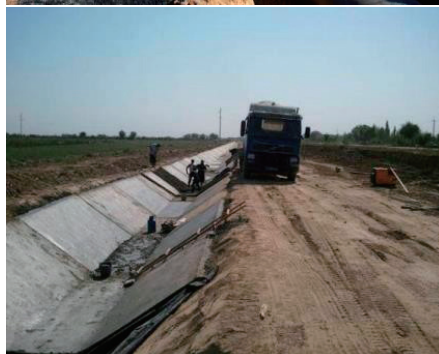
The Development Fund of the Aral Region under the Ministry of Finance was established to implement this Program. The income of the Fund at the end of 2017 amounted to 188.9 billion soums. The expenses of the Fund according to the approved



address lists of 2017 amounted to 123.5 billion soums.

According to the approved forecast indicators of income and expenses of the Development Fund of the Aral region under the Ministry of Finance (according to the protocol of the Commission for the implementation of targeted programs financed by the Development Fund of the Aral Region under the Ministry of Finance of the Republic of Uzbekistan on December 30, 2017) 319.1 billion soums, preliminary expenses of the Fund amount to 234.7 billion soums.

In addition to the above decisions, the Government has taken additional measures for the socio-economic development of the Republic of Karakalpakstan and the Khorezm region, as well as raising the living standards of the population for 2017–2021.



Through the Ministry of Water Resources of Uzbekistan, this state program provides for:

- Creation of a breeding forest seed base of desert species of forest plantations in the Kungrad district of the Republic of Karakalpakstan and the Yangibazar district of the Khorezm region on the basis of the Main Department of Forestry of the Ministry of Agriculture and Water Resources.
- Construction and reconstruction of 126.3 km of inter-farm and inter-district collectors, hydraulic structures in the Republic of Karakalpakstan.
- Construction and reconstruction of 20.1 km of main collectors, 2 units of reclamation pumping stations, 9 units of hydraulic structures in the Khorezm region.
- Improvement of water resources management in South Karakalpakstan on an area of 100 thousand ha of irrigated land, including Beruni (34.0 thousand ha), Turtkul (32.8 thousand ha) and Ellikkala (33.2 thousand ha) districts, construction and reconstruction of the Buston Canal, the Right-Bank of Tuyamuyun Canal, the Pakhta-Arn Canal and inter-farm canals.
- Development of water resources management in South Karakalpakstan on an area of 100 thousand ha of irrigated land, including Beruni (34.0 thousand ha), Turtkul (32.8 thousand ha) and Ellikkala (33.2 thousand ha) districts, through the construction and reconstruction of the Buston Canal, the Right-Bank Tuyamuyun Canal, the Pakhta-Arna Canal and inter-farm canals

Government Resolution No. PP-2754 of February 2, 2017 approved the proposal of the Council of Ministers of the Republic of Karakalpakstan, the Uzbek Agency “Uzkommunkhizmat” and JSC “Uzbekiston Temir Yollari” to implement the project on “Construction of the Kungrad-Muynak water conduit” with a water distribution center. The construction of a facility worth 26.6 billion soums and a length of 101 km was conducted for five months (from February to July 2017). More than 25 thousand people from the Nukus, Beruni, Muynak, Kungrad and Karauzyak districts are now provided with clean drinking water. Achilbay Ramatov, First Deputy Prime Minister of Uzbekistan, and Musa Erniyazov, Chairman of the Jokargy Kenes of Karakalpakstan, took part in the ceremony of launching the water pipeline with a daily capacity of 7,000 cubic meters in Muynak city.



Project of the Nukus branch of the Executive Committee of the International Fund for Saving the Aral Sea on “Organization of social assistance to the population of the Aral Sea region”

During 1998 - 2013, the Nukus branch of the Executive Committee of IFAS at the expense of the state budget implemented project on “Organization of social assistance to the population of the Aral Sea region in adapting to market conditions in the zone of ecological crisis”. The project financed 6 165 projects for a total of 13,063.1 million soums on repayment terms, and 9,239 new jobs were created.

In July 2013, based on the minutes of the meeting of the Coordination Council on the Aral Sea and Aral Sea region issues under the Council of Ministers of the Republic of Karakalpakstan of July 23, 2013 No. 02-08 / 5-07 / 463, the project was stopped due to the Law on Microcredit Organizations (2010), in which it is indicated that only organizations having a license for this activity can deal with microcredit. The Nukus branch of EC IFAS does not have such a license. To date, the project funds after their full return to the deposit account amount to about 2.2 billion soums.

In March 2017, a Protocol of the Coordination Council on the Aral Sea and Aral region problems under the Council of Ministers of the Republic of Karakalpakstan was prepared on the resumption of the project of Nukus branch of the Executive Committee of the International Fund for saving the Aral Sea on “Organization of social assistance to the Aral Sea population” in order to create new jobs in the Republic of Karakalpakstan. It was entrusted to the Nukus branch of the Executive Committee of IFAS in coordination with the

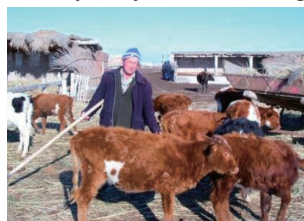


GEF IFAS Agency to implement the project on the terms of the loan agreement with the Microcredit Organization “Tadbirkor Invest” under the Association of Business Women in Nukus.

The objectives of the project are the expansion of microfinance activities of the organization by providing micro-credit, micro-loans and micro-leasing for individual regions of the Republic of Karakalpakstan, namely Muynak, Takhtakupir, Kegeyli, Kungrad, Kanlykul, Shumanay, Karauzyak, Chimbay, Hodjeyliy, Nukus district and Nukus.

The project assumes financing of at least 90 business projects involving microcredit and microleasing with the condition of creating at least 200 new jobs aimed at:

- Creation, development and expansion of small and medium-sized enterprises, family entrepreneurship, points of rendering paid household, medical, veterinary and agrotechnical services;
- Creation of private structures to improve the quality of life of the population: the production of home furniture, the maintenance and repair of cars, household and office equipment;
- Organization of small industries for the production of agricultural and local raw materials, building materials, the development of traditional types of folk crafts;
- Development of small and private agribusiness in rural areas (trade, livestock, dekhkan households, small production and services);
- Creation of new and modernization of existing industries for the production of environmentally friendly import-substituting food products and soft drinks;
- Restoration of old and organization of new productions for growing fish in inland waters and its processing in order to provide the population with light proteins of animal origin;
- Creation and development of business activities in the field of trade, production and the provision of paid services to the public.



Source - Agency of Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan

Also, a microcredit organization is supposed to provide microfinance services in the form of microloans to at least 97 individuals to meet their borrowing needs and to manage households (including microbusiness) and for personal needs (treatment, training, tourism, events, for MNR, the acquisition and re-equipment of vehicles and household appliances, etc.).

In accordance with the submitted business plan for the project, the following interest

rates are set:

- Microcredits - 20-24% per annum;
- Microleasing - 18-20% per annum;
- Microloans - up to 36% per annum.

Micro-credit organization «Tadbirkor Invest» under the Association of women in Nukus guarantees the successful implementation of this business project. For further refinancing of new business projects, this organization will have repayable funds from previously issued loans in the amount of more than 700 million UZS, the budget will receive tax payments of more than 21 million UZS, and at the disposal of the microcredit organization and the Nukus branch of IFAS by the end of 2018, net income of 85 million UZS remains.

GOALS AND OBJECTIVES OF FURTHER STEPS FOR IMPROVING THE ENVIRONMENTAL CONDITION OF THE ARAL SEA REGION

The Summit of Heads of Founders of IFAS held on August 24, 2018 in Turkmenistan showed that, in the context of the general warming of the political climate in the region, the environmental health issues of the common rivers of Central Asia and the Aral problem have again risen to the top of the priorities of the leaders of the countries. It is not just an understanding that sustainable development and the improvement of life depends on the conservation of natural resources. Our countries have certain opportunities for progress in the restoration of rivers and ecosystems, carrying out their recovery at the national and regional levels.

The President of the Republic of Uzbekistan Shavkat Mirziyoyev put forward a number of important initiatives that, when implemented, can “dramatically improve the unfavorable environmental situation in our region.” For this, “decisive and non-standard measures are needed”.

The main initiative of the President of Uzbekistan, stated at the IFAS Summit, was to declare the Aral Sea area as a zone of environmental innovation and technology. This suggests that we are fundamentally changing the ideology of solving the Aral catastrophe: we do not just draw attention to the environmental crisis in order to reduce its negative consequences, but create a mechanism to eliminate it. To implement this initiative, on October 16, 2018, the President has signed Resolution No. PP-3975 on the establishment of the International Innovation Center of the Aral Sea Region under the President of the Republic of Uzbekistan, with the scientific and technical support of the Islamic Development Bank and the International Center for Biosaline Agriculture (ICBA):

Priority areas of activity of this center:

- improvement of the ecosystem and sustainable livelihoods in the saline lands of the dried bottom of the Aral Sea;
- organization of work on cooperation with international organizations for the

development and implementation of innovations and solutions to diverse problems in saline environments;

- establishment of experimental fields for testing;
- identification, promotion and transfer of innovative technologies and approaches, including agroforestry, afforestation, aquaculture, bioenergy, diversification of crops, cultivation of complex crops, animal husbandry, improvement of pastures, drought management and mitigation, adaptation to climate change;
- development of public-private partnership in overcoming the consequences of the drying of the Aral Sea and the environmental rehabilitation of the Aral Sea Basin.

The announcement of the Aral Sea Region as a zone of environmental innovations and technologies is associated with the formation of conditions that will ensure the following:

- creating conditions for attracting foreign investment in the development and introduction of environmentally friendly technologies;
- comprehensive implementation of the principles of a green economy, environmentally friendly, energy- and water-saving technologies, prevention of further desertification and ecological migration, the development of ecotourism and the implementation of other measures;
- formation of a single list and joint preparation of innovative projects, taking into account the experience of implementing such projects in the Aral Sea region, as well as the allocation of long-term concessional loans and grants for these purposes;
- taking measures to fix mobile sands, reducing the removal of poisonous aerosols from the dried bottom of the Aral Sea, covering forest stands of the entire dried sea bottom;
- creation of new highly productive pastures, for the intensive development of animal husbandry and providing jobs for the population of the Aral Sea region;
- establishment of the scientific and educational base for the preparation of popular specialists under the International Innovation Center;
- creation of transboundary protected natural areas in the Aral Sea zone to preserve the unique fauna of the region and endangered animal species;
- increasing the level of regional cooperation on water conservation, management and rational use of transboundary water resources;
- conducting joint interdisciplinary research, including at the site of scientific information centers of the Interstate Commission for Water Coordination and the Interstate Commission for Sustainable Development;
- monitoring of existing water bodies, drained bottom of the Aral Sea and existing forest locations (tugai, etc.) in the basin using drones and GIS (geographic information system) technologies;
- conducting work with the Committee on Science and Technology of the UN Convention to Combat Desertification;
- development of public-private partnership in order to eliminate the negative environmental and social consequences of the process of draining the Aral Sea;

- development of a set of measures and approaches to improve the environmental situation, life, income and welfare of the population of the Aral Sea Basin is required.

WORKS TO IMPROVE THE ENVIRONMENTAL CONDITION OF THE SOUTHERN AREAS OF THE ARAL SEA REGION

It is necessary to create an engineering infrastructure that is currently absent in the Aral Sea zone - roads, communications, water supply, etc. There is an opportunity to take advantage of unique local conditions and reproduce the achievements of foreign and domestic experience here.

First of all, it is necessary to solve the issue of stable water supply in the Aral Sea region. The territory of the South Region of the Aral Sea covers the northern part of the Aral Sea delta of the Amudarya River and the adjacent arid part of the Aral Sea from the Ustyurt plateau in the west to the Kyzylkum desert in the east. The total area of the dried seabed on the territory of Uzbekistan exceeds 3.34 million hectares.

Until today, this territory is not provided with the necessary stable volume of water resources. Unstable water supply does not allow to fully implement all the necessary measures to stabilize ecosystems and socio-economic development of the Aral Sea region.

It is necessary to create a complex of engineering structures in the Amudarya delta and artificially watered landscape ecosystems, adjacent areas of the dried bottom of the Aral Sea, in order to restore the natural ecological regime in the whole of the South Aral Sea.

The task is to revive the Aral Sea region differentially in two project zones:

- **The first zone** is the development of the Amudarya delta for the restoration of a largely historical ecological regime and the creation of conditions for normal life activity. For this zone, reservoirs of the first filling stage have been allocated. These include Mejdurechenskoye, Rybachye, Muynakskoe and Djiltyrbaskoye reservoirs, and Mashankul, Ilenkul, Makpalkol and Dumalak lakes.
- **The second zone** is the development of the infrastructure on the dried bottom of the Aral Sea to mitigate the effects of the sea dry out. Water reservoirs of the second stage, Adjibay-1, Adjibay-2, Djiltyrbas-1, are allocated for this zone, into which water will flow depending on natural water availability.

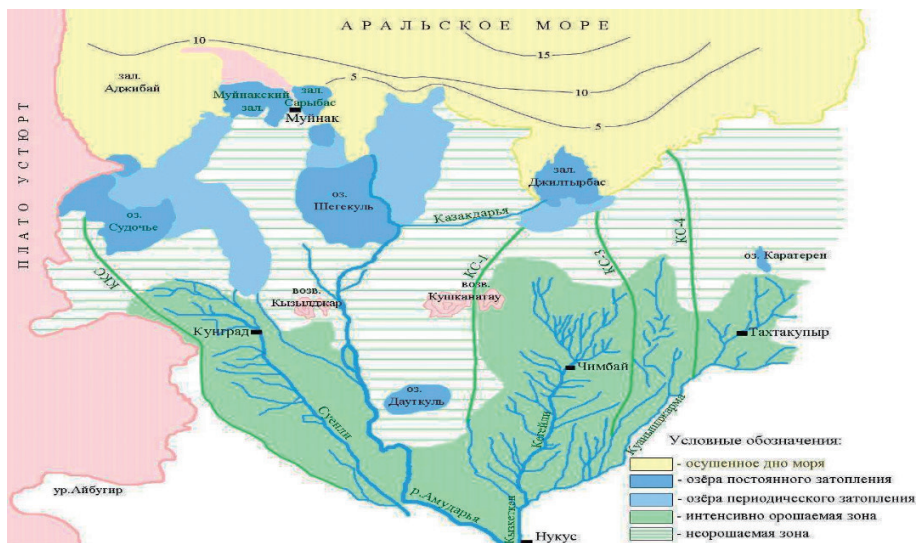


Fig. 2. 27. Diagram of the existing water infrastructure in the South Aral Sea.

The scope of work

The main purpose of the works in the first zone is the completion of construction and reconstruction of the facilities that were started, but not funded, as well as new facilities, which were originally foreseen in the feasibility study. Works in the first zone include the following objects:

№	Name of objects	Estimated construction cost (01/01/2018) million USD
1	Raising the height of the existing Northern and Eastern dams of the Mejdurechensk reservoir to the level of 59 m, in order to ensure the design volume of the reservoir bowl	10,0
2	Water outlets for irrigation of the Maliy and Bolshoy Zakirkol lakes and feed the Taldyk channel	0,34
3	Reconstruction of the “Shuak” lintel	0,48
4	Completion of the construction of diversion canals and fastening of the lower pools of the Ribachye Reservoir outlets	0,19
5	Construction of a dam on the Makpalkol lake	1,46
6	Construction of a water outlet from the Makpalkol lake	0,75
7	Reconstruction of the duct Darkesh	0,78
8	Construction of the southern dam of Muynak reservoir	6,18
9	Restoration of the lateral spillway from the Mejdurechenskiy reservoir to the Maypost-Domaly system of lakes	8,24

10	The construction of buildings in the system of eleven ditches to increase the level of the weir to the level of 57 m	2,5
11	Reconstruction of the Raushan canal at a length of 42 km with a carrying capacity of 150 m ³ / s, of the Liman channel (10 km, 10 m ³ / s) and the Mashankulsky discharge (8.3 km, 60 m ³ / s)	4,2
12	Reconstruction of the head structure on the Amudarya River to the Raushan canal at a flow rate of 150 m ³ / s	0,41
13	Reconstruction of water outlets from the Raushan canal to the Liman canals (10 m ³ / s) and Mashankulsky discharge (60 m ³ / s)	2,25
14	Clearing of the Bolshoy Jansiz channel, 20.2 km	0,75
15	Water outlet structure from the Mashankol lake to the Maliy Jansiz channel at a flow rate of 30 m ³ / s	1,17
16	Water outlet construction from the Maliy Jansiz channel into Lake Ilmenkol at a flow rate of 20 m ³ / s	0,80
17	Water outlet facility from Ilmenkol Lake to the Maliy Jansiz channel at a flow rate of 10 m ³ / s	0,50
18	Construction of a dam on Karadjar lake, 10.25 km	4,94
19	Construction of a water outlet at a flow rate of 10 m ³ / s from Karadjar Lake	0,65
	TOTAL for the first zone	46,6

Description of objects in the first zone

The northern dam is a water-supporting structure enclosing the deepest part of the Mejdurechensk reservoir. The length of the dam is 32.7 km, its main part is located in the northern part of the reservoir. In order to accumulate water in the Mejdurechensk reservoir with a volume of up to 440 million m³ at the normal retaining level (NLU) of 57.0, the dam crest is arranged at the level of 59.0.

The eastern dam is located along the right bank of Akdarya River and separates the Mejdurechenskoye reservoir with a volume of 440 million m³ from the Maypost Lake with a volume of 30 million m³. Its main part runs from north to south and has a length of 8.26 km, the dam crest is arranged at around 59.0.

Water outlets for watering of the Maliy and Bolshoy Zakirkol lakes and feeding the Taldyk channel. The construction of the facilities is planned in the north-western part of the Northern Dam (Criteria positions of depression surfaces in the dam body (CP): 20 + 00) of the Mejdurechensk reservoir, from where it will be possible to supply water to the Bolshoy and Maliy Zakirkol lakes with a flow rate of 5 m³ / s. This consumption is calculated on the basis of sufficiency for filling the lakes system for several months and maintaining the right level of water, taking into account the vapors.

Reconstruction of the “Shuak” lintel. The dam “Shuak” is located at the end of the Eastern dam of the Mejdurechensk reservoir, representing a blank earthen partition

of the Akdarya riverbed. In order to improve the reliability of the jumper, it is proposed to expand it to the width along the ridge at 59.0 13-20 m, for which a quality embankment is provided on the side of the lower jumper link.

Completion of the construction of diversion canals and fixing of the lower pools of the Ribachye Reservoir outlets. The diversion channels from the Rybachye reservoir are located in the northwestern part of the dam and are used to divert water to the downstream from the reservoir in order to create flowage and divert excess water to the Aral Sea. Both channels are designed to pass 30 m³/s.

Construction of fencing on the Makpalkol Lake. Lake Makpalkol is filled with Amudarya water from the Mejdurechensk reservoir through the Marinkinuzyak canal. Triggering from the lake is carried out by gravity through the channel of the Darkesh towards the Ribachye Gulf (at high horizons in the lake).

Construction of the outlet from the Makpalkol Lake. Criteria positions of depression surfaces in the dam body (CP: 18 + 90) protecting the dam of the Makpalkol Lake provides for the outlet to the Darkesh channel. After the reconstruction of the Darkesh channel, the water outlet in the body of the enclosing dam will be able to pass water downstream into the Ribachye Reservoir.

Reconstruction of the Darkesh duct. Under existing conditions, in one of the former left-bank ducts of the Amudarya River - the Darkesh channel - a flood discharge from the Makpalkol Lake in an unregulated mode enters the Ribachye Reservoir. The project provides for the expansion of the existing channel along the bottom to a distance of 20 m from the right bank.

Construction of the southern dam of Muynak reservoir. To increase the capacity of the Muynak reservoir and ensure its stable operation, it is necessary to construct the Southern Dam. The beginning of the route to the Southern dike embankment is located on the existing Muynak-Uchsay road. The route goes in a straight line, in the general direction from the north-west to the south-east to access channel with criteria positions of depression surfaces in the dam body of 90 + 00 (CP). The construction of the Southern dam will provide an opportunity to increase the Normal retaining level (NRL) of the reservoir from the level of 51.5 to 52.5 with the estimated filling volume up to 161 million m³, which will complete the construction of the complex of hydraulic structures of the Muynak reservoir. The construction of the Southern dam includes the construction of three earthen dams from the soil with the laying of the downstream slope $m = 3$ and the upper - $m = 7$. The southern embankment dam with a length of 8.4 km is mated with the dam of the Muynak canal with the help of the left interfacing and guiding dams. The length of the mating dam is 3.65 km, the left track is 1.5 km. Totally 13.55 km. The dam crest mark was 54 m, width - 8 m.

Restoration of the lateral spillway from the Mejdurechenskiy reservoir to the Maypost-Domal lakes system. The side spillway is calculated on a throughput of 410 m³ / s. The location of the lateral water pipeline is taken at the section of the Eastern

dam from CP 17 + 00 to CP 23 + 00. The lateral water supply ridge corresponds to the mark of NLU 57.0, which makes it possible to dispense with eroded bridges to hold the water level. Due to the fact that the ground level in the upstream and downstream in this section is higher, as well as taking into account measures to maintain the water level in the downstream (Maypost lake) at 55.0, the reinforced concrete lining of the upper slope and the slope structure are reduced.

Eleven channels. On the area from CP 23 to CP 41 of the Eastern Dam, 11 channels are located, which are a catastrophic spillway from a semi-engineering reservoir. They are open channels in the earthen channel, along which water is drained from the reservoir bowl to the Maypost depression and further to the Akdarya River. In the current state, channels can skip water consumption up to 800 m³ / s. It is necessary to raise the threshold of the spillway on these channels to the level of 57 m, which guarantees the required filling of the Mejdurechensk reservoir.

The Mashankul-Karadjar lakes system is located in the left-bank zone of the Amudarya delta. Previously, it consisted of 21 lakes with a total area of more than 70 thousand hectares. In the late 60s, fish production amounted to 1 thousand tons. According to the 1992 space imagery, the system was represented by a group of lakes with a total wetting area of 24 thousand hectares. In terms of fisheries, the most productive were Koptinkol, Khojakol, Kanbakly, Jaungirkol, Ilmekol and Keuser. The system is formed by transitions from one to another, of various areas with numerous connecting ducts. The boundaries of the lakes Khojakul, Ilmenkol and Keuser are most clearly marked. Khojakul Lake is located 25 km north-east of Kungrad. Its formation is closely connected with the emergence of Lake Mashankul, formed in 1934. The lake feeds through the Raushan Canal and unites a number of reservoirs, forming the Mashankul system, which includes Lake Khojakul with the adjacent water reservoirs Sazyrkul, Kultykkul, etc.

In general, the Mashankul-Karadjar system has a mixed feed - this is the water of the Amudarya, fed into the system through the canals of Suenli, Raushan, and wastewater of the Ustyurt collector. Lakes have average depths of over 1.5 m (2.5-3 m). The maximum depth (11 m) is noted in lakes Kantakly and Keuser. The fish fauna of the system includes up to 18 species of fish.

This system has retained its natural appearance and diversity of biota to the greatest extent compared with other water bodies of the delta zone of the Amudarya. It should also be noted that in the Mashankul-Karadjar lake system, the second priority is irrigation of pastures in the area of lakes Mashankul, Ilmenkol and Karadjar. At the same time, the total area of watering pastures will be 10-15 thousand hectares.

According to the project, after its restoration, the system will consist of 3 main reservoirs - Mashankul with an area of 7.4 thousand hectares, Ilmenkul 5.2 thousand hectares and Karadjar 2.02 thousand hectares. In addition, pastures will be restored on an area of about 3-5 thousand hectares and a natural complex, the area of which will be finalized in cost analysis.

To restore these reservoirs, the project envisages the reconstruction of the previously existing water supply system along the Raushan canal and the water distribution system using the Small Jansyz channel, the construction of the enclosing dam and the outlet structure in the area of the Karadzhar settlement. After the reconstruction of the Raushan Canal, the water in the lake. Mashankul will be supplied through the Mashankul discharge, which, if necessary, will also be reconstructed in full - via the Liman canal, to irrigate the areas suspended from its system. From Mashankul Lake, water will be supplied along Maliy Jansiz to the Ilmenkul and Karadjar lakes. The regulation of water supply and water levels is planned to be carried out by 3 hydraulic structures located on the Maliy Jansiz channel.

To regulate the water horizon of Karadjar Lake, it is necessary to construct barrage dams and a tubular outlet for regulating the water supply to Sudochie Lake along the Karadjar channel.

Objects of the Second zone – arrangement of the drained bottom of the Aral sea to mitigate the effects of sea withdrawal

№	Name of the object	Estimated cost of construction (1.01.2018) million U.S. dollars
1	Construction of the Raushan pumping station, located approximately 8 km north-west of the Raushan farm at the end of the KS-3A collector and consisting of 6 pumps with an aggregate carrying capacity of 3.0 m ³ / s - for water supply to the Sudochie lakes system Construction of the Raushan pumping station, located approximately 8 km north-west of the Raushan farm at the end of the KS-3A collector and consisting of 6 pumps with an aggregate carrying capacity of 3.0 m ³ / s - for water supply to the Sudochie lakes system	4,1
2	Completion of the construction of a complex of facilities at the Djiltyrbas reservoir	9,3
3	Construction of a complex of facilities on the Djiltyrbas-1 polder	22,6
4	Construction of a complex of facilities on the Adjibay-1 polder	3,75
5	Construction of a complex of facilities on the Adjibay-2 polder	36,2
6	Access roads and temporary construction roads	3,85
7	Design and survey work	9,2
	TOTAL for the second zone	89,0

Description of objects in the second zone

The Sudochie wetland system is located northwest of the Raushan farm in the Kungrad district of Karakalpakstan, with an area of approximately 500 km², including the main lakes (open water) Akushpa, Begdulla Aydin, Bolshoe Sudochie and Karateren. The main part of the water is supplied to the territory through the Main Left-Bank Collector

(MLBC), a drainage channel flowing in from the south and also referred to as MLBC, and additional water supply is provided by inflow from the Ustyurt canal from the south-east only for several months a year. To complete the water supply complex to this system, it is necessary to build a Raushan pumping station located approximately 8 km north-west of the Raushan farm at the end of the KS-3A collector and consisting of 6 pumps with an aggregate throughput of $3.0 \text{ m}^3 / \text{s}$.

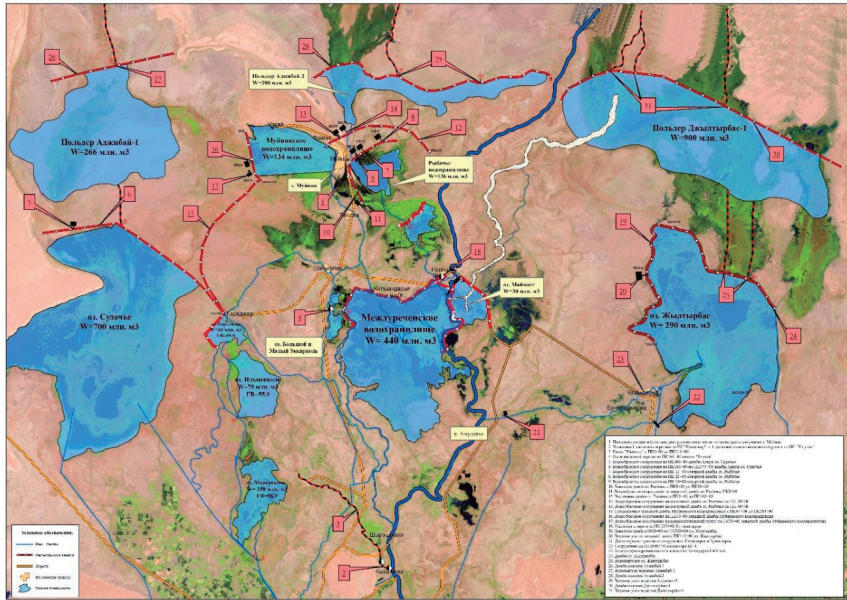
Djiltyrbas reservoir is formed by the device from the north and east of the retaining dam with a length of 38 km. Its filling will occur through the existing Kazakhdarya canal from the Mejdurechensk reservoir and with water from the KS-1 collector. The dam structure is an earthen profile 10 m wide across the ridge, 1: 3.5 upper slope laying, 1: 3 lower slope laying and 6 m wide ridge, 1: 3 upper and lower slope laying in areas where the dam base is located on elevations above design NLU. On the crest of the dam, which has a mark of 53.50 m, passes an operational gravel road. In accordance with the calculations, for the best flushing of the reservoir, mixing the collector and river water in the body of the dam it is planned to build two water outlets at a flow rate of $50 \text{ m}^3 / \text{s}$ each. Water outlets are designed in the form of a monolithic reinforced concrete three-point pipe with a cross section of $2.5 \times 2.5 \text{ m}$. Discharge water is provided for diversion channels up to 2 km each in the direction of the Djiltyrbas-1 Reservoir.

Adjibay-1, Adjibay-2 and Djiltyrbas-1 Reservoirs. The main objects of construction of these reservoirs are fencing dams and water outlets. The number of water outlets in the composition of each polder was assigned depending on its parameters, conditions for creating flow through the entire water area and on the estimated maximum discharge costs:

- Adjibay-1 - 1 outlet, flow rate $51 \text{ m}^3 / \text{s}$;
- Adjibay-2 - 3 outlets, each flow rate is $90 \text{ m}^3 / \text{s}$;
- Djiltyrbas-1 - 3 outlets, the flow of each $60 \text{ m}^3 / \text{s}$.

Enclosing dams are earthen, have a maximum construction height of 3.1-6.5 m. The width of the dam crest is 10 m. The height of the dam crest above the calculated level of the NLU is 1.5 m. The dam profile is constructively adopted according to the planed waterproof slope repose 1:35. The laying of the lower escarpment 1: 3. A gravel construction and maintenance road is arranged along the dam crest.

Water outlets are structurally made of monolithic reinforced concrete in the form of three-point pipes with a hole size of $2.5 \times 2.5 \text{ m}$, which are overlapped by flat sliding gates.



Picture. 2.28. Layout of project facilities in the South Aral Sea region.

Expected results of the project

According to the results of all the design work, a complex of reservoirs and basins will be created, which together will ensure a stable volume of water resources in the Southern Aral Sea region of at least 3.3 km³ per year.

Design parameters of reservoirs

Name of the facility	Water Mirror level, m	Top level of the dam, m	Mirror area, km ²	Capacity, million m ³	Length of dam, km
Adjibay-1	46,0	47,5	281,3	258,6	18,0
Adjibay-2	45,0	46,5	174,4	390,4	39,2
Djiltirbas -1	45,0	46,5	624,2	894,8	54,0
Muynak reservoir	52,5	54,0	97,4	162,2	19,3
Ribachie reservoir	52,5	54,0	62,4	134,2	8,0
Mejdurechensk reservoir	57,0	59,0	267,4	421,2	53,33
Djiltirbas	52,0	53,5	353,0	372,4	39,0
Sudochie	52,3		350	700	
Totally			2210.1	3333.8	230,83

To maintain this system of reservoirs and Basins, water inflow must be ensured in the main channel of the Amudarya River (below Takhiatash) and in collector systems at least 5.3 km³ per year.

Flow volumes (million m³) required to maintain the created system of delta reservoirs (preliminary assessment)

Name of zones	Water surface, (thousand hectares)	Flow volume (km ³)
Levoberejnaya	96,0	1,1
Priamudarinskaya	122,0	3,14
Pravoberejnaya	64,7	1,03
Totally	282,7	5,27

According to the results of the project, a stable water horizon will be provided in the waters of the southern Aral Sea region, which will provide a stable increase in vegetation (reeds, grasses, pastures) used for fodder for cattle and other fauna of the region (fish), which in turn will bring additional income to the local population. Also, the number of livestock and the number of bred fish will increase.

Implementation of all the above-mentioned works on stabilization of water supply in the Aral Sea region will require such innovative measures as:

- modernization of mechanisms of hydrological regulation of the risk of dysfunction of water management systems and complexes in conditions of low water and disordered use of transboundary waters in Central Asia;
- development of water management strategy in emergency and conflict situations;
- conservation and sustainable management of wetland ecosystems and coastal corridors of the Aral Sea Basin to support their sustainable livelihoods.

The second priority in the innovation zone is the development of a system for monitoring the state of the environment and water resources in the Aral sea region and on the drained seabed.

In this plan, it is required to create a coverage database based on remote sensing methods using satellite resolution:

- resumption of ground surveys of changes in the landscape of the Aral Sea and Aral region after 2010;
- clarification of the classification of landscapes and land classification of images of 22 standard reference areas according to the number of classes;
- organization of permanent remote monitoring of the dried seabed, the Aral Sea region and two water bodies - the West and the East; processing of cards and their accumulation; update and issue of a monthly bulletin of 36 water bodies.

Introduction of a modern high-tech system for monitoring the state of the environment

of the Aral Sea and the dried seabed:

- equipment of 21 and additional 12 points available on the way to the East and West seas by means of automatic control with security alarm and solar power to obtain online information via mobile communication Uzmobil;e;
- organization of Uzmobil;e communication system;
- organization of groundwater monitoring by means of automatic control of 40 wells;
- monitoring of agricultural land use based on satellite images of Landsat 2 and Sentinel with the preparation of annual maps of land use.

The monitoring system will make it possible to develop an environmental policy and strategy, which should include the following issues:

- assessment of the stability of water supply to the Delta and measures to strengthen it. Strategy to increase water supply to the Delta on the basis of strict compliance with environmental releases in the Aral sea and Aral sea region. Linkages with the Regional water strategy, IFAS;
- determination of the area of the required afforestation of the drained seabed and proposals for the development of a plan of landings in the framework of regional activities on the road map to stop the aeolian degradation of landscapes;
- preparation of measures for the sustainable regime of the Aral sea basins and the development of fish farming in these reservoirs;
- activities for the development of pasture livestock on the basis of a network of self-draining wells (feasibility study);
- development of the use of groundwater for irrigation of greenhouses on the example of Israel, where in similar conditions in the Negev desert there are 40 thousand hectares of greenhouses;
- the creation of wells on the example of Israel's small ponds for fish farming.

The third priority in the area of innovation – afforestation of the dried bottom of the sea. As you know, the International innovation center of the Aral sea region under the President of the Republic of Uzbekistan includes the Department of forestry – it will be engaged in the cultivation of seedlings of desert and forage plants and will provide not only the Republic of Karakalpakstan, but also neighboring Central Asian republics with planting materials for afforestation of desert areas. The center allocated a plot of 45 hectares, which will create a nursery of forest planting materials.

Thus, it is clear that the center will be used as a unique place for the introduction of the most advanced scientific developments and as a base for the organization of training and exchange of experience in combating land degradation and increasing the productivity of pastures from other countries where there are similar soil and climatic conditions.

Work on the development of forest plantations with the fixation of moving sands on the dried bottom of the Aral Sea within the territory of Uzbekistan has been conducted

since 1980. Since 2000, international organizations have been involved in this work, in particular the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the International Fund for Saving the Aral Sea, the World Bank, the Global Environmental Facility (GEF), the Japan Ecological Fund, the Embassy of Japan, etc.

In the last 17 years, forest plantations in the Southern Aral Sea region have been organized on an area of more than 350,000 hectares. Including on the area of 321,800 hectares - at the expense of the country's budget, on 27,000 hectares - financed by GIZ (Germany), on 1,500 hectares - by the non-governmental organization "Kofütis" (France), on 15,000 hectares - IFAS.

At the dried bottom of the Aral Sea and the adjacent territory in the Southern Aral Sea region there are more than 1,500 thousand hectares suitable for forest plantations and fixation of mobile sand dunes.

The President of Uzbekistan has tasked with joint forces to implement large-scale afforestation of the dried-up day of the Aral Sea. In December, work began with the goal of mastering, by the end of 2019, more than 1 million hectares of the dried Aral. More than 530 tractors, all-terrain vehicles, excavators and two An-2 aircraft are involved. Coordinate the work of the units of the Ministry of Emergency Situations and specialists of the State Committee on Forestry. At the end of March 2019, the cultivated area is 1 million hectares (furrows are made, see photo), over 440 tons of saxaul seeds are sown on more than 450 thousand hectares.

Along with afforestation, it is necessary to carry out work on the restoration of pastures for **livestock and karakul breeding**.

It is important to take into account for practical measures the proposal of the President of Uzbekistan: "It is necessary to drastically increase the level of regional cooperation in water conservation, management and rational use of transboundary water resources." To this end, the President proposed the adoption of a Regional Program for the Rational Use of Water Resources in Central Asia.

It should be noted that at the 63rd meeting of the ICWC, which was held in April 2014 in Tashkent, the water authorities of the countries of Central Asia began a discussion about the need for a water saving program and linking it with factors of climate and other changes, as well as the need to coordinate national water saving programs regional or basin level. This program should be one of the main activities of IFAS for the coming years.



Source - Agency of Information and Mass Communications under the Administration of the President of the Republic of Uzbekistan

**Per capita water consumption
m³ / person per year in selected countries:**

Turkmenistan - 5100
Kazakhstan - 2250
Kyrgyzstan - 1910
Tajikistan - 1830
Uzbekistan - 1670
US - 1600
Switzerland - 1000
Turkey - 550
Germany - 460
Israel - 300
Singapore - 45

The joint focus of countries on solving the above problems will lead to a gradual decrease in the cost of water per hectare, per person, per unit of production. For this, it is also necessary in the framework of the ICWC to clearly implement the release schedules and distribution plans, which is an important and necessary indicator of common interests.

Given the proposal of the President of Uzbekistan to create transboundary protected areas in the Aral Sea zone, several actions need to be implemented in this direction. *“Biodiversity conservation should be our common goal.” The President proposed to find a common regional approach to preserve the unique fauna of the region (endangered species of animals such as cheetah, kulan, saiga): for example, “outline” in the Aral Sea transboundary protected natural territories.*

Today, eight reserves, two national natural parks, one Low-Amudarya State Biosphere Reserve, the Republican Center for Breeding of Rare Animal Species “Goitered gazelle”, seven nature monuments have legal state status in Uzbekistan. It is planned to create a national park “Central Kyzylkum” with a total area of 1.1 million hectares, a natural complex “Sanctuaries of the Aral Sea Region”, a preserve “Kuldjuktai” with an area of 174.2 thousand hectares. In the summer of 2018, documents were coordinated to give legal status to the “Saygachy” complex landscape reserve, the main purpose of which is to preserve the Ustyurt saiga population. The country also prepared a draft “Program for the creation of a network of protected natural territories”, within the framework of which it is planned to expand the system of protected natural territories from 2.3 million to 8.1 million hectares (about 17% of the territory of Uzbekistan), including measures to protect data areas.

The proposed South Ustyurt National Park with a total area of 1.42 million hectares (in Karakalpakstan) included into proposal of the President - this zone can be combined with the adjacent territory of Turkmenistan. Similar protected areas can be organized in the border area with Kazakhstan on the Ustyurt in the West Sea zone, on the Vozrajdenie, in the territory adjacent to the Barsakelmes reserve (in the territory of Kazakhstan), etc.

It is also important to take into account for practical measures the proposal of the President of Uzbekistan - the development of effective scientific cooperation.

The President of Uzbekistan literally said: “In this regard, we consider it important to organize joint interdisciplinary research, including at the site of scientific information centers of the Interstate Commission for Water Coordination and the Interstate Commission for Sustainable Development.”

In this regard, first of all, strengthening and development of the information and analytical potential of IFAS as part of the regional cooperation platform (consultations, mechanisms for finding compromises, agreeing on priorities, principles and mechanisms for coordinating the sharing of water resources, joint target planning, etc.) is proposed.

Within the initiative of the President of Uzbekistan In January 2019, the National Program for the Development of the Aral region was approved with funding of 279 projects worth \$ 38 million in Karakalpakstan and the Khorezm region in 2019. Some of the projects of this Program are funded by the contribution of the Republic of Uzbekistan to IFAS from the state budget. In addition to this, the Agency for the Implementation of IFAS Projects and the Nukus Branch of the Executive Committee of IFAS in 2019 allocated from the state budget of the republic funding for the contribution to IFAS in the amount of over 446 billion soums (about 53.5 million US dollars) for the implementation of some projects for the creation of reservoirs in the Amudarya delta within the framework of the Aral Sea Basin Program IFAS.

On November 21, 2018, under the auspices of the UN, the Multiparty Trust Fund for Human Security for the Aral Sea region was created. With the support of this Fund, Uzbekistan intends to create a single platform for developing cooperation and mobilizing donor resources. Norway, Japan, Kazakhstan, Algeria and other countries and organizations supported the initiative to establish the Fund. Norway has already decided to allocate US \$ 1.2 million for the trust fund. The Road Map was adopted to support the activities of the Foundation. Uzbekistan has made its own contribution to this fund in the amount of 6.5 million US dollars.

With the coordination of the Ecological Party of Uzbekistan established in January 2019, the Concept “Aral Sea Region - zone of environmental innovations and technologies” is being prepared, which will be introduced for its adoption at the regional level under the auspices of IFAS until September 2019. The organization is also being prepared in the autumn of 2019 with support of the UN, ADB and the Global Environment Facility of the high-level international conference “Priaralye - zone of environmental innovation and technology”.

CHAPTER 3. NEED FOR WATER AND ITS USE IN UZBEKISTAN

The current annual demand for water in all sectors of the economy is about 64.2 km³ (see table 3.1 below). For the future, the demand for potable water supply, industry and rural areas will increase, while in irrigated agriculture it will decrease due to water-saving technologies and fertility enhancement measures. At the level of 2030, the total required water volume for Uzbekistan should not exceed 60.1 km³ per year.

Table 3.1. Actual and prospective water consumption (demand) by sectors of the economy of Uzbekistan (million m³ per year)

Water users (by priority)	Total water demand	Including by sources		
		Surface water resources	Groundwater resources	Return water
2018				
Utilities	5320	2200	3120	0
Industry	1885	855	1030	0
Agricultural water supply	485	415	70	0
Fisheries	640	460	0	180
Power industry	770	770	0	0
Irrigated agriculture	55100	50000	1100	4000
Total	64200	54700	5320	4180
2030				
Utilities	6200	2450	3750	0
Industry	3500	1580	1920	0
Agricultural water supply	950	810	140	0
Fisheries	640	460	0	180
Power industry	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. Summary explanatory note. Association "Vodproekt" of the Ministry of Water Resources of the Republic of Uzbekistan. Tashkent. 2017. 169 pp.

3.1. GENERAL USE OF WATER IN UZBEKISTAN

According to the “Schemes”, the limit of Uzbekistan as a whole in the Amudarya and Syrdarya River Basins is 63.02 km³ / year with a 100% limit. In the case of reduced water availability, water withdrawal limits are also reduced.

The total annual water withdrawal of the country in the 1980s was about 66.1 km³. After independence in Uzbekistan, there is a clear tendency to a decrease in water consumption and water intake. In particular, in the period from 2011 to 2015, the total water intake was about 53 km³ per year (Fig. 3.1, Table 3.2). However, in the past two years, this level stopped at around 55 km³ per year.

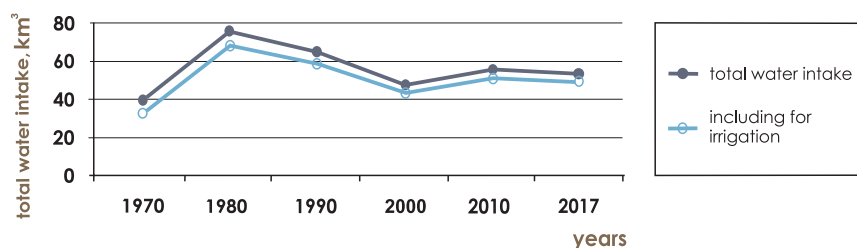


Fig. 3.1 Republic of Uzbekistan: Dynamics of water intakes, km³

Table 3.2. Dynamics of actual water intake from rivers (million m³)

1960		1980		1990		2000		2010		2018	
Totally	Irrigation	Totally	Irrigation	Totally	Irrigation	Totally	Irrigation	Totally	Irrigation	Totally	Irrigation
30780	27900	64910	55510	56611	58156	53265	35687	56611	44718	54700	50000

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 32.5 million people. As a result of population growth, the specific indicator of water consumption per person decreased (Fig.3.3).

Analysis of the use of the water intake limit shows that Uzbekistan since 2005 receives water on average 85.0%, and in dry years, like 2008 and 2011, about 70-75% of the total annual limit. In particular, according to the Ministry of Water Resources of the Republic of Uzbekistan, in the last six years, water was withdrawn as follows:

- 2012 - 56.1 km³ (including 50.9 km³ for irrigation),
- 2013 - 53.9 km³ (48.9 km³),
- 2014 - 51.8 km³ (46.8 km³),
- 2015 - 55.1 km³ (49.9 km³),
- 2016 - 54.5 km³ (49.4 km³),
- 2017 - 55.5 km³ (50.1 km³).

All issues related to the use of water in Uzbekistan are regulated by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan of March 19, 2013 No. 82 “On approval of the regulation on water use and water consumption in the Republic of Uzbekistan”. This Regulation determines the order of water use and water consumption on the territory of the Republic of Uzbekistan (for more details, see section 4.1).

Irrigation is the largest consumer of water and today it uses more than 90% of all water resources of Uzbekistan, although the volume of water used for irrigation in the country has decreased by more than 10 billion m³ since 1980.

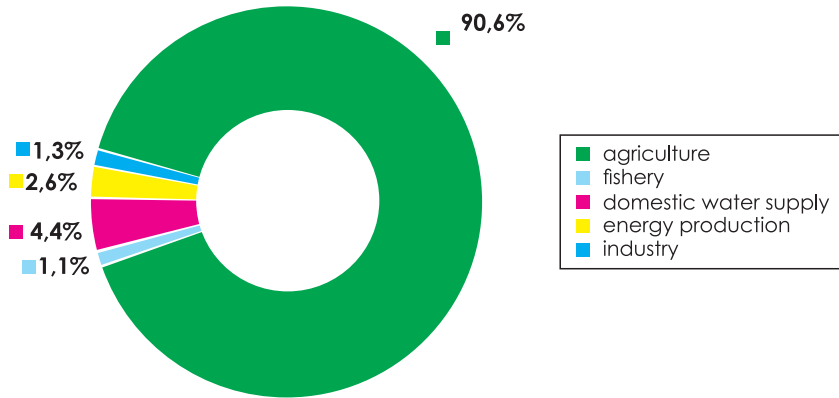


Fig. 3.2. Use of water resources by sectors of the economy of Uzbekistan in 2017

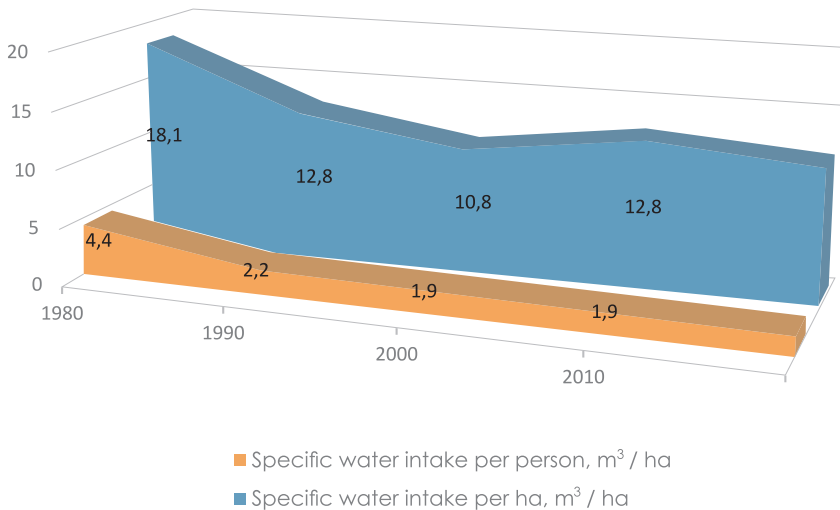


Fig. 3.3. Republic of Uzbekistan: Dynamics of specific values of water consumption for 1 person and per 1 hectare (data from SIC ICWC)

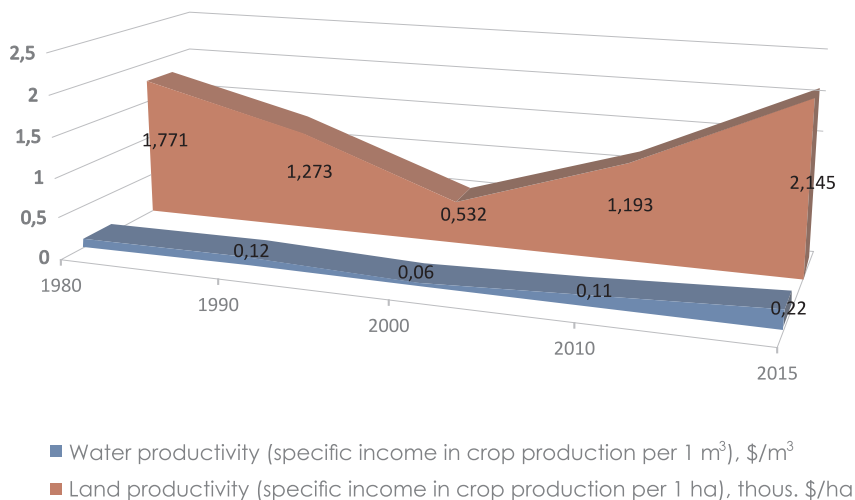


Fig. 3.4. Republic of Uzbekistan: Specific values of water and irrigated land productivity (data from SIC ICWC)

Accordingly, in comparison with 1980, there is a decrease in the specific water consumption in irrigated agriculture and per hectare of irrigation. At the same time, after a sharp decline by 30% in 1990 in the specific consumption per hectare, and per capita by 39%, a further decrease in the first indicator was 9%, and in the second indicator by 28%. This situation is due to a sharper population growth compared with the rate of decline in specific water supply. The indicators of water productivity and the specific cost of water for irrigation vary considerably in the regions of the republic — with an average productivity in the republic of \$ 2,294 / ha (Fig. 3.5).

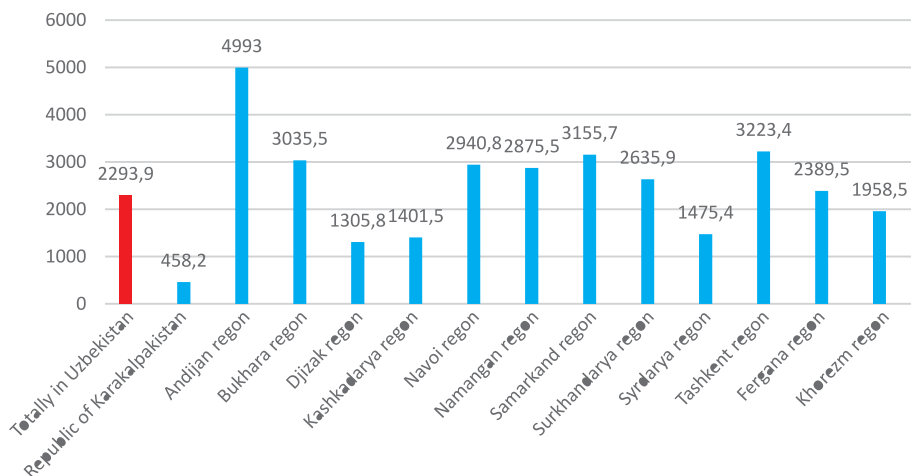


Fig. 3.5. The productivity of irrigated land in 2015 by regions of the Republic of Uzbekistan (data from SIC ICWC)

As can be seen Andijan region has 2 times more productivity, and the Republic of Karakalpakstan – almost 5 times less. This is due to various reasons: the combination of crops (share of commercial crops), the degree of salinization of land, cultivation



technology (in the Andijan region used sowing under the film), water supply, human resources (the deficit is particularly characteristic of Karakalpakstan, Jizak, Syrdarya and Kashkadarya).

<http://suvsoz.uz>

3.2. THE ROLE OF IRRIGATION FOR FOOD SECURITY

The term “food security” appeared in international documents after the grain crisis of 1972–1973, when overproduction of food in developed countries paralleled hunger in third world countries. The problem of food security quickly went beyond national borders and became a subject of discussion for the world community. In December 1974, the UN General Assembly approved the “International Food Safety Obligations in the World” developed by the Food and Agriculture Organization of the United Nations (FAO), where only the most general definitions were defined. In 1994, in the United Nations Development Program (UNDP), food security already understood the availability of basic food for the population. Accessibility was understood not just as the availability of basic foodstuffs, but also free access to them, sufficient purchasing power of the population. In November 1996, during the Rome World Summit, the “Rome Declaration on World Food Security” was adopted. The Declaration reaffirmed “the right of everyone to access to safe and healthy food, in accordance with the right to adequate food and the right of everyone to life”.

There are various approaches to defining the term “food security”, either focusing on food imports, self-sufficiency, or a combination of imports and own food production. Food security is a situation in which all people at every point in time have physical and economic access to sufficient quantitatively safe food necessary to lead an active and healthy life. The Rome Declaration on World Food Security refers to the duty of any state to ensure the right of everyone to access safe and healthy food in accordance with the right to adequate food and the right to be free from hunger.

Food policy is accordingly viewed as a set of measures designed to systematically and effectively address development challenges not only for production, foreign trade, storage and processing, but also equitable distribution of basic foodstuffs, as well as for social development of rural areas.

Food security includes:

- Physical access to food. Food products should be available in the country in the required amount and range (in accordance with the accepted standards of consumption), the supply of food should be uninterrupted. The achievement of this condition is ensured by the state control over external and internal supplies, as well as existing food stocks;
- Economic access to food. Every citizen of the country, regardless of age, property and official status, must have a sufficient level of income to purchase a minimum set of food. The achievement of this condition is ensured both by maintaining a sufficient level of income of the population and by monitoring the level of food prices. There should also be the possibility of self-sufficiency of the population with food at the expense of private farms and suburban areas;
- Food safety. The quality of raw materials and food products must meet the established requirements and guarantee safe consumption. A person should receive with food the whole complex of substances necessary for the normal

development of the body and at the same time be confident in its safety, i.e. in the absence of substances harmful to health and the environment. The increased interest in food safety in the world is due to the increasing number of diseases associated with food poisoning. In addition, diseases caused by poor-quality food can have a negative impact on the state of domestic and foreign trade, as well as on the income and employment of certain categories of the population.

National Food Security– a state of the economy and agro-industrial complex of the country, which, while maintaining and improving the environment, regardless of external and internal conditions, allows the population to continuously receive environmentally friendly and healthy food at affordable prices, in amounts not lower than scientifically sound standards.

The country's food security is a state of the country's economy and agro-industrial complex, which, while preserving and improving the living environment regardless of external and internal conditions, allows the country's population to smoothly obtain environmentally friendly and healthy food at affordable prices, in amounts not lower than scientifically based normal.

The role of food security is related to the fact that food is a basic indicator of human activity. The level of nutrition of the population characterizes the level of economic development of the country as a whole, since the production of food was, is and will be the very first condition for direct producers and all production in general, and the level of food supply to the population is considered as the most important factor and determining the level of social life, the viability of the economic structure and the state structure of each country.

One of the priorities for the development of agriculture – an important sector of the economy of Uzbekistan – is the saturation of the domestic market with food, achieving self-sufficiency in their production and food security. The large-scale transformations and qualitative changes in the sphere of agroindustrial complex carried out during the years of independence of Uzbekistan, the comprehensive balanced policy on optimization of acreage and zoning of agricultural crops allowed not only to increase yields, but also to significantly raise the standard of living of the population.

Before Uzbekistan gained independence, an average of 3 million tons of grain was imported into the country. In 1990 it was collected 2038, 2 thousand tons of grain. That is why there was an acute shortage in the retail chain of the most important food products in the country. According to statistical surveys conducted in 1989, up to 95 % of all food items were sold intermittently in the consumer market, which led to the introduction of a card system for the distribution of basic consumer goods for everyday use in the former USSR. According to the results of surveys of the population of the republic, officially conducted by the statistical bodies in 1989, 89.3% of respondents

believed that they consume insufficient meat products. This figure for dairy products was 56.5%, sugar-55.3%, confectionery-49.55, potatoes-17.5%.

One of the first steps towards gaining sovereignty was the decision taken in 1989 to allocate more than 400,000 hectares of irrigated land for garden plots. In the years of reforms, 550 thousand hectares of irrigated land were additionally allocated as personal garden plots to the population, and their total area amounted to 700 thousand hectares. More than 9 million rural people use this land in their own household.

Further steps to implement market and institutional reforms in the agrarian sector included a change in the structure of sown areas, a decrease of cotton crops almost twice in favor of grain crops. As a result, Uzbekistan, which previously imported more than 80% of its need for grain, gained grain independence. If at the beginning of the 1990s industrial crops, especially cotton, occupied more than half of the total sown area, since 1995 they have been sharply reduced to 36.1%. At the same time, the acreage of grain crops was sharply increased. At that time, they occupied 24% of the total sown area, and accordingly were increased to 44-45%.

As a result of purposeful work on reforming and diversifying agriculture, the production of grain products increased 3.9 times, potatoes - more than 7 times, melons - almost 2 times, vegetables - almost 3 times, fruits - 5.3 times grapes - more than 3.2 times. At the same time, the production of raw cotton has decreased by 27.9%.

In 2015, 12 million 592 thousand tons of vegetables were grown, including potatoes, 1 million 850 thousand tons of melons, 1 million 556 thousand tons of grapes, 2 million 731 thousand tons of fruits.

In 2016, almost 3 million tons of raw cotton, 8.3 million tons of grain, more than 21 million tons of fruits and vegetables were grown, including the production of potatoes in the country amounted to 2958.3 thousand tons (109.7%), vegetables - 11,272.5 thousand tons (111.3%), food melons - 2045.2 thousand tons (110.4%), fruits and berries - 3042.7 thousand tons (110.8%) and grapes - 1735, 3 thousand tons (109.9%). The total volume of agricultural production in 2016 grew by 6.6%.

The average wheat yield in the country reached 55 centners per hectare, and in some areas it amounted to 60-77 centners per hectare, which is a great success of our farmers. High yields were achieved mainly due to the intensification of agricultural production, improvement of breeding and introduction of zoned cotton varieties and cereals, the development of modern agricultural technologies. The yield of grain crops increased 2.8 times, wheat more than 4 times, vegetables and melons almost 2 times, fruits and berries more than 3 times compared with the 1990s.

In order to further improve the capacity of the livestock sector, in 2016, about 5.2 thousand projects for cattle and fish breeding, development of poultry farming and beekeeping farms were implemented through loans from commercial banks worth over 464 billion soums. As a result, as of January 1, 2017, in all categories of farms,

the total number of cattle was 12,165.3 thousand heads (104.5% of the corresponding period of 2016), sheep and goats - 19749.2 thousand heads (103.4%) and poultry - 65758.9 thousand heads (107.7%).

As a result of an increase in livestock numbers, the share of livestock products in total agricultural output increased from 36.6% in 1990 to 41% in 2016, mainly due to an increase in livestock numbers in dekhkan farms, which significantly affected the growth in meat production (in live weight) from 789.1 to 2117.8 thousand tons (almost 2.7 times), milk - from 3034.2 to 9703.3 thousand tons (almost 3.2 times), eggs - from 1231, 8 to 6111.7 million units (almost 5 times).

As a result of the growth of agricultural production and its processing, consumption of consumer products in the Republic of Uzbekistan has increased.

It should be noted that along with the positive results of the implementation of agrarian reforms in the Republic of Uzbekistan, there are also certain shortcomings and problems. On January 14, 2017, an expanded meeting of the Cabinet of Ministers was held, devoted to a comprehensive analysis of the results of the country's socio-economic development in 2016 and the identification of the most important directions and priorities of the economic and social program of the government of the republic for 2017. President of the Republic of Uzbekistan Sh.M. Mirziyoyev pointed out the following disadvantages.

The first is the flaws in optimizing the size of land. There were serious miscalculations in the selection of applicants for the creation of farms.

Secondly, individual farms do not have sufficient working capital, necessary equipment and other material and technical resources, which negatively affected crop yields, the fulfillment of contractual obligations and the profitability of farms as a whole.

Third, due to insufficient organization of work and personal irresponsibility of individual managers in a number of districts and farms, the expected yield of raw cotton has not been obtained. The fulfillment of the task of harvesting grain into state resources in a number of areas has not been ensured.

In the future, qualitative structural changes in agriculture are of fundamental importance. We are talking about a gradual reduction by 2020 of the volume of production and government purchases of raw cotton from 3,350,000 tons to 3 million tons. Due to the reduction in the production of raw cotton by 350 thousand tons, about 170.5 thousand hectares of irrigated land are released. And at the same time, as a rule, low quality lands by Bonitet grade are released, where the cotton yield does not exceed 12-15 centners per hectare, with the average yield of 26.1 centners per hectare achieved in the country. Mostly saline land is released, as well as land in the foothill areas unsuitable for cotton cultivation.

Vegetable crops, including potatoes, fodder, oil crops, will be planted on the sown

areas liberated from cotton as well as orchards and vineyards. As a result of the optimization of acreage and the introduction of modern agricultural technologies by 2020, it is planned to increase the production of cereals to 8.5 million tons with an increase of 16.4 percent, increase the production of potatoes by 35 percent, other vegetables – by 30, fruits and grapes – by 21.5, meat – by 26.2, milk – by 47.3, eggs – by 74.5 percent, fish – by 2.5 times. At the same time, it should be taken into account that the volume of exports of these types of food will increase significantly.

The Strategy of action in five priority areas of development of the Republic of Uzbekistan in 2017-2021 for the modernization and intensive development of agriculture identified large-scale tasks. Among them are the following activities:

- Implementation of an integrated water resources management system by involving all stakeholders and linking it to land management;
- Institutional development in the agrarian sphere, support in carrying out a number of agricultural reforms, development of legal mechanisms for regulating water-land relations;
- Development of socio-economic scenarios and plans for the long-term development of the agricultural sector.
- Restoration of controllability of the agro-industrial complex as a single organizational and legal entity, enhancing the role of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan as an organizer and coordinator of many functions of the agro-industrial complex;
- Rational combination of large, medium and small dekhkan and farm enterprises and enterprises of various forms of ownership, as well as maintaining an effective division of production between these forms of business;
- Ensuring and maintaining price parity in the agro-industrial complex between agriculture and industry, overcoming the movement towards monopolism on the part of agricultural partners in the agro-industrial complex and commercial structures;
- Sufficient level of investment to support the agricultural sector and to use the achievements of scientific and technological progress;
- Development of cooperative systems and links between industry and agriculture;
- Continued implementation of measures to further optimize farms and agricultural lands.

One of the main tasks of food security is to expand the production of its own food products, which allows creating reliable reserves of food and raw materials that ensure the food security of the country from domestic sources, which is of particular importance in the context of rising prices on basic foodstuffs on world markets. It is necessary that growth in food production outpaced population growth. Uzbekistan has achieved self-sufficiency in many major products (Table 3. 2).

Table 3.2. Food resource and self-sufficiency Indicators

Product group	Production, thousand tons		Self-sustainment rate, %	
	1992	2016	1992	2016
Cereals	1997	8261	36,6	80,0
Wheat	964	6940	21,8	80,0
Potatoes	365	2958	57,8	99,0
Vegetable oils	385	274	130,5	76,0
Vegetables	4381	11276	103,2	280,0
Fruits	1163	4778	107,6	140,0
Meat	469	2172	88,8	100,0
Eggs	107	6152	100	100,0
Milk	3745	9703	102,3	100,0

Source: <https://stat.uz/ru/433-analiticheskie-materialy-ru/2049-pokazateli-selskogo-khozyajstva> and the FAOSTAT Food Balance Sheet

As can be seen, the main types of food products (potatoes, vegetables, fruits, meat, eggs, milk) achieved almost complete security, as well as significant production of fruits and vegetables for export.

Dependence on import of wheat has declined significantly since 1992.

Conversely, dependence on imported vegetable oil has increased. This is largely due to slower growth in domestic cotton production, relative to population growth, as well as the reorientation of oil production to non – traditional oilseeds-safflower, sunflower and soybean.



Overall, food imports in Uzbekistan in 2017 is still a significant amount to 1.27 billion US dollars (8.9% in total imports).

Source - <http://suvsoz.uz>

3.3. AQUACULTURE AND FISHERIES

In the early 1960s, the government implemented a large-scale program for the development of fish farming: about 20 fish farms were established in all regions of Uzbekistan (the total area of ponds was about 20 thousand hectares), technologies were developed, research centers, educational and training institutions were established. The leading technology of pond aquaculture was semi-intensive cultivation of carp fish in polyculture. Such fish species as common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molitrix*), silver carp (*Hypophthalmichthys nobilis*) and grass carp (*Ctenopharyngodon idellus*) were grown. The breeding period lasted from late March-early April to October-November, and wintering - from November to March. Commercial fish was produced during the two-year production cycle. In the first year, fingerlings were grown in fish nurseries (10-50 hectares) up to twenty-five-gram weight. After wintering, they were grown in feeding ponds (70-150 ha) to a weight of 500-1000 g. In 70-80 years, the average productivity of fish ponds in Uzbekistan was 3-3.3 t / ha, and in the Tashkent region - 4-4.5 t/ha.

In Uzbekistan, fresh river water is traditionally used to grow fish. However, in recent years, due to water scarcity, fish farms located in river valleys are forced to use salty wastewater (3-5 g/l). In the 1980s, the volume of aquaculture production was 20-25 thousand tons / year.

In 1995-2005, the average volume of aquaculture production in Uzbekistan was 4.2 thousand tons / year with a total value of 4.2 million us dollars. The volume of production peaked in 1990 and amounted to 20.4 thousand tons, then gradually decreased to 3.8 thousand tons in 2006.

Today, in all regions of the country there are 1-2 full-cycle fish pond farms. Currently, only the state fish nursery of the Tashkent region is owned by the state, all other fish farms are private.

In 2014, fish production in the country almost twice exceeded the level of 1991 and amounted to 46.5 thousand tons (in 1991 – 27.2 thousand tons). At the same time, about 30.5 thousand tons were grown in artificial ponds, and more than 16 thousand tons were caught in natural reservoirs.

In addition to local fish species such as carp, grass carp, carp, asp, snakehead, catfish and carp, cultivation of tropical species has also been cultivated in the country - African catfish, tilapia, trout, and Siberian sturgeon.

In October 2014, the Government of Uzbekistan and the Food and Agriculture Organization of the United Nations (FAO) signed a country framework for the period from 2014 to 2017. The agreement, among other things, provides for the solution of the problems of the conservation and rational use of fish resources, the production of high-quality fodder for fish, the production of aquaculture products, and the development of networks for the supply of fish and fish products.

In 2017, about 85 thousand tons of fish were grown in Uzbekistan. In total, over 3,600 fish farms operate in the country, and the total area of water bodies occupied by growing fish products exceeds 595 thousand hectares.

According to analysts, for Uzbekistan the minimum required rate of fish consumption is 12 kg per person per year (in the world this figure is 16.6 kg per person). With a modern population of more than 32 million people, the absorptive capacity of the domestic market is more than 380 thousand tons.

By 2020, Uzbekistan will start production of cold-blooded fish species - trout, sturgeon and salmon. A project to grow delicatessen worth 10 billion soums will be implemented in the foothill areas of Andijan, Jizak, Kashkadarya, Namangan, Samarkand, Surkhandarya and Fergana regions. According to the official forecast, the annual production of new products will be up to 100 tons per year. **This is one of the points of the Program of Measures to Accelerate the Development of the Fish Industry in the Republic for 2018–2023, approved by the President of Uzbekistan on April 6, 2018.** This document includes:

- Improvement of selection and breeding works for intensive cultivation of valuable species of fish, fish planting material (fry) on the terms of public-private partnership;
- Expansion of production of fish products (canned food, caviar, flour, delicacies and others);
- Implementation of measures for the development of aquaculture, efficient and rational use of land and water resources;
- Further development of scientific research in the field of fish farming;
- Improvement of training, retraining and advanced training of personnel;
- Increasing export potential of the fish industry;
- Increasing feed base for the development of fish farming, improving the culture of fish consumption, as well as further enhancing the role of the “Uzbekbaliksanoat” in managing and coordinating the fish industry;
- Developing conditions for strengthening the material and technical support of fish farms.

For the accelerated development of fish farming in the Kuyichirchik district of the Tashkent region, a free economic zone “Balikishlabchikuruvchi” was established with a 30-year operation period with the possibility of its further extension. During the entire period of operation, special tax, customs and foreign exchange regimes are in force in the territory of the “Balikishlabchikuruvchi” FEZ.

In 2018, Uzbekistan is expected to produce about 150 thousand tons of fish. This is 2.5 times higher than the average annual production of recent years (about 60 thousand tons). The three leaders in fish production this year will include the Tashkent region with 20.1 thousand tons of fish, Karakalpakstan - 20 thousand tons and Khorezm region - 13.1 thousand tons. The volume of water consumption of pond farms in the republic in 2018 will be 608 million m³.

3.4. HOUSEHOLD WATER SUPPLY IN UZBEKISTAN

The municipal sector of the republic is the most important part of the territorial infrastructure, and its activities largely form the living environment of the person – the comfort of housing, settlements, provides life support.

The development of the industry, the effectiveness of its activities form the appropriate quality of life of the population, reflect the degree of life and lifestyle, serve as one of the prerequisites for the development of economic potential. Everything is interconnected: quality services are the key to a healthy society.

Over the years of independence, large-scale work has been carried out in Uzbekistan to improve the provision of quality drinking water to the population. Consistent implementation of the most important priorities, programs and projects for the development of drinking water supply and Sewerage systems of the republic has significantly improved the condition of centralized water supply and sewerage services in cities and regions, including rural areas.

Only in 2011-2016 about 13 thousand kilometers of water pipelines and water supply networks, more than 1.6 thousand water wells, as well as 1.4 thousand water towers and reservoirs were built and reconstructed in the Republic. As a result, including by attracting grants and loans from international financial organizations, numerous settlements that did not have access to drinking water are provided with water supply that meets modern requirements for water quality and safety.

By attracting grants and loans from international financial institutions, such as the Asian development Bank, the World Bank, the Islamic Development Bank and others, numerous settlements without access to drinking water have been supplied with water that meets water quality requirements.

At the same time, there are still a number of unresolved problems related to the provision of quality drinking water and sewerage services to certain settlements, especially in the Republic of Karakalpakstan, Bukhara, Jizak, Kashkadarya, Surkhandarya, Syrdarya and Khorezm regions.

The constant increase in the number of families and makhallas, the construction of hundreds of new residential areas, settlements and the expansion of cities require the adoption of effective measures to radically improve the water supply and sewerage system, aimed at the modernization of water intake and sewage treatment facilities, water pipelines, pumping stations, distribution centers, water supply and sewerage networks on the basis of modern energy-saving and resource-saving technologies.

Taking into account these important tasks, on April 20, 2017, the President of Uzbekistan adopted a resolution “**On the program of integrated development and modernization of drinking water supply and sewerage systems for 2017-2021**”, which is aimed at creating more comfortable and favorable social and living

conditions for the General population, especially in rural areas, taking into account the continuous provision of high-quality drinking water availability for consumers, as well as improving the efficiency of water supply and Sewerage services in the Republic for the period 2017-2021. In particular, the resolution approved:

- Summary and the address parameters of the Program of complex development and modernization of water supply systems and sewage systems for the years 2017-2021, in the context of regions and settlements, which envisages the construction and reconstruction of 10.2 thousand kilometers of water pipelines and water supply networks, 1677 units of water wells, 1744 units water towers and reservoirs, installation of 1440 units of pumping equipment;
- Targeted program for the construction and reconstruction of the drinking water supply system for interregional purposes and especially important facilities for the period 2017-2021, which provides for the implementation of major projects for the construction and reconstruction of 20 water supply facilities, laying 302 kilometers of water pipelines and water supply networks;
- Targeted program for the construction and reconstruction of the drinking water supply and sewerage system of the Republic of Karakalpakstan and the regions for 2017-2021 through attraction of loans from international financial institutions for implementation of 36 investment projects.

In 2017-2021, 4.8 trillion soums will be allocated for financing of the Program, including 2.2 trillion soums from the State budget, 2.6 trillion soums or 730.7 million dollars from international financial institutions (see table 3.3).

To coordinate the work and ensure control over the implementation of the Program, the Republican Commission was approved. The resolution also provides for the creation of the “Clean water” Fund, the funds of which will be directed to the further development and modernization of the entire water supply and sewerage system, providing the population of the Republic with quality drinking water, especially in rural areas.

Along with this, for further reliable operation of water supply system facilities, certification of water supply facilities of each locality with the creation of an electronic database of water supply system facilities is provided. Implementation of the resolution will allow:

- First, to drastically improve water supply and sewage systems in cities, districts and communities;
- Secondly, to increase the coverage of the population with centralized water supply in the republic to 84 %, and in some regions to 90 %;
- Thirdly, to create more comfortable and favorable social and living conditions for the general population, especially in rural areas.

In short, the implementation of these extremely important tasks will serve the socio-economic development of the country, the improvement of cities and villages, the

further improvement of the level and quality of life of our people.

One of the largest and most developed systems is the water supply system of Tashkent city and part of the Tashkent region (Kibray district, Zangiata district), which is served by the state unitary enterprise “Suvsoz” (see box). Water supply of the city of Tashkent is carried out from seven water intake facilities with an installed capacity of 2326 thousand m³ per day, most of which are operated for more than 40-45 years.

<http://suvsoz.uz/vodosnabjenie/structure/>):
SUE “Suvsoz” covers 99.7% of the city with centralized water supply.
Water surface area - 340 km²
The average amount of water supply per person per day - 978 l
The maximum amount of water supply per person per day is 1,112 liters
The average volume of water supply to Tashkent per day is 2,066,616 m³
Number of users of water in Tashkent - 2 309 000 people
The total volume of water consumption by the population of the city per year is 754,314,877 m³

Table 3.3. Summary parameters of the program for the integrated development and modernization of drinking water supply systems for 2017-2021

№	Regions	Types and objects of work:									
		Water conduits	Water supply networks	Wells	Water towers	Reservoirs	Power lines	Transformers	Pump stations	Chlorinators	Fencing
		km	km	units	units	units	km	units	units	units	ML
	Totally	1677,9	8525,4	1677	1517	227	423,2	1016	1440	805	169132
	Incl.										
1	Republic of Karakalpakstan	200,7	582,2	44	3	14	1,2	3	38	14	3240
2	Andijan region		841,9	216	145	6			4	5	3290
3	Bukhara region		549,2	8	12	4	7,0	13	13	13	1400
4	Jizakh region	86,7	424,5	101	47	34	37,0	77	75	31	15180
5	Kashkadarya region	28,7	425,5	74	34	30	7,4	60	60	39	
6	Navoi region	93,6	556,7	25	19	46	8,6	27	41	37	5730
7	Namangan region	115,6	95,4	57	6	11	27,2	17	50	23	2729
8	Samarkand region	86,8	893,5	336	272	6	58,7	278	312	302	90 858
9	Surkhandarya region	623,1	1 317,1	321	591	12	168,8	304	412	267	4300
10	Syrdarya region	94,0	680,1	156	149	1		128	76	11	8668
11	Tashkent region	77,9	412,1	99	74	8	7,0	48	10	43	12559
12	Fergana region	44,2	919,1	228	165	1	43,3	4	239	1	1978
13	Khorezm region		752,5			24		12	15		2400
14	Minjilkoobs-lujivaniya	226,7	75,8	12		30	57,0	45	95	19	16800

The major water works of the water supply system of Tashkent²¹

1. Bozsu waterworks - since 1931 they have been carrying out open water intake from the Boz-Su canal, providing the city with 10% of the total capacity of all waterworks in Tashkent and maintaining water pressure in the central areas of the city



Currently, due to the development of the city, Bozsu waterworks were located directly within the city, and initially Bozsu waterworks were located on the outskirts of Tashkent on the banks of the Boz-su canal. The construction covers a total area of 74 hectares. This structure has an installed capacity of 235 thousand m³ per day.



<http://suvsoz.uz>

At Bozsu waterworks there is a three-stage water purification technology:

- Settling in horizontal sedimentation tanks with preliminary coagulation
- Filtering on fast filters
- Drinking water disinfection

2. Kibray waterworks - since 1955, they have carried out underground water intake from 93 wells located on both banks of the Chirchik River, providing 19.6% of the total waterworks of the city. The source of water supply is a powerful stream under the Chirchik River valley.

The area of waterworks is about 1000 hectares. The initial capacity of the Kibray waterworks is 32 thousand m³ per day, currently their installed capacity is 455 thousand m³ per day. The structure includes two pumping stations of the 2nd lift with tanks with a capacity of 10 thousand m³. The area of buildings is about 1000 hectares.

Kibray waterworks have 3 sanitary protection zones:

- the first zone includes a strictly protected area of the facilities;
- the second zone - the territory along the Chirchik River from the buildings to Gazalkent city;
- the third zone - from Gazalkent city to the Charvak reservoir.



<http://suvsoz.uz>

²¹ Material of State Unitary Enterprise "Suvsoz": www.suvsoz.uz

3. Since 1960, **South waterworks** have been carrying out underground water intake from 42 wells from underground sources on the right bank terrace of the Chirchik river valley, providing drinking water to a part of the Sergeli, Yakkasaray and Chilanzar districts of the city, which is 6.2% of the total waterworks of the city.



<http://suvsoz.uz>

The initial capacity of the South waterworks is 6 thousand m³ per day, and currently its capacity is 143 thousand m³ per day. The facilities are located on a total area of 60 hectares. The facilities also include a second-lift pumping station with tanks with a total capacity of 10 thousand m³. In addition to its own water, the South waterworks pumps the water supplied by the Kuyluk water pipeline from the Kibray waterworks to the city.

The southern waterworks is located in the city and has only one belt of sanitary protection zone, which includes the very territory of the building, fenced around the perimeter.

Also, the South waterworks includes the Kuylyuk-2 Waterworks, which were transferred to the balance of the trust in 1996, previously supplied with a boiler room of the TashTPP. Today, the Kuylyuk-2 waterworks provide water for a portion of the Sergeli and Chilanzar districts of the city. They consist of 9 wells that supply 29 thousand m³ of water per day.

4. Since 1969, **the Kadirya waterworks** have been carrying out open water intake from the Boz-Su canal through the discharge channel, providing 60% of the total drinking water demand in the city.

The initial capacity is 225 thousand m³ per day. Its productivity is 1 million 375 thousand m³ per day. The total area of the buildings is 138 hectares. A three-stage water purification technology is provided at the Head Facilities of the Kadirya water pipeline:

- Settling in horizontal sedimentation tanks;
- Filtering on fast filters;
- Water disinfection.



<http://suvsoz.uz>

Due to the favorable high-rise location of the facilities, purified drinking water is supplied to the city by gravity, which significantly reduces its cost.

5. The Kara-Su waterworks - since 1934 they have been carrying out underground water intake from 11 wells, which is 2.2% of the total capacity of all waterworks of the city.

The waterworks “Kara-Su” are located in the city - on the southwestern outskirts of the city. The initial capacity is 5 thousand m³ of water per day, and now they have 4 wells directly on the structures, with a capacity of 28.5 thousand m³ of water per day, and 7 more wells are located separately in the city, with a total capacity of 23.7 thousand m³ per day. In general, at present, the facilities have a capacity of 52.2 thousand m³ of water per day. The waterworks “Kara-Su” have one belt of sanitary protection zone.

6. The waterworks “Sergeli” - since 1966 they have been carrying out underground water intake from 9 wells, which is 1.7% of the total capacity of all waterworks of the city.

Water supply facilities “Sergeli” are located on the territory of the Sergeli administrative district. They include 9 wells, 2 tanks of clean water with a capacity of 1 thousand m³ each and a pumping station of the second lift. The initial capacity was 10 thousand meters of sup>3 water per day, by 1988 it increased by 2 times. The sanitary protection zone consists of two zones.

7. Water supply facilities “Bektemir” - since 1992 carry out underground water intake from 11 wells, serving mainly the array “Vodnik” and the village “Binokor”, which is 1.1% of the total capacity of all water supply facilities of the city.

Water supply facilities “Bektemir” are located on the territory of Bektemir administrative district. It includes 11 dispersed wells and 4 reservoirs of clean water with a total volume of 2.5 thousand m³. The capacity of these facilities is 25 thousand m³ of water per day.

Also in the city there are 149 pumping stations III-lifting and three water distribution units: Mirzo-Ulugbek, Chilanzar and Sergeli.

Water pipes were installed in the 60s. The length of the city water supply system at the moment is 3,545 km, of which water pipes with a diameter of 600 mm and above have a length of 639 km, water pipes with a diameter of 50 to 500 mm have a length of 2,906 km.

The number of wells and chambers in the city water supply is 30,745 pieces, fire hydrants - 10,649 pieces, intersections with water barriers, underground and railways - 475 places, valves with a diameter of 50-1600 mm, there are 31,641 pieces.

Drinking water in Uzbekistan in all respects meets the requirements of the State Standard O’zDSt-950-2000 on “Drinking Water”.

3.5. WATER CONSUMPTION IN INDUSTRY OF UZBEKISTAN

Industry is a fundamental part of the country’s economy. In a broad sense, the concept of “industry”, according to the” Encyclopedic Dictionary of Brockhaus and Efron”, means” human economic activity, which is conducted as a craft and aimed at the creation, transformation or movement of material objects”, in a narrower sense - refers to the processing of raw materials into objects suitable for consumption.

Modern industry is characterized by a high degree of specialization. As a result of the deepening of the social division of labor, many industries have emerged, forming, in the aggregate, the structure of the industry.

Currently, there are more than 49 thousand industrial enterprises in the Republic, of which 3.1% are mining and quarrying, 94.4 – manufacturing enterprises, 0.7 – engaged in electricity, gas, steam and air conditioning, 1.8 % - water supply, sewerage, waste collection and disposal.

At the same time, the structure of industrial production as of January-December 2017 looks different, i.e. the contribution of mining and quarrying in the total volume of industry amounted to 12.7%, manufacturing – 78.1%, electricity, gas, steam and air conditioning – 8.4%, water supply, Sewerage, waste collection and disposal – 0.8% (Fig.3.6).

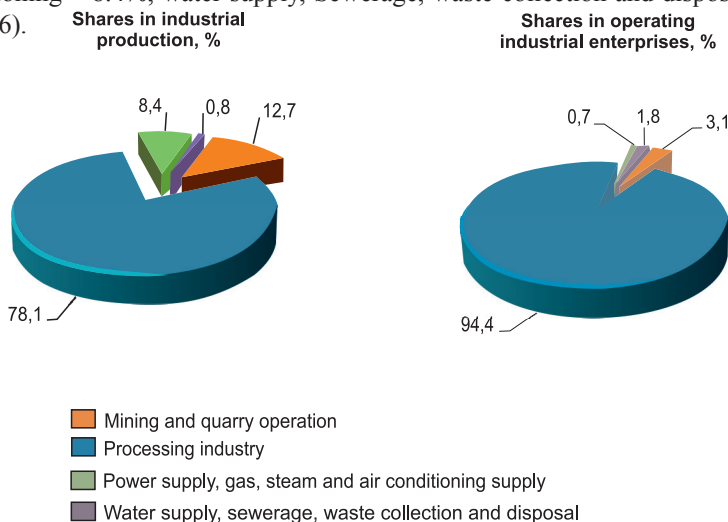


Figure 3.6. Structure of industrial production and operating industrial enterprises by industry sections in the Republic of Uzbekistan for 2017 (<https://stat.uz>)

For comparison, we can say that in France the share of manufacturing in total industrial production is-85%, the Federal Republic of Germany – 77%, Italy – 76%, the Russian Federation – 68%, the Republic of Kazakhstan – about 40% and the Republic of Uzbekistan – 78.1%.

It is important to note that the adoption of the Decree of the President of our country “on the formation of the Ministry of Innovative Development of the Republic of Uzbekistan” of November 29, 2017 № UP-5264, will be an additional impetus to ensure the accelerated innovative development of all sectors of the economy and social sphere on the basis of advanced foreign experience, modern achievements of world science, innovative ideas, developments and technologies, including the development of the country’s industry.

According to the Act on water and water use (1993), the water requirements of the industry are a priority and are fully covered (without limits).

The industry of Uzbekistan carries out 1.7 km³ of water annually, of which only 0.87 km³ is consumed irrevocably. Almost half of the water withdrawn is returned in the form of industrial effluents that pose an environmental threat to the environment. More than five hundred industrial enterprises dump about 0.15–0.20 km³/year. Poorly treated wastewater containing salts of heavy metals, fluorides, phenol, petroleum products, the whole group of nitrogen, as well as biological and other pollutants, specific to individual industries, to surface water bodies. From 1 to 5 percent of industrial waters from a hundred enterprises are discharged into water courses without any purification.

Industrial production, is considered as the main polluter of water with heavy metals, phenols and petroleum products. Industrial, domestic/municipal and collector-drainage waters discharged into waterways contain from 8 to 15 pollutants, the concentration of which exceeds the Maximal Permissible Concentration (MPC) values for domestic/drinking water and water for fish reservoirs by 2-10 times.

Total consumption for industrial needs today is 1.7 km³/year, and will increase to 3.0 km³/year by 2030. In recent years, the share of reuse of industrial waters has increased, the highest degree of reuse is observed at industrial enterprises in Tashkent, Navoi and Fergana regions. (The results of the activities of the State Committee of the Republic of Uzbekistan for Nature Protection for 2016).

An example of sustainable water management in industry is the “SamAvto” enterprise in Samarkand, which produces buses and trucks. Since production processes have an impact on the environment, environmental problems have been taken into account at the plant design stage (ISO 9001 from 1991 to 2007, and ISO 14000 from January 2008). The company uses underground water from artesian wells and has a backup connection to the municipal water supply network. For this purpose, the company needs a special permit based on hydrogeological research. During the production cycle, one vehicle needs about 3 m³ of water. Using multi-stage cleaning equipment consisting of mechanical and chemical cleaning processes and, at the final stage, the process of ion exchange with recoverable materials, most of the purified water is reused in the painting shop. The remainder of the treated water is discharged into municipal sewer networks, for which the company must make payments in accordance with the readings of water meters and analyzes of residual concentrations of pollutants. Scheduled inspections are carried out once every 2-3 years, but if irregularities are

found, the frequency of inspections is reduced to one year.

Currently, the total industrial water consumption in Uzbekistan in the amount of 1.85 km³ per year is covered by water intake from groundwater - 1.03 km³ and 0.85 km³ - from surface sources.

3.6. IMPLEMENTATION OF WATER-SAVING TECHNOLOGIES IN IRRIGATION

The peculiarity of the situation of the last decades in the water sector of Uzbekistan is that the volume of water demand exceeds (especially in low-water periods) the amount of technically accessible water resources in the sources (rivers). Against the background of population growth and the growth of socio-economic needs, this creates problems in ensuring general water security, and, in particular, for the product and environmental components of this security.

One of the priority solutions to these problems is the implementation of water conservation and water management measures, which are divided into two parts:

- Water saving measures for water delivery to consumers
- Water saving measures when using water.

Today, the state is responsible for the delivery of water to consumers in irrigated agriculture, which is represented by the Ministry of Water Resources and all its bodies, which have on their balance the huge infrastructure of water intake, storage and delivery to the border of the final water consumer. The state, in addition to providing irrigated agriculture with the required (expedient) volumes of water, is interested in reducing the costs associated with transporting and diverting unnecessarily withdrawn water volumes and redistributing the released water among other sectors of the economy, taking into account environmental requirements. That is, the State is interested in reducing the volume of water taken from a source, increasing the efficiency of water transportation to water consumers, which is very important in the absence of paid water use.

The main goal of agricultural producers (end-users of water) is to obtain maximum income from agricultural production on irrigated lands. Therefore, as water consumers, they have no direct incentives for water conservation, especially in the absence of paid water use. However, given that there is an increase in the shortage of water resources, agricultural producers should achieve their main goal in conditions of limited water use, in which they actually receive an average of 80-90% of the required volume of water. The limited water use that has a place in Uzbekistan today plays a major role in encouraging water users to save and rational use of water. It should be remembered, however, that this powerful lever of water conservation with unreasonable use can adversely affect the ameliorative state of irrigated land. Further mobilization of incentives for water saving at the level of water consumers in irrigated agriculture will occur during the transition to economic mechanisms (payment for water supply services) and measures to manage the demand for water.

Changes are taking place in the irrigated agriculture of Uzbekistan related to the restructuring of agriculture and water management. Of course, they also affect the scope of water management in terms of water delivery to consumers. The following are the problems faced by water authorities:

- The number of independent water users increased by several orders of magnitude;
- Automatic transfer of a significant part of the former on-farm irrigation network to the inter-farm-inter-farm (at the WUA level);
- Today there are no clear instruments for linking different levels of water supply from the standpoint of reducing water losses at the junctions of the hierarchy (due to inconsistency of requirements for water and water supply, weak information binding mechanism);
- The level of monitoring of water supply and drainage is very low, resulting in a decrease in the accuracy of water accounting. This is also reflected in the poor efficiency of the mechanisms for paid water use;
- The structure of the acreage has changed (especially the large-scale increase in the area of winter wheat), which affected the irrigation regime;
- Changes in irrigation regime were reflected in the operating conditions of irrigation systems (water supply is carried out without stopping all year round).

It should be noted that the irrigation systems, and especially in the massifs of the new development, were previously designed on the basis of a certain crop rotation structure established by the policy makers, i.e. in the calculation of a specific calculated hydromodule. The current, often spontaneous, change in the structure of crops, without taking into account the capacity of the irrigation network, provokes a decrease in water availability and, as a result, the productivity of irrigated land.

All these problems at the level of water supply are aggravated against the background of limited opportunities for large-scale modernization of the main and inter-farm irrigation systems.

The lowest level of the water sector in irrigated agriculture where water is used is farms. The efficiency of the entire irrigated agriculture water management complex depends on how efficiently and productively water is used at this level and how economically viable the cost of water for the crop produced is to a large extent.

In this regard, it is important to search for solutions to improve the efficiency of water use for irrigation of crops, which could have an effect mainly due to clear planning and water management at the farm level. At the same time, it is necessary to assess the feasibility of using more advanced irrigation methods, such as drip, sprinkling, and subsurface irrigation in those natural and economic conditions and in those crop formulations where the water saving effect can be manifested most significantly in the process of applying these methods.

At the level of water use a fairly wide range of issues emerges that need to be addressed:

- Need for appropriate planning system of water allocation and water use at WUA level – the farmer;
- Requires clarification of hydromodule zoning and water consumption of crops;
- Optimization of reclamation modes against the background of the real state of drainage and irrigation techniques;

- Development of skills of agricultural techniques that increase soil fertility;
- Introduction of perfect irrigation methods;
- Increasing financial incentives for water users to save water – the transition from per-hectare payment for services on water delivery to the payment for services is based on the submitted volume of water.

In order to promote progressive methods of irrigation (drip, sprinkling, discrete and high-frequency irrigation), pilot demonstration facilities have been created in the republic. They are used to work out technological maps of agricultural crops cultivation in combination with irrigation technology. The government supports various forms of subsidies for their widespread introduction and dissemination.

On August 4, 2017, the presidential decree № UP-5134 “On measures to radically improve the activities of the Ministry of Agriculture and Water Resources” created the basis for a serious reorganization of the Ministry in order to increase the productivity of land and water with special attention to the following areas:

- Implementation of a unified agrotechnical and water management policy aimed at comprehensive modernization of the industry, introduction of science and technology, modern resource - and water-saving agricultural technologies, advanced domestic and foreign experience in the field of agriculture and water management.
- Improving the principles and system of water resources management, ensuring their careful and rational use, improving the ameliorative status of irrigated land, reconstruction and modernization of water facilities, hydraulic structures.
- Ensuring, on a systemic basis, the close integration of education, science and production, training, retraining and advanced training of personnel, taking into account the current and future needs of the agriculture and water sector in highly qualified specialists.

It is considered that the basis of the fight against irrational water use in water management systems is to increase the efficiency of two types of systems: technical and organizational. Increasing the technical efficiency of water supply systems is achieved, as we all know, by eliminating leaks in the network, combating filtration in irrigation canals lining or transfer of earthen canals in pipes, trays, the introduction of automation, etc. The increase in organizational efficiency is achieved by preventing discharges, idle runs of water through channels, elimination of unauthorized water intakes, construction inside the system reservoirs that capture excessive supply, as well as daily regulation basins that equalize the daily unevenness of water supply and water intake.

However, no less attention should be paid to eliminating the uneven distribution of water between the branches of the channels of a smaller order or between water users. Any distribution system, including water management, is characterized by entropy, which is the more, the more steps in the hierarchy and the less degree of regulation and restrictions. Water management systems are also characterized by an increase in

the degree of deviation from the average water supply as they move away from the water source. Thus, the task of reducing unproductive water costs in the network is reduced to the maximum organization of the order and control of the operating bodies.

In 2005, SIC ICWC proposed a certain systematization of measures to prevent water losses at various levels of the water management hierarchy - see Table 3.4.

Table 3.4. Causes of loss of water productivity in irrigation systems and measures to eliminate them [Dukhovny V.A., et al., 2005]

Hierarchy level	Reason of water loss	Prevention measures	
		Type	Description
Basin	Instability of head intake and water disposal due to:		
	• political friction (upstream-downstream);	legal	Agreements
	• violation of planned water supply schedules;	organizational	creation of a body or the development of regulatory procedures;
	• water over- intake at the upper water intakes;	legal	•agreements and penalties; •improving the accuracy of the distribution system SCADA organization of water accounting and losses
	• undercounting of losses at the upper levels;	technical	control of water supply from drainage water
	• instability of the water supply source	technical	organization of water supply and water distribution systems
	• unmonitored distribution	technical	organization of water supply and water distribution systems

Canal system	• lack of a distribution planning and scheduling system	technical	• preparation and implementation of management rules; • plan modeling and adjustment
	• lack of discipline for water distribution and planning	organizational technical	• rules of water accounting and control; • implementation of GIS and water use plan
	• water over- intake / over schedule	organizational, economic	• penalties
	• lack of water accounting	technical	• introduction of hydrometry; • implementation of SCADA; • development of information system;
	• lack of distribution order	technical	• introduction of water circulation; • attraction of all types of waters
WUA	• stochasticity and irregularity of requirements	technical measures	• water use plan; • method for water distribution between different groups; • water circulation methods (Warabandi, etc.)
	• lack of balance of water supply and water accounting	technical measures	•introduction of accounting tools; • Information system; • dispatching
	• lack of interest in water conservation	financial measures	• awards to WUA employees; • fines and benefits; • WMO payment system
	• lack of clarity in terms of irrigation	technical	• daily planning and adjustment of water supply; • forecast of water requirements system
Household	• lack of water use plan	technical	• training and water use planning
	• inappropriateness of irrigation scheme	technical	• recommendations on the technique and methods of irrigation
	• underestimation of weather fluctuations	technical	• advisory services
	• uneven moistening	technical	• GIS, recommendations on land leveling
	• yield loss due to land reclamation condition	technical	• improved drainage performance

Required investments in water-saving technologies

The achievement of potentially possible yields, while reducing water costs, due to well-known measures, namely the use of drip irrigation, sprinkling and laser planning of irrigation areas. These technologies allow to reduce water consumption by 10-40% compared to the used furrow irrigation. However, these methods of improving the efficiency of water resources use require significant investments (Fig. 3.6), for the payback of which it is necessary, according to expert estimates, to increase the yield by at least 20-30%.

Certainly, in the conditions of a decrease in the water availability of rivers and, accordingly, water availability, the main, effective measure for increasing the efficiency of irrigation water use in crop irrigation is the use of more advanced irrigation methods and means.

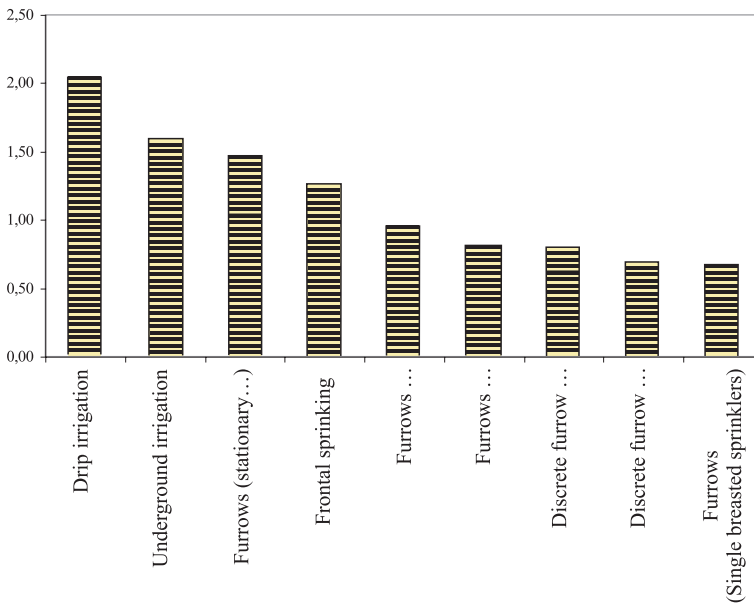


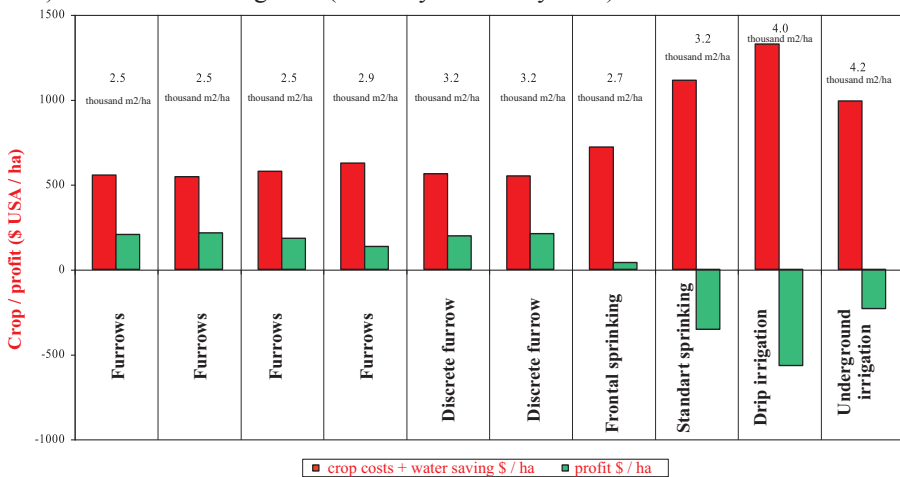
Fig. 3.6. Required investment per 1 m³ of saved water (SIC ICWC)

In the near future, we can only talk about improving existing methods of surface irrigation by optimizing technologies and organizing irrigation, reviving some of the rational irrigation techniques used earlier in Uzbekistan (multi-tiered irrigation, alternating irrigation and dry row spacing).

Of the most effective water-saving irrigation methods, methods such as subsurface, drip, and sprinkling are very widely known. However, in each specific case, the aspect of the expediency of introducing capital-intensive methods and means of improving irrigation should be decided on the basis of thorough technical and economic calculations.

As the practice of the last five years shows, with the introduction of capital-intensive water-saving methods, taking into account the costs associated with this introduction, the real profits of farms are still small, and the introduction of stationary sprinkling systems and subsurface irrigation is currently associated with losses for farms, i.e. impossible without state support (Figure 3.7).²²

Alternative options for the most capital-intensive methods of water saving (drip irrigation, soil irrigation, sprinkling) are less capital-intensive methods: land planning in strips for a horizontal surface or a slope of <0.0005 and discrete regulation of water supply to furrows. This is followed by water-saving technologies that are traditionally used in farms with a high culture of irrigated agriculture and do not require investment for implementation: irrigation through the aisle (on loamy and clay soils) and multilevel irrigation (on sandy and loamy soils).



Picture. 3.7. Costs and profits of farms in the implementation of water conservation (for example, cotton with a yield of 3.5 t / ha in the III hydromodule region). The top lines show the specific volume of possible water savings relative to normal furrow irrigation (Source: SIC ICWC)

At the moment, the discrepancy between the purchase prices of agricultural products and the prices of energy and equipment, actually close to the prices of the world market, does not contribute to the interest of farmers to invest in the modernization of irrigation equipment. The interest and initiative of the farmers themselves should be a decisive factor in the application of perfect irrigation techniques.

The system of increasing the level of rational water use should provide for the purposeful work of all stakeholders in the effective use of water in four interrelated directions:

²² Currently, the profitability of drip irrigation systems can be provided only on the 2nd, 3rd year of cultivation of crops with the free sale of fruits and vegetables.

- Improvement of the legal framework
- Improvement of the regulatory framework
- Revival of irrigation equipment production
- Creation of a network of demonstration systems and sites for teaching practical techniques of rational water use and legal issues of water sharing
- Creation of zonal centers for introducing advanced methods into the practice of irrigated agriculture.

Based on this, it is advisable to develop a strategy for a national system to improve the rationality of water use, taking into account the specific features of irrigated agriculture in natural climatic zones and national laws on land and water.

The scheme of the integrated use of water resources of the Republic of Uzbekistan until 2027 suggests the following changes in the structure of irrigation equipment on the irrigated lands of Uzbekistan in the period 2018-2027 (in thousand hectares):

Irrigation technique	2018	2027
Furrow irrigation by alternating between rows (through the furrow)	724,7	0
Shortened furrows irrigation	2493,3	520,48
Irrigation by furrow shielded by plastic film	58,9	850,72
Furrow irrigation using flexible hoses	164,1	1148,04
Irrigation by free flow (alfalfa and feed crops)	232,4	872,9
Irrigation by flooding (fig.)	307,8	55,9
Drip irrigation	34,9	860,1
Other methods	207,1	0
Total irrigated area	4222,7	4308,14

In this case, the overall efficiency of the system will grow from 0.67 in 2018 to 0.71 in 2027. As a result of changes in crop patterns and the introduction of the above irrigation methods, the total water intake in the country for irrigation will decrease from 57474 million m³ in 2018 to 48030 million m³ in 2027.²³

Presidential Decree No. PPP-4087 of December 27, 2018 “On urgent measures to ensure the widespread use of drip irrigation technology in cotton production” approved a number of incentives for cotton producers and local producers of water-

²³ Scheme of integrated use of water resources of the Republic of Uzbekistan until 2027. Summary explanatory note. Association “Vodproekt” of the Ministry of Water Resources of the Republic of Uzbekistan. Tashkent. 2017

saving technologies to facilitate their introduction throughout the country.

To implement the provisions of this presidential instruction, the Cabinet Of Ministers of the Republic of Uzbekistan adopted resolution No. 103 of February 6, 2019 «On approval of the regulation on the procedure for covering the costs associated with the introduction of drip irrigation, raw cotton producers». An overview of the procedures for implementing incentives for water conservation in cotton cultivation is shown in the diagram below.

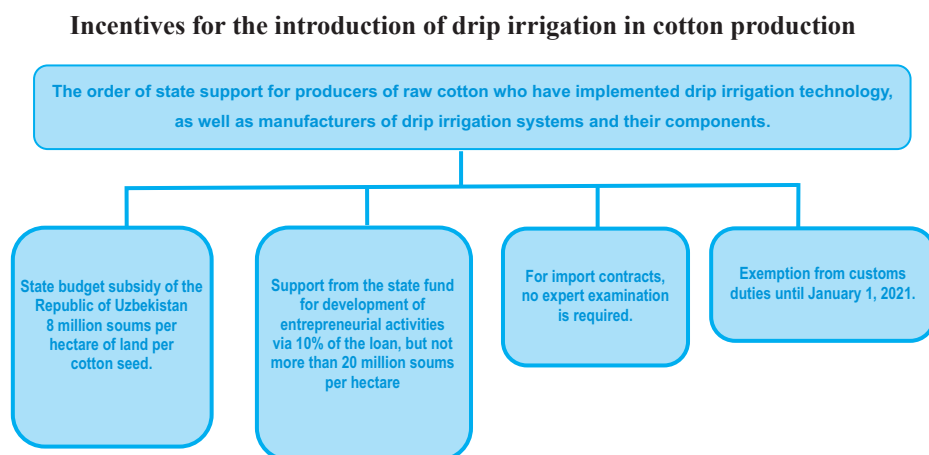


Figure 3. 8. Procedures for the implementation of incentives for the introduction of water-saving technologies for cotton production

In this context, the development of the “Tomchi” mobile application by the project of the Swiss Agency for Development and Cooperation, with the support of the National Project on Water Resources Management in Uzbekistan, is very relevant and timely. Mobile application “Tomchi” provides access to information on water saving technologies and connects manufacturers with end users.



The mobile application tool, developed as a virtual field farmer school, provides (i) access to comprehensive information on water saving technologies used in the local context, relevant legislation and best practices; (ii) an estimate of the cost of the relevant projects; (iii) a feedback mechanism; and (iv) a platform connecting water users with local producers and service providers of affordable water saving technologies.

This unique and innovative application is the first step in

introducing ICT tools into the daily activities of the Ministry of Water Resources and its divisions at the level of basins, irrigation systems including district units, water users associations and farmers to promote improved access to knowledge, data collection and sharing real time information.

At the same time, the Ministry of Water Resources should promote the implementation of: (i) academic courses on advanced water-saving technologies in agriculture for students and (ii) practical training for cotton producers in the operation and maintenance of water-saving systems with on-site demonstrations.

3.7. WATER CONSUMER ASSOCIATIONS

Water Consumer Associations (WUAs), created in the form of non-governmental non-profit organizations, perform one of the most important tasks of the country's socio-economic development program by providing farmers and other water consumers with water and land-reclamation services at the lower level of the water management hierarchy. Currently (as of January 1, 2018), 1503 WUAs operate in Uzbekistan, which provide water management services to more than 59 thousand water consumers, covering an area of about 4.0 million hectares of irrigated land.

Unfortunately, staffing, logistical and financial situation of WUAs do not meet the requirements and do not allow them to effectively solve their tasks. Among the key constraints to the development of financially sustainable WUAs are the following:

- Insufficient understanding of the role and significance of WUAs and, as a result, the substitution of self-organization of water consumers by administrative actions of local officials. In most cases, when allocating credit funds, WUA requirements are often ignored, and, as a result of the intended means, WUA services are sent for other needs (fuel and lubricants, MTP, etc.).
- The lack of free funds for farmers and other water users to make membership fees and other payments to the WUA funds and in this regard the problems of start-up capital, the growth of accounts receivable and accounts payable, the inability to provide water services, as well as to cover the fixed costs of operation, maintenance and repair of on-farm irrigation and drainage systems in the WUA coverage area. In 1503 WUAs existing today in Uzbekistan there are 37.1 billion soums of accounts receivable and 125.4 billion soums of accounts payable, including 13.0 billion soums of wages, 99.8 billion soums of electricity and 12.0 billion soums of tax and other mandatory payments.
- Imperfection of the current tax system, which complicates the work of WUAs and does not stimulate effective water resources management.
- Lack of qualified personnel for work in WUAs and underdeveloped system of stimulation and professional development of specialists.

The proposed measures to strengthen the legislative framework and ensure the financial sustainability of WUAs include the following:

Adopt a separate law on WUAs or include a special chapter on WUAs in the Law on Water and Water Use, which, among other things, stipulate that WUAs are created in a special organizational-legal form, act in the public interest and enjoy state support (a specially authorized body, preferential taxation, etc.). This will help to comprehensively consider all issues of WUA activity.

Write off all WUA receivables and payables accumulated over many years.

Take advantage of the opportunities provided for in the Law "On guarantees of the activities of non-state non-profit organizations" No. 1-2, 2007 and No. 51, 2008 and

Law “On Social Partnership” No. 39, 2014, in order to create favorable conditions for a stable functioning of the WUA, in particular through the creation of social partnership between water management organizations and WUA on the basis of articles 3 and 5 of the Law “On social partnership”. Implementation mechanisms:

- To consider the contract concluded between territorial units of Ministry of Agriculture and WUAs for delivery of water, as social partnership agreements. Article 10 of the Law “**On Social Partnership**” provides that social partnership agreements «may provide for the performance of work or the provision of services, as well as the implementation of socially and socially significant projects with material, including financial support from the subject of social partnership».
- Create a “**Fund to support water management**” at the Ministry of Water Resources at the expense of deductions of the tax on the use of water resources in all sectors of the economy. From the Fund to carry out targeted financing (subsidies) WUA to pay salaries of key employees - Director, accountant and hydraulic engineering. It is necessary to keep all the benefits and preferences granted to WUAs as non-governmental organizations, and perhaps even ask for additional benefits to the WUAs for the payment of the unified social payment at the rate of 15% versus the conventional 25%.

To streamline the allocation of funds for the needs of WUAs at the expense of preferential loans. In particular, it is necessary to increase the share of funds allocated to WUAs at the expense of cotton and grain loans to 5%. And also, it is proposed to transfer the allocated funds for the electricity costs of pumps in the amount of 2.5% and future electricity costs of pumping stations on the balance of WUAs and farms to pay from the account of the district WUAs.

Strengthen contractual discipline regarding the supply of water for irrigation of cash and repetitive crops. It is necessary to clearly define the procedure for charging fees for WUA services to farms aimed at fruit-vegetables and horticulture, as well as from household plots (tomorka).

It is proposed on a long-term preferential leasing basis through the “Uzmeliomashlizing” Company, to transfer the WUA of each region with one small excavator.

As part of a public-private partnership, BISAs should assist WUAs in the construction of gauging stations, bearing in mind the transition to the bulk payment method, as well as the possibility of acquiring or transferring mechanisms and transport for them.

Organize an effective advisory service in WUAs for farmers.

3.8. THE AGRICULTURAL WATER SUPPLY AND FLOODING OF PASTURES

Almost half of the population lives in rural Uzbekistan. The growth of rural settlements improvement, as well as the development of agricultural production in recent years, have predetermined the high rates of development of agricultural water supply. Agricultural water supply systems by their purpose can be divided into the following groups:

1. Water supply systems of rural settlements, as well as repair and technical stations of agricultural machinery and machines.
2. Water supply systems of livestock industrial complexes and separate farms.
3. Irrigation systems (for preparation of liquid feedings for tilled crops, irrigation of plants in greenhouses and greenhouses).

As sources of water supply in rural areas, first of all, seek to use underground water. In cases where their quality is unsatisfactory or the flow rate of underground sources is low, water from surface sources is used.

At the level of 2018, agricultural water consumption in Uzbekistan is 485 million m³, of which 415 million m³ is taken from surface sources and only 70 million m³ – from underground sources. At the level of 2030, it is expected to increase agricultural water supply to 950 million m³, of which 810 million m³ - from surface sources and 140 million m³ – from underground.

In fulfilling the tasks of ensuring the food security of Uzbekistan, the production of animal products is important. The development and productivity of this industry, along with other factors, depends on how animal husbandry is provided with fodder. Here, an important role belongs to the rational use and preservation of existing natural pastures, the area of which in Uzbekistan exceeds 20 million hectares. Most of the pastures (78%) are in the desert zone, 15.5% in the foothill hilly rainfield zone, and 6.5% in the mountainous and high-mountainous zone.

On the basis of natural pastures in Uzbekistan astrakhan breeding is developed. By karakul production, our country ranks first in the world.

The extensive use of pastures in the past 50 years has led to a decrease in the biological productivity of pastures and more than half of their area (out of 20 million hectares) are subject to degradation. Therefore, a strategy has been developed for managing and increasing the productivity of pastures until 2021, including the issues of their irrigation.

Today (at the level of 2017), the total water consumption of pastures is about 65 million m³ per year. By 2030, this volume is expected to reach 100 million m³.

CHAPTER 4. ORGANIZATION OF WATER MANAGEMENT IN UZBEKISTAN

4.1. WATER LEGISLATION ²⁴

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)²⁵, 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 resolution of disputes and conflicts between the union republics and between the union republics and far-abroad countries was carried out:

- On water use between the Union republics - the Ministries of Land Reclamation and Water Resources (MLRWR) or the Governments of the Union Republics, if it is impossible to resolve the issue at the inter-republican level - the (MLRWR) or the Government of the USSR;
- Union republics and foreign countries - by the Government of the USSR.

The fundamentals of the water legislation of the union republics of the region were very close to each other before the union broke up and before the republics began to develop sovereignly, and the «Basis ...» defined a rigid framework within which the lawmaking of republics in the sphere of water relations was allowed.

Developed in the early 1970s the Water Codes (Kazakh SSR, Kyrgyz SSR, Tajik SSR,

²⁴ Section is prepared with the participation of Rysbekova Yu. Kh. (SIC ICWC)

²⁵ Fundamentals of water legislation of the USSR and Union Republics. Adopted by the Supreme Soviet of the USSR 10 Dec. 1970 («Bulletin of the Supreme Soviet of the USSR», 1970, No. 50, Art. 566), enacted on September 1. 1971. Changes and additions - January 7. 1980 («Bulletin of the Supreme Soviet of the USSR», 1980, No. 3, Art. 43) - Agricultural Encyclopedic Dictionary - М.: Soviet Encyclopedia, 1989 Ch. Editor: Mesyats V.K. / Dictionaries and encyclopedias on Academician // http://agricultural_dictionary.academic.ru/3741/ОСНОВЫ_ВОДНОГО_ЗАКОНОДАТЕЛЬСТВА_СОЮЗА_ССР_И_СОЮЗНЫХ_РЕСПУБЛИК

Turkmen SSR, Uzbek SSR) were almost the same in terms of the format and content of the norms and were valid in terms of the new independent republics of Central Asia that did not contradict the legislation, before they adopted national legislation in the field of water relations.

The Declaration of independence by the countries of Central Asia (the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan, and the Republic of Uzbekistan) necessitated the revision of the legal framework for the regulation of water relations at the national and interstate levels.

In the countries of Central Asia during 1993-1994 were taken:

- 1) The Water Code of the Republic of Kazakhstan (1993) – has lost its force;
- 2) The Water Code of the Republic of Tajikistan (1993) – has lost its force;
- 3) The law of the Kyrgyz Republic “On water” (1994) – has lost its force;
- 4) The law of the Republic of Uzbekistan “On water and water use” (1993).

In 2000-2005 new Laws were adopted in the sphere of water relations – water Codes of Tajikistan (29.11.2000), Kazakhstan (09.07.2003), and Kyrgyzstan (12.01.2005). In Turkmenistan, the Water Code of the Turkmen SSR (from 01.06.1973) remained in force until 01 November 2004, when the code of Turkmenistan “on water” came into force.

These Codes and the Law of the Republic of Uzbekistan on «Water and Water Use» (with amendments and additions in the subsequent period) are the key legislative acts in the field of regulation of water relations in the post-Soviet republics of Central Asia. As a General rule, other acts of legislation in the field of water relations regulation should not contradict the mentioned legislative acts.

THE LAW OF THE REPUBLIC OF UZBEKISTAN “ON WATER AND WATER USE” (1993)

Currently, the fundamental national legislative act in the field of water relations regulation is the law of the Republic of Uzbekistan (RUz) “on water and water use” of May 6, 1993 № 837-XII, as amended and supplemented in subsequent years (1997-2017).²⁶

The most significant changes and additions to the Law of the Republic of Uzbekistan (LRUZ) “On Water and Water Use” of 1993 were made by the Law of the Republic of Uzbekistan of December 25, 2009 (No. LRUZ-240)²⁷.

²⁶ The Law of the Republic of Uzbekistan «On Water and Water Use» of May 6, 1993 No. 837-XII (with the latest changes in accordance with the Law of the Republic of Uzbekistan of September 4, 2014 No. 3PY-373 –Legislation of the Republic of Uzbekistan, 2014, No. 36, p. 452)

²⁷ The Law of the Republic of Uzbekistan «On introducing amendments and additions to some legislative acts of the Republic of Uzbekistan in connection with the deepening of economic reforms in the agriculture and water economy» of December 25, 2009 No. ZRU-240 // Legislation of the Republic of Uzbekistan No. 52 (396) December 31 2009 (555) - 540 p. (p. 245-280)

The named Law (No. LRUz-240 in the LRUz “On Water and Water Use”) introduced, in particular, amendments and additions:

1) Added new articles:

- Article 2¹ (Basic Terms).
- Article 18¹ (WATER CONSUMERS).
- Article 18² (WATER CONSUMER ASSOCIATIONS).
- Article 19¹ (Sources of Water).
- Article 21¹ (Types of water use).
- Article 32¹ (Rights of Water Consumers).
- Article 35¹ (Responsibilities of WATER CONSUMERS).
- Article 50¹ (Responsibilities of WATER CONSUMERS using water for agricultural purposes).

2) Excluded articles:

- Article 22 (General and special water use).
- Article 23 (Shared and separate water use).
- Article 24 (Primary and secondary water use).
- Article 88 (Competence of water dispute resolution district authorities).
- Article 89 (Competence of regional water dispute resolution authorities).

In addition, the Law of the Republic of Uzbekistan of April 30, 2013 № LRUz-352 - NW RUz, 2013, № 18, Article 233 – excluded article 73 (Bodies that allow the use of water bodies for wastewater discharge).

In General, more than 90 articles of the law of the Republic of Uzbekistan on “Water and Water Use”, or about $\frac{3}{4}$ of the text of the Law, not including amendments to the titles of the chapters and articles of the Law, were changed only in 2009-2016.

In total, the law “on water and water use” currently contains 121 articles

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, shows that there is a need to improve the regulatory framework for water resources management.

In particular, analysis of changes and additions made to the Law of the Republic of Uzbekistan “On water and water use” in 2009 shows that a significant part of them is connected with the division of water users into WATER USERS and WATER CONSUMERS or change of name of government agency.

Thus, in accordance with the Law of the Republic of Uzbekistan of December 25, 2009 № LRUz-240²⁸:

²⁸ Law of the Republic of Uzbekistan of December 25, 2009 №LRUz-240 «on amendments and additions to some legislative acts of the Republic of Uzbekistan in connection with the deepening of economic reforms in agriculture and water management».

- 1) Article 21 (Basic concepts) - 18 definitions are given, among which such are “water consumption” and “water use”, “water consumer” and “water user” “association of water consumers”;
- 2) Article 18 (Water users) is supplemented with Articles 18¹ (Water Users) and 182 (Water Users Associations);
- 3) Article 19 (Objects of water use) is supplemented with Article 19¹ (Sources of water consumption), there are no significant differences in the content of the articles;
- 4) Article 21 (Types of water use) is supplemented by Article 21¹ (Types of water consumption), there are no significant differences in the content of the articles;
- 5) Article 32 (Water Users Rights) is supplemented with Article 32¹ (Water Consumer Rights), there are no significant differences in the content of the articles; etc.

The most characteristic in terms of low efficiency of making changes and additions to the Law of the Republic of Uzbekistan “On Water and Water Use” is to change the name of Chapter XXIII (RESOLUTION OF WATER USE) with its renaming to “RESOLUTION OF WATER TREATMENT AND WATER USE” and titles of articles (85-87 , 90-95) chapters (XXIII).

Thus, the content of all the listed articles, which have been amended, remains the same. In all cases (9 articles) of the above-mentioned Chapter (XXIII) of the Law, the changes are reduced in General to the fact that the word “water consumption” is added (the current and changed names of the articles are given through a slash):

- 1) Article 85 (Bodies resolving disputes on water use / Bodies resolving disputes on water use and water consumption);
- 2) Article 86 (Competence of self-government bodies of settlements and villages to resolve disputes on water use / Competence of self-government bodies of citizens to resolve disputes on water use and water consumption);
- 3) Article 87 (Competence of city authorities to resolve water use disputes / Competence of local authorities to resolve water use and water consumption disputes); etc.

COMPETENCES OF GOVERNMENTAL AUTHORITIES AND MANAGEMENT IN THE AREA OF WATER RELATIONS REGULATION

Specified by the Law “On Water and Water Use” and specified by separate articles of the competence of public authorities and management in the field of regulation of water relations in Uzbekistan are listed in Table 4.1.

State administration in the field of water use is carried out by the Cabinet of Ministers of the Republic of Uzbekistan, local government bodies, and also specially authorized state administration bodies for regulation of water use directly or through basin (territorial) administrations and other state bodies.

The law specifically authorized state bodies in the field of regulation of water use, determined, within their competencies:

- 1) The Ministry of Water Resources of the Republic of Uzbekistan (surface water);
- 2) The State Committee of the Republic of Uzbekistan on geology and mineral resources (groundwater);
- 3) The State Inspectorate for the Supervision of Geological Study of the Subsoil, the safe conduct of work in industry, mining and the domestic sector under the Cabinet of Ministers of the Republic of Uzbekistan (thermal and mineral waters).

According to the Law, the state control over the use and protection of waters, in accordance with the procedure established by law, shall:

- 1) Local government bodies;
- 2) The State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection (Goskomekologiya (State Committee on Ecology));
- 3) The State Inspectorate for Supervision of the geological study of the subsoil, the safe conduct of work in industry, mining and the domestic sector under the Cabinet of Ministers of the Republic of Uzbekistan;
- 4) The Ministry of Health of the Republic of Uzbekistan;
- 5) The Ministry of Water Resources of the Republic of Uzbekistan

The bodies of the state Committee of the Republic of Uzbekistan on Geology and mineral resources exercise departmental control over water use.

At the grass-roots level, water user Associations with the status of non-governmental non-profit organizations (NGOs), farmers, dekhkan farms, citizens, other water users and water users are involved in water resources management.

The law “on water and water use” directly refers to other state and other bodies that are involved in the management of water resources in Uzbekistan at the stages of issuing permits for water use, coordination of the implementation of relevant activities, planning, etc. (see below).

Table 4.1. Competences of public authorities and management in the field of regulation of water relations in the Republic of Uzbekistan

Public authorities and administration	Competence in the field of water relations regulation
Oliy Majlis of the Republic of Uzbekistan	<ul style="list-style-type: none"> • adoption of legislative acts on water and water use, amendments and additions to them; • definition of the main directions of the state policy in the field of water resources use and protection and adoption of strategic state water management programs; • resolution of other issues under the jurisdiction of the Oliy Majlis of the Republic of Uzbekistan

<p>Cabinet of Ministers of the Republic of Uzbekistan</p>	<ul style="list-style-type: none"> • implementation of a unified state policy in the field of integrated and rational use, management and protection of water resources; • coordination of activities of ministries, state committees, departments and other legal entities in the field of integrated and rational use, management and protection of water resources, as well as prevention and elimination of harmful effects of water; • establishment of the order of formation and use of the Water Fund, the order of approval of water use standards, water consumption and water withdrawal limits from the water body; • ensuring state water accounting and control of their use and protection, state water cadastre and water monitoring; • development of measures to prevent and eliminate major accidents, disasters, environmental crises and the harmful effects of water; • establishment of payment procedures for the use of water resources, compensation for pollution and depletion of water bodies; • development of inter-state relations; • implementation of other measures provided for by law.
<p>Local government bodies</p>	<ul style="list-style-type: none"> • identification of the main directions of use and protection of water resources in country; • ensuring law and order in the field of water resources management and protection; • accounting and assessment of the state of water bodies, control of water use and protection, compliance with water intake limits, water users' accounting of water use; • carrying out actions for preservation and improvement of water objects, prevention and liquidation of harmful impacts and water pollution, restoring objects damaged by accidents, floods, mudslides and natural disasters; • regulation of other matters provided for by law

The Ministry of Water Resources of the Republic of Uzbekistan is a government body that implements a unified policy in the field of water management, and coordinates the activities of state bodies, economic management bodies and other organizations in the rational use and protection of water resources, and the prevention and elimination of harmful effects of water.

The Ministry is the assignee of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan for all its rights, obligations and agreements in the field of water management.

The Ministry of Water Management was established pursuant to the Decrees of the President of the Republic of Uzbekistan of February 12, 2018, № UP-5330 “On Organizational Measures for the Radical Improvement of the State Management System of Agriculture and Water Resources”; on “On measures to fundamentally improve the system of state management of agriculture and water management” of April 17, 2018 №. UP-5418 and the Presidential Decree of April 17, 2018 № PP-3672 “On measures to organize the activities of the Ministry of Water Management of the Republic of Uzbekistan».

Participation of non-governmental non-profit organizations and citizens in water resources management

According to the Law, Water Consumer Associations (here and below, the Association uses the abbreviation of the WUA, the Water Consumer Association, so as not to be confused with WUAs, the WUA), other NGOs, in accordance with their charters, and citizens assist government agencies in implementing waters and water features.

State bodies may take into account the proposals of WUAs, other NGOs, as well as citizens.

Before making changes by the Law of the Republic of Uzbekistan of December 25, 2009 (No. LRUZ-240) to the Law of the Republic of Uzbekistan “On Water and Water Use”, the content of the norm is somewhat different (art. 10) Participation of public associations, groups and citizens in the implementation of measures for the rational use and protection water):

- Public associations, collectives in accordance with their charters and citizens assist state bodies in the implementation of measures for the rational use and protection of water.
- State bodies in these events take into account the proposals of public associations, groups and citizens.
- In the current version of Article 10 of the Law “On Water and Water Use”, the formerly obliged state bodies ’duty (“to take into account proposals”) was transformed into their right (“may take into account”).

According to the Law “On Water and Water Use”, WUAs are created primarily according to the hydrographic principle or other conditions that ensure rational management and use of water resources.

The founders of WUAs can be only legal entities - farms, dekhkan farms with the formation of a legal entity, other water consumers.

WUAs can be farms and dekhkan farms, self-government bodies of citizens, as well as other water consumers.

According to the legislation, waterworks and other hydraulic structures on water bodies used by the bodies of agriculture and water management are state-owned and operated in the prescribed manner.

Hydrotechnical facilities on the irrigation and drainage network of WUAs, as well as other water users, including irrigation canals and collector-drainage networks, are operated by water users according to their affiliation. On a contractual basis with WUAs and with other water users, agricultural and water management authorities can accept for maintenance the irrigation and drainage network and facilities on it.

Water relations between WUA and its members located in its service area, as well as agricultural and water management bodies and other legal entities and individuals are regulated on a contractual basis.

Allocation of water resources for irrigation of gardens and household plots of citizens is provided for in water withdrawal limits; these limits are set by the WUA. WUA provides water for collective gardens, vineyards, gardens and homestead land on the basis of a water consumption agreement. WUAs generalize the needs of citizens for water for irrigation of vegetable gardens and household plots, conclude water consumption agreements and establish the order of water consumption between them, and also organize repair and restoration work on irrigation networks.

According to their charters, NGOs can stimulate and encourage the implementation of effective measures for the rational use of water, water consumption and water protection in the manner prescribed by law.

Water Management: Harmonization

The legislation provides for the coordination of projects related to the use and protection of water resources with the relevant authorities.

Thus, the projects of construction and reconstruction of enterprises, structures and other objects affecting the state of water and water bodies are subject to agreement:

- With the agencies of agriculture and water resources;
- With the agencies of sanitary supervision;
- With the authorities for the protection of nature;
- With the agencies for geology and mineral resources;
- Other body.

In addition, these projects must undergo state expertise, as well as projects for the repair and restoration of reclamation facilities.

Projects of construction and reconstruction of bridges, crossings and other transport communications through water bodies are subject to coordination with the authorities:

- Agriculture and water management
- For nature conservation;
- To monitor and supervise the technical condition and safety of large and especially important water facilities.

In addition, where necessary, these projects are agreed upon:

- With energy authorities;
- With architecture and construction authorities;
- The Uzbek Agency for road and river transport (regarding the definition of navigation)

Projects for repair and restoration of bridges, crossings and other transport communications through water bodies affecting the state of water and water bodies shall be subject to agreement with the authorities:

- Agriculture and water management;
- Other authorities, in accordance with the law.

Water bodies are provided for use in agreement with the authorities:

- Agriculture and water management;
- Sanitary supervision;
- For nature conservation;
- For geology and mineral resources.

Use of water intake constructions intended for drinking, household and other needs of the population as the non-centralized water supply by the enterprises, organizations, the organizations, farms, dekhkan farms is made according to decisions of public authorities on places and under approval:

- With organizations operating water bodies;
- With conservation authorities;
- With sanitary authorities;
- With citizen self-government bodies.

The law prohibits direct-flow water supply systems for newly designed and commissioned industrial facilities, with the exception of enterprises and other facilities, which under the terms of production cannot be transferred to the recycling water supply. For existing enterprises that do not have a circulating water supply, the nature protection authorities set the terms of transfer to the circulating water supply by agreement:

- With the agencies of agriculture and water resources
- With other interested bodies.
- The use of water bodies for hydropower needs is carried out in coordination with the authorities:
- Agriculture and water management, taking into account the interests of other sectors of the economy, as well as compliance with the requirements of integrated and rational use of water, unless otherwise provided by the decision of the Cabinet of Ministers of the Republic of Uzbekistan, and in appropriate cases – the decision of the bodies of agriculture and water management and nature protection.

Water intake from reservoirs of fishery for the industrial purposes, irrigation and other needs can be made only on condition of installation of the special adaptations excluding possibility of hit of fish in water intake constructions, in coordination:

- The authorities for the protection of nature.

The use of water bodies for navigation is carried out by agreement:

- With the agencies of agriculture and water resources;
- The authorities for the protection of nature;
- With the Uzbek Agency of road and river transport.

The order of operation of reservoirs is determined by the rules approved by the Ministry of water resources of the Republic of Uzbekistan for each reservoir, cascade or reservoir system as agreed:

- With the state Committee of the Republic of Uzbekistan on ecology and environmental protection;
- With The state Inspectorate for control and supervision of the technical condition and safety of large and particularly important water facilities under the Cabinet of Ministers of the Republic of Uzbekistan;
- With other interested bodies.

Enterprises, organizations and institutions whose activities affect the state of water and water bodies are obliged to carry out technological, forest reclamation, agrotechnical, hydrotechnical, sanitary and technical measures, which must be agreed:

- With local authorities;
- With the authorities for the protection of nature
- With the agencies of agriculture and water resources
- With the organs of sanitary supervision;
- With other interested bodies.

Enterprises, institutions and organizations are obliged to take measures to prevent and eliminate the harmful effects of water as agreed (or according to the instructions of the authorized state bodies):

- The authorities for the protection of nature;
- With the agencies of agriculture and water resources;
- With the agencies for Geology and mineral resources;
- With local authorities;
- With other interested bodies.

Irrigation of agricultural land with waste water is permitted by the nature protection authorities upon agreement:

- With bodies of state sanitary and veterinary supervision.

The law on “Water and Water Use” and the acts of legislation issued in accordance with it determine other bodies with which activities or projects related to the use and protection of water are coordinated.

Water resources management: establishing types of general and special water use and consumption, issuing permits.

The list of types of general and special water use was established in accordance with the legislation:

- The Ministry of Water Resources of the Republic of Uzbekistan;
- The Ministry of Health of the Republic of Uzbekistan;
- 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 State Inspectorate for Supervision of the geological study of the subsoil, the safe conduct of work in industry, mining and household sector under the Cabinet of Ministers of the Republic of Uzbekistan.

Permission for special water use or water consumption from natural water bodies shall be issued by the nature protection authorities upon agreement:

- 1) With water management authorities - for surface waters;
- 2) With bodies for geology and mineral resources - for groundwater
- 3) With bodies for the supervision of geological study of the subsoil, the safe conduct of work in industry, mining and domestic sector - on mineral and thermal waters.

Permission for special water use or water consumption from artificial water bodies, depending on their value (status), issue:

1) Ministry of Water Resources of the Republic of Uzbekistan - from water bodies of national or inter-regional significance:

- Basin management of irrigation systems,
- Management and operation of reservoirs,
- Organizations operating transboundary water bodies, water bodies of inter-regional importance, large and especially important water facilities,
- Management of pumping stations, energy and communications, land reclamation expeditions,
- Other water users and water users;

2) Basin management of irrigation systems - from water bodies of regional or interdistrict, as well as regional significance:

- Water Consumer Associations (WUA),
- Other water users and water consumers;

3) WUA, in the area of their service, in agreement with the district department of agriculture and water management:

- Farmers and dekhkan farms,
- Citizens' self-governing bodies,
- Other water users.

General water use and water consumption on water bodies provided for separate use is allowed under the conditions established by the organizations operating these water bodies, in coordination with the authorities:

- Agriculture and water management;
- Nature protection.

If necessary, general water use and water consumption on separate-use water bodies may be prohibited in the prescribed manner.

According to the Law, the use of groundwater of drinking quality for needs not related to drinking and domestic water supply, as a rule, is not allowed.

At the same time, in areas where there are no necessary surface water sources and sufficient reserves of groundwater of drinking quality, the use of these waters for purposes not related to drinking and domestic water supply, in accordance with the limits, may allow the authorities:

- On nature conservation;
- On geology and mineral resources

The legislation provides for the priority use for therapeutic and resort purposes of water bodies classified as therapeutic.

At the same time, in exceptional cases, the bodies of agriculture and water management and environmental protection authorities may authorize the use of water bodies classified as medical, for other purposes, in agreement with the authorities:

- Supervision of geological exploration, safe conduct of works in industry, mining and municipal sector;
- Health;
- Resort management.

The issues of issuing permits for special water use or water consumption are regulated in detail by the Regulation on the procedure for issuing permits for special water use or water consumption (effective from August 1, 2013)²⁹, approved by the relevant Resolution of the Cabinet of Ministers (CM) of the Republic of Uzbekistan (06/14/2013 171).³⁰

According to the Decree of the Cabinet of Ministers of the Republic of Uzbekistan (No. 171), the bodies responsible for implementing the Decree are defined as follows:

²⁹ Resolution of the Cabinet of Ministers of the Republic of Uzbekistan «On approval of the regulation on the procedure for issuing permits for special water use or water consumption» of June 14, 2013 No. 171

³⁰ Resolution of the Cabinet of Ministers of the Republic of Uzbekistan «On approval of the Regulations on the procedure for water use and water consumption in the Republic of Uzbekistan» (Collection of Laws of the Republic of Uzbekistan, 2013, No. 12, Art. 155)

- Ministry of Water Resources of the Republic of Uzbekistan;
- Ministry of Health of the Republic of Uzbekistan;
- 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 State Inspectorate for Supervision of the geological study of the subsoil, the safe conduct of work in industry, mining and the domestic sector at the Cabinet of Ministers of the Republic of Uzbekistan;
- The Council of Ministers of the Republic of Karakalpakstan, regional and khokimiyats of Tashkent.

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.

According to the Regulation, a permit for special water use or water consumption from natural water bodies is issued by:

- State Committee on Ecology and Environmental Protection of the Republic of Uzbekistan - to water users and water consumers from natural water bodies of interregional and transboundary significance, to individual organizations operating large and especially important water, energy, and community facilities;
- Territorial committees on ecology and environmental protection – water from natural water bodies of regional, interdistrict and district significance.

A permit for special water use or water consumption from artificial water bodies is issued:

- Ministry of Water Resources of the Republic of Uzbekistan;
- Basin management of irrigation systems, management of operation of reservoirs, organizations operating transboundary water bodies, water bodies of inter-regional importance, large and particularly important water facilities, management of pumping stations, energy and communications, land reclamation expeditions, as well as other water users and water consumers - from water bodies of inter-regional and transboundary importance,
- To the separate organizations operating large and especially important water, power and household objects;
- Basin management of irrigation systems
- Water consumers associations, as well as other water users and water consumers - water from water bodies of regional importance;
- Water user associations;
- Farmers and dekhkan farms, self-government bodies of citizens and other water consumers located in their service area are from water bodies for agricultural needs, in coordination with the district department of agriculture and water management.

According to the Regulation, the permit for special water use or water consumption from natural water bodies is issued by the environmental and environmental protection authorities in coordination with the authorities on:

- Water management - using surface water;
- Geology and mineral resources - the use of groundwater (including springs);
- Supervision of geological study of subsoil, safe conducting works in industry, mining and communal-household sector - the use of mineral and thermal waters.

Water management: water withdrawal limits

The Law on “Water and Water Use” prescribes that water withdrawal limits are set for all water users and water users.

Water withdrawal limits (with the exception of water withdrawal limits for farms and dekhkan farms and other water consumers that are serviced by WUAs, and water withdrawal limits for communal and household services) are set by the agricultural and water authorities:

- By water sources;
- By basin irrigation systems, main canals (systems), irrigation systems;
- By branches of the economy;
- By territory;
- By water users and water users.

The above water withdrawal limits in terms of groundwater are established by the agricultural and water management bodies as agreed by the authorities:

- On geology and mineral resources;
- On the supervision of geological study of the subsoil, the safe conduct of work in industry, mining and the domestic sector (in terms of thermal and mineral waters).

The water intake limits for farms and dekhkan farms and other water users are set by the servicing agent.

The limits of water intake of municipal and households are set by the relevant operating organizations.

Water withdrawal limits are set for water users and water consumers, taking into account the forecast and actual water content of sources twice a year for agricultural needs and once a year for other needs, and are mandatory for them.

Water user services for the delivery of water, as well as other water services rendered are paid on a contractual basis.

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).

According to the Decree of the Cabinet of Ministers of the Republic of Uzbekistan (No. 82), the bodies responsible for implementing the Decree are defined as follows:

- Ministry of Water Resources of the Republic of Uzbekistan
- Ministry of Health of the Republic of Uzbekistan
- State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection,
- State Committee of the Republic of Uzbekistan on Geology and Mineral Resources
- State Inspectorate for Supervision of the geological study of the subsoil, the safe conduct of work in industry, mining and the domestic sector under the Cabinet of Ministers of the Republic of Uzbekistan,
- Council of Ministers of Karakalpakstan, regional, city and district khokimiyats:

According to the Regulation, which determines the order of water use and water consumption on the territory of the Republic of Uzbekistan, in particular:

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

- (1) Drinking, medical, and household economy;
- (2) Industry;
- (3) Agriculture;
- (4) Sanitary and environmental releases.

2) Water withdrawal limits for the needs of landscaping, sports and recreational facilities, are prioritized to the communal needs.

3) Water withdrawal limits are set:

- Ministry of Water Resources of the Republic of Uzbekistan-basin management of irrigation systems, management of main canals (systems) of inter-regional and cross-border significance, individual enterprises and organizations operating large and particularly important water, energy and municipal facilities, by sources, territories and sectors of the economy;
- Basin administrations of irrigation systems - associations of water consumers, as well as other water users and water consumers - from water bodies of the oblast (Republic of Karakalpakstan) or inter-district, and also of regional significance by sources, territories and branches of the economy;
- Associations of water consumers - farms and dekhkan farms, self-government bodies of citizens and other water consumers located in their service area.

4) The limit of water withdrawal from groundwater for non-agricultural needs is established when a permit is issued for special water use or consumption for the period of the permit validity.

5) The water withdrawal limit for water users and water consumers from the public water supply system is established by the relevant operating agencies serving them in the manner determined by the “Uzkommunkhizmat” Agency.

6) Water withdrawal limits are set taking into account the forecast and actual water content of the sources twice a year - for agricultural needs and once a year - for other needs and are mandatory for water users and water users.

7) Water use planning and setting water withdrawal limits should ensure a scientifically based distribution of water between water users and water users, taking into account the priority satisfaction of drinking and household needs of the population, the conditions of protection and the prevention of their harmful effects.

8) Water withdrawal limits for agricultural needs are set:

- Ministry of Water Resources of the Republic of Uzbekistan annually until September 15 - for the autumn-winter period (October 1 - March 31) and until March 15 - for the crop vegetation season (April 1 - September 30);
- Management of basin irrigation systems annually until September 20 - for the autumn-winter period and until March 20 - for the growing season;
- Water User Associations annually until October 1 - for the autumn-winter period and until April 1 - for the growing season.
- Water withdrawal limits for non-agricultural water users and water users are set once a year - before October 1 each year.
- Water withdrawal limits for non-agricultural water users and water consumers from groundwater are set once for the period of the validity of the special permit.

9) Water withdrawal limits are approved.

- The order of the Ministry of Water Resources of the Republic of Uzbekistan based on the recommendation of the Council for the rational use of land and water resources, the development of irrigation and the improvement of soil fertility;
- The order of management of basin irrigation systems - based on the recommendation of the Water Management Council;
- Minutes of the general meeting of associations of water consumers - in agreement with the district department of agriculture and water management.

10) The water intake limits for water users and water consumers from the public water supply system for the needs of the public utilities are approved by the orders of the relevant operating agencies serving them in the manner established by the “Uzkommunkhizmat” Agency.

11) When setting water withdrawal limits, the priority of the industry and equal percentage security of all water users and water consumers separately by sources and irrigation systems should be observed, taking into account the expected water content.

12) Water withdrawal limits, with the exception of cases of lowering the water content of sources, cannot be changed without the consent of water users and water users.

13) In cases of lowering or increasing the water content of sources, water withdrawal limits can be promptly adjusted with the permission of the higher-level authorized organization, without changing the parameters of the water use plan or water consumption.

Water resources management: use planning and state water accounting, reporting

According to the Law “On water and water use”:

1) Water use and water consumption are carried out on the basis of water use and water consumption plans, taking into account the annual actual water availability.

2) Planning of water use and water consumption in the collector-drainage network is carried out taking into account the state of reclaimed land, the quality of collector-drainage water.

3) Water consumption plans are drawn up and approved by WUAs, which summarize water use plans and make associations’ water use plans.

4) WUAs’ water use plans are summarized by irrigation management and basin management of irrigation systems.

5) Compiled and summarized water use plans are approved:

- For WUA, the irrigation system management in coordination with the district department of agriculture and water management;
- According to the irrigation system - the Basin Administration of the irrigation systems in agreement with the relevant territorial bodies of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan;
- On the basin irrigation system, on large and especially important water facilities - by the Ministry of Water Resources of the Republic of Uzbekistan.

More detailed issues of water use planning and water consumption are regulated by the “Regulations 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 the Republic of Uzbekistan (No. 82 of March 19, 2013).

According to the Regulation (No. 82), in particular:

1) Water use and water consumption plans are drawn up in accordance with the approved regulatory documents within the allocated water withdrawal limits by water users and water users themselves and are an integral part of the water use and water consumption agreement.

2) Plans for water use and water consumption for the needs of municipal households are drawn up and approved in accordance with the procedure established by the “Uzkommunkhizmat” Agency.

3) Water relations are regulated on a contractual basis:

- Between a WUA and its members in its service area,
- Between WUA and other bodies of agriculture and water management and other legal and physical persons.

4) Services of water users for water delivery, as well as other water services rendered are paid on a contractual basis, and the conditions and cases of charging for services rendered for water delivery by operational water organizations of the Ministry of Water Resources of the Republic of Uzbekistan are established by the Cabinet of Ministers of the Republic of Uzbekistan.

5) Standard forms of contracts on water use and water consumption are approved by the Ministry of Justice of the Republic of Uzbekistan and the Ministry of Water Resources after approval (except for cases of water use and water consumption from the public water supply system):

- With the state Committee of the Republic of Uzbekistan on ecology and environmental protection (at water intake from natural water bodies),
- With the state Committee of the Republic of Uzbekistan on Geology and mineral resources (at water intake from underground waters),
- With the state Inspectorate for supervision of geological exploration, safe conduct of works in industry, mining and municipal sector under the Cabinet of Ministers of the Republic of Uzbekistan (with water intake from thermal and mineral waters).

6) Standard forms of contracts on water use and water consumption are approved by the Ministry of Justice of the Republic of Uzbekistan and the Ministry of Water Resources, after approval (except in cases of water use and water consumption from the public water supply system):

7) Standard forms of contracts on water use and water consumption from the public water supply system are approved in accordance with the procedure established By the Agency “UZKOMMUNKHIZMAT”.

8) Legal entities and individuals enter into contracts on water use and water consumption with the relevant operating organizations serving them.

9) The water use and consumption agreements concluded in accordance with the established procedure are subject to accounting:

- In the Ministry of Water Resources of the Republic of Uzbekistan - contracts concluded with individual organizations operating water bodies of inter-regional and transboundary importance, as well as large and particularly important objects;
- In the Basin Irrigation System Administration (BISA)- contracts concluded with operational organizations that are part of the Basin management;
- In district departments of agriculture and water management - contracts concluded by WUAs with farmers and dekhkan farms, self-government bodies of citizens and other water consumers and water users located in the service area of WUAs.

10) The list of contracts subject to registration with the Ministry of Water Resources of the Republic of Uzbekistan, the BISA, in the regional departments of agriculture and water management, is approved by the Ministry of Water Management of the Republic of Uzbekistan.

11) The register of agreements on water use and water consumption is transmitted by:

- Republican Water Inspectorate “Uzsuvnazorat” under the General Prosecutor’s Office and its territorial structural units (for water use and water consumption from artificial water bodies)
- Relevant bodies of the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection (for water use and water consumption from natural water bodies) to ensure control in the prescribed manner.

12) The agreements on water use and water consumption, concluded by the operating organizations of the municipal water supply system with water users and water consumers, shall be accounted for in the manner established by the “Uzkommunkhizmat” Agency.

13) The rights and obligations of the parties are determined by the contract in accordance with the requirements of the Law of the Republic of Uzbekistan “On Water and Water Use” and other legislative acts.

The Law on Water and Water Use, in order to ensure state accounting and planning of the use and protection of water, provides:

- 1) Compilation of water balances - on river basins, basin irrigation systems and economic regions to assess the availability and extent of water use;
- 2) Development of general and basin (territorial) schemes for the integrated use and protection of water - to determine the main water management and other measures to be taken to meet future water needs of the population and economic sectors, as well as to protect waters and prevent their harmful effects;

3) Development and maintenance of the state water cadaster;

4) Monitoring of waters, including groundwater, which is a system of observations of the state of waters for the timely detection of changes, their assessment, prevention and elimination of negative processes.

Water balances are compiled by specially authorized bodies of state administration in the field of regulation of water use (see above), within their competence and summarized by the Ministry of Water Resources of the Republic of Uzbekistan.

Details of the procedure for the collection of water resources, record keeping and reporting for water use and water consumption are reflected in the Regulations on the procedure for water use and water consumption (2013), according to which:

1) Water resources are taken for water use and water consumption only if there is an agreement on water use and water consumption, which has been registered in the established manner, in agreement with the service operating organization.

2) Water intake is carried out only on written requests of water users and water consumers (except for cases of water intake from the system of municipal water supply, and also underground reservoirs) on their readiness for water use and water consumption, on the basis of the plan of water use and water consumption, within the established limit of water intake.

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

4) Places of water resources intake shall be equipped with appropriate means for their regulation and accounting.

5) Means of regulation and accounting must always be kept in good working condition.

6) In order to ensure state accounting of water and its use, maintenance of the State Water Cadaster and compilation of water management balances, systematic accounting and reporting is established for water use and water consumption and their monitoring in accordance with the procedure established by the Ministry of Agriculture and Water Resources, as agreed):

- With the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection,
- With the State Committee of the Republic of Uzbekistan on geology and mineral resources (groundwater),
- With the State Inspectorate of the Republic of Uzbekistan for the supervision of geological study of the subsoil, the safe conduct of work in industry, mining and the domestic sector under the Cabinet of Ministers of the Republic of Uzbekistan (thermal and mineral waters).

7) The procedure for taking, recording and reporting on water resources for water use and water consumption from the public water supply system is established by the Agency “Uzkommunkhizmat”.

8) All special water users and water consumers are obliged to keep records and reports, to provide information on water use and water consumption, as well as on water disposal in accordance with the procedure established by the Ministry of Water Resources of the Republic of Uzbekistan, and in the case of water intake from the public water supply system according to the procedure established by the “Uzkommunkhizmat” Agency.

Requests regarding the state water cadaster are reflected in more detail in the Regulations on the procedure for the development and maintenance of the state water cadastre of the Republic of Uzbekistan, approved by the relevant Resolution of the Cabinet of Ministers of the Republic of Uzbekistan (January 11, 1998 No.11)³¹.

According to the Regulations, in particular:

1) The State Water Cadastre is developed and maintained in accordance with the Law of the Republic of Uzbekistan “On Water and Water Use” with a view to organizing rational use of water resources, regulating water management relations, evaluating economic activities, the environmental situation and is an integral part of the Unified System of State Cadastres of the Republic of Uzbekistan

2) The components of the state water cadastre are registration of water bodies and water users, accounting of water quantity and quality, assessment of water resources and their use.

3) The state water cadastre is one of the main components of the Unified system of state cadastres.

4) Water-cadastral information adopted in accordance with the established procedure is legally binding in the regulation of water and water management relations, the solution of social, economic and environmental problems associated with the use of water.

5) The state water cadastre is maintained by:

- Center of hydrometeorological service at the Ministry of Emergency Situations of the Republic of Uzbekistan-on the section of surface waters,
- State Committee of the Republic of Uzbekistan on Geology and mineral resources

³¹ Regulations on the procedure for the development and maintenance of the State water cadastre of the Republic of Uzbekistan / Resolution of the Cabinet of Ministers of the Republic of Uzbekistan «On approval of the regulation on the procedure for the development and maintenance of the state water cadastre of the Republic of Uzbekistan» (No. 11 of January 7, 1998). / As amended in accordance with the Decree of the Cabinet of Ministers of the Republic of Uzbekistan of September 24, 2003 No. 411 (- LRUz, 2003, No. 17-18, Art. 156) and the Decree of the Cabinet of Ministers of the Republic of Uzbekistan of April 14, 2004 No. 183 (LRUz, 2004, No. 15, Art. 179)

- on the division of groundwater,
- Ministry of Water Resources of the Republic of Uzbekistan - on the section of water use.

6) The composition of the data of the State water cadastre is determined by a separate normative and technical document “Composition of the water cadastre data”.

7) Data of the State water cadastre are provided to consumers in the form of paid publications on request (established procedure).

8) Data of the State water cadastre are systematized and published on the territory of the Republic, regions, the Republic of Karakalpakstan, river basins, basin irrigation systems, and on the section of groundwater - and hydrogeological regions.

9) Data on surface water resources, their quality and changes under the influence of economic activity are summarized for water bodies and their areas, river basins of state and interstate importance, basin irrigation systems, regions and the Republic as a whole.

10) Data on groundwater resources, their quality and changes under the influence of economic activity are summarized by fields, river basins and their areas, aquifers and groundwater basins, regions and the Republic as a whole.

11) Data on water use are summarized by river basins of national importance, basin irrigation systems, particularly important water facilities, regions and the Republic as a whole, as well as by types of water use and sectors of the economy.

12) The Central Asian Research Hydrometeorological Institute of Uzhydromet under the Ministry of Emergency Situations of the Republic of Uzbekistan performs the functions of the main interdepartmental center of the State water cadastre.

13) The functions of the head departmental centers of the State Water Cadastre, territorial centers and local bodies of the State Water Cadastre are determined by the relevant regulatory documents (under the sections “Surface Water”, “Groundwater” and “Use of Water”).

Questions regarding water monitoring are reflected in more detail in the Regulations on State Environmental Monitoring, approved by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On Approval of the Regulation on State Environmental Monitoring in the Republic of Uzbekistan” (April 3, 2002, No. 111)³².

According to the Decree of the Cabinet of Ministers of the Republic of Uzbekistan (No. 111), the bodies responsible for implementing the Decree are defined as follows:

³² Regulations on state monitoring of the environment / Annex to the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan “On approval of the regulation on state monitoring of the environment in the Republic of Uzbekistan” of April 3, 2002, No 111 (The collection of legislation of the Republic of Uzbekistan, 2002, No. 7, Art. 49; 2004, №15, Art. 179, No 42, Art. 446)

- 1) The State Committee on Ecology and Environmental Protection,
- 2) Ministry of Water Resources
- 3) Ministry of Health
- 4) The State Committee on Land Resources, Geodesy, Cartography and the State Cadastre
- 5) Center of Hydrometeorological Service under the Cabinet of Ministers of the Republic of Uzbekistan.

According to the Regulations, in particular:

1) The state monitoring of the environment includes:

- Monitoring of pollution sources (emissions);
- Monitoring of air pollution;
- Monitoring of pollution of surface and groundwater;
- Monitoring of hazardous natural and man-made processes;
- Monitoring of land pollution and terrestrial ecosystems;
- Background monitoring.

2) The state monitoring of the environment is carried out at the following levels:

- Republican monitoring (covers the entire territory of the Republic of Uzbekistan);
- Regional monitoring (covers the territory limited by physiographic, administrative and other borders);
- Local monitoring (covers the territory of certain natural, man-made and landscape-ecological complexes).

3) State environmental monitoring is developed on the basis of the integration of monitoring systems of ministries, departments and economic management bodies.

4) State environmental monitoring is carried out:

- State Committee of the Republic of Uzbekistan on ecology and environmental protection - in terms of monitoring of pollution sources and monitoring of terrestrial ecosystems.
- Center of hydrometeorological service at the Ministry of Emergency Situations of the Republic of Uzbekistan – in terms of monitoring of air pollution, pollution of surface (natural watercourses) waters, soils and background monitoring;
- Ministry of Water Resources of the Republic of Uzbekistan - in terms of monitoring the quality (mineralization) of collector-drainage waters of the main watercourses;

5) State Committee of the Republic of Uzbekistan on land resources, geodesy, cartography and the state cadastre of the Republic of Uzbekistan in terms of monitoring land pollution;

6) State Committee of the Republic of Uzbekistan on Geology and Mineral Resources

- in terms of monitoring the pollution of groundwater and hazardous geological processes;

7) Ministry of Health of the Republic of Uzbekistan - in terms of sanitary and hygienic monitoring of the environment.

8) Ministries, departments and bodies of economic management, activities of which lead or can lead to a deterioration of the state of the environment, conduct departmental monitoring of the environment.

9) Coordination of the activities of ministries, departments and bodies of economic management in the field of state monitoring of the environment is carried out by the State Committee of the Republic of Uzbekistan on ecology and environmental protection.

10) Ministries, departments and bodies of economic management that monitor the state of the environment in the state monitoring system donate to the relevant service of the State Committee of the Republic of Uzbekistan on ecology and environmental protection generalized information on the state of the environment (reports, reports, periodic bulletins).

Water resources management: resolution of water disputes

According to the Law on “Water and Water Use”:

- Disputes on water use and water consumption are resolved in the manner prescribed by law: the Cabinet of Ministers of the Republic of Uzbekistan;
- Local authorities;
- Self-government bodies of citizens;
- Water management bodies;
- Bodies for nature protection;
- Geology and mineral resources authorities;
- Other authorized bodies and courts.

1) Competence of bodies for the resolution of disputes on water use and water consumption (except for disputes, the resolution of which is within the competence of the bodies of agriculture and water management, nature protection and other authorized state bodies):

- The responsibility of the self-government bodies of citizens is the resolution of disputes on water use and water consumption between citizens on the use of water bodies located on their territory;
- It is the responsibility of local authorities to resolve disputes on water use and water consumption between enterprises, institutions, organizations and citizens on the use of water bodies in the relevant territory;

2) The Cabinet of Ministers of the Republic of Uzbekistan is responsible for the

resolution of disputes on water use and water consumption between enterprises, institutions, organizations located in different areas or in the same region and the Republic of Karakalpakstan.

3) Disputes on water use and water consumption from transboundary waters and transboundary water bodies between the Republic of Uzbekistan and other States shall be resolved in the manner determined by international treaties of the Republic of Uzbekistan.

4) Property disputes related to water relations shall be resolved by the relevant court in the manner prescribed by law.

The Law “On water and water use” does not separately stipulate the competence of WUAs in resolving disputes on water use and water consumption.

Water resources management: prevention and management of natural disasters caused by the harmful effects of water

The implementation of urgent measures to prevent and eliminate natural disasters caused by the harmful effects of water is regulated by the law on water and water use and other legislation, in particular the Law of the Republic of Uzbekistan on the protection of the population and territories from natural and man-made disasters (of 20 August 1999)³³.

The Law on “Water and Water Use” provides for the establishment, where necessary, of flood and other commissions, which include representatives of relevant enterprises, organizations and institutions, as well as representatives of agriculture, water management and nature protection, for the operational management of work on the prevention and elimination of natural disasters caused by the harmful effects of water.

Such Commissions are established by the Cabinet of Ministers of the Republic of Uzbekistan, state authorities of regions, districts and cities.

Execution of works on prevention and liquidation of consequences of emergency situations during the passage of floods and mudflows on the territory of the administrative district to organize the public authorities.

According to the Law of the Republic of Uzbekistan “On protection of population and territories from natural and man-made disasters”:

1. The Ministry of Emergency Situations (MES) of the Republic of Uzbekistan is a specially authorized body of the state administration for protection from emergency situations.

³³ Law of the Republic of Uzbekistan «on protection of population and territories from natural and man-made emergencies» of August 20, 1999, No. 824-I (Newsletter of the OLIY MAJLIS of the Republic of Uzbekistan, 1999, No. 9, article 221; Assembly of legislation of the Republic of Uzbekistan 2010, No. 37, article 316; 2014, No. 4, Article 45)

2. Ministries and departments in the field of emergency protection are obliged to:

- Develop and carry out measures to improve the sustainability of the industry and its subordinate objects in emergency situations;
- Submit for approval to the Ministry of Emergency Situations of the Republic of Uzbekistan a plan of action, regulations, rules and instructions for protection against emergency situations;
- To train employees of subordinate facilities in methods of protection and emergency actions as part of rescue services and rescue units.

3. Ministries and departments introduce regular posts for specialists on protection of the population and territories from emergency situations at potentially hazardous facilities, the list of which is established by the Cabinet of Ministers of the Republic of Uzbekistan. Responsible persons are appointed at other facilities.

On June 1, 2017, the Decree of the President of the Republic of Uzbekistan “On measures to fundamentally improve the effectiveness of the emergency prevention and response system” was adopted.

Water resources management: protection of water and water bodies

Issues of water and water bodies protection are regulated by the Law on “Water and Water Use” and other, first of all, environmental legislation (laws on “Nature Protection”, on “Protected Natural Areas”, etc.).

Any work (construction, repair, restoration, dredging, etc.) in the areas of water protection, coastal strips and zones of sanitary protection of water bodies, in the areas of formation of groundwater affecting the state of water and water bodies, are made in accordance with the legislation.

More detailed issues of protection of water and water bodies are reflected in the Regulation “on water protection zones of reservoirs and other water bodies, rivers, main canals and reservoirs, as well as sources of drinking and domestic water supply, medical and cultural and recreational purposes in the Republic of Uzbekistan”.

The regulation was approved by the relevant Resolution of the Cabinet of Ministers of the Republic of Uzbekistan (April 07, 1992 № 174)³⁴ and regulates the procedure for establishing zones of water protection and zones (districts) of sanitary protection of water bodies (including small rivers), as well as the mode of economic activity in these zones to prevent pollution, clogging and depletion of water resources.

The main environmental legislative base in Uzbekistan today:

- Law of the Republic of Uzbekistan “on nature protection” of 9 December 1992;

³⁴ Regulation on water protection zones of reservoirs and other water bodies, rivers, main canals and collectors, as well as sources of drinking and domestic water supply, medical and cultural and recreational purposes in the Republic of Uzbekistan « (as amended) / Approved by the Cabinet of Ministers of the Republic of Uzbekistan № 174 of April 7, 1992.

- Law of the Republic of Uzbekistan on “Environmental Expertise” of 25 May 2000;
- Law of the Republic of Uzbekistan “on amendments and additions to the Law of the Republic of Uzbekistan on “Normative Legal Acts” of December 24, 2012;
- Law of the Republic of Uzbekistan “on sanitation and epidemiological safety of the population” of August 26, 2015;
- Law of the Republic of Uzbekistan on “Environmental Control” of August 26, 2015.

In matters of water protection, the “Provision on water protection zones of reservoirs and other reservoirs, rivers, main canals and collectors, as well as sources of drinking and domestic water supply, therapeutic, cultural and health purposes in the Republic of Uzbekistan”, approved by the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan April 7, 1992.

On April 21, 2017, President of the Republic of Uzbekistan Mirziyoyev Sh. signed a decree “On Improving the System of State Administration in the Field of Ecology and Environmental Protection”. According to the decree, the State Committee of the Republic of Uzbekistan on Nature Protection has been transformed into the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection, subordinated to the Cabinet of Ministers of the Republic of Uzbekistan. Its tasks include environmental protection, monitoring compliance with legislation in the field of the protection and use of natural resources, training of specialists. This decree prescribes the urgent preparation of new pollution control mechanisms that meet current realities.

Water management: other aspects

The law on “Water and Water Use” and the relevant legal acts regulate other aspects of water resources management (use of water for drinking, household and other needs of the population, industrial purposes, needs of fisheries, hunting, responsibility for violation of water legislation, etc.).

Thus, the issues of fisheries and hunting are regulated under the following documents:

3) Resolution of the Cabinet of Ministers of the Republic of Uzbekistan of April 10, 1991 № 95 approved the Regulation on hunting and fishing in the territory of the Republic of Uzbekistan;

4) Resolution No. 350 of the Cabinet of Ministers of the Republic of Uzbekistan of 13 August 2003 approved the Regulation on the procedure for the consolidation and use of natural reservoirs of fisheries; etc.;

The Law on “Water and Water Use” provides, in particular, that:

- Enterprises, institutions, organizations, agricultural cooperatives, farmers and

dekhkan farms and citizens are obliged to pay damages caused by violations of water legislation, in the amount and manner established by law.

- Officials and other employees, through the fault of which enterprises, organizations and institutions incurred the cost of damages, are responsible in the prescribed manner.

Issues of compensation of losses caused by violation of water legislation are regulated by the civil legislation-the Civil Code (CC) of Uzbekistan (see Chapter 57 of the CC, article 1001 of the CC of UZBEKISTAN).

Issues of responsibility for violation of water legislation are regulated:

1) Criminal Code (for example, Art. 203 of the Criminal Code of the Republic of Uzbekistan);

2) Code of the Republic of Uzbekistan on Administrative Responsibility (Articles 72-76 and Section IX (“Responsibility for Violating the Procedure for Water Use and Water Consumption”));

3) Regulations on the procedure for water use and water consumption in the Republic of Uzbekistan, approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan of March 19, 2013 No. 82.

In particular, the Regulation (No. 82 - 2013) provides that:

1) Supervision of compliance with the procedure for water use and water consumption from natural water bodies is carried out by the bodies of the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection.

2) The supervision of compliance with the procedure for water use and water consumption from artificial water bodies is carried out by the Uzsuvmazorat Republican Water Inspectorate.

3) Citizens and officials are brought to administrative responsibility for violation of the procedure for water use and consumption in accordance with the Administrative Liability Code of the Republic of Uzbekistan.

4) In case of violation of the order of water intake for agricultural, fisheries, industrial, energy and domestic needs, the following penalties are applied:

- For excess water intake by water consumers -10 % of the established minimum wage (minimum wage) for each thousand cubic meters of excess water taken;
- For water intake from unauthorized places of water intakes, and also unauthorized capture of water by water users and water consumers - 20% of the established size of minimum salary of the payment for each thousand cubic meters of the taken-away water.

- In case of repeated violation of the order of water use and water consumption within one year, penalties are applied tenfold.

5) Penalties for excess water intake for agricultural water consumers are applied twice a year (at the end of autumn-winter and vegetation periods), and for other water consumers-once at the end of the calendar year.

6) In addition to the penalties specified in this paragraph, other additional liability measures may be provided for in water use and water consumption contracts.

7) Penalties are applied in the prescribed manner:

- Republican water inspection “Uzsuvnazorat” at the Prosecutor General’s office of the Republic of Uzbekistan and its units in the field - with water intake from artificial water bodies;
- State Committee of the Republic of Uzbekistan for nature protection and its territorial bodies - at water intake from natural water bodies.

8) In respect of water users and water consumers - business entities, penalties are applied by the court, except in cases of recognition of guilt and voluntary payment of penalties.

9) In other cases, the application of penalties is carried out by the bodies of the Ministry of Water Resources of the Republic of Uzbekistan and the state Committee of the Republic of Uzbekistan on ecology and environmental protection in accordance with the legislation.

10) Funds received from the application of penalties (referred to in paragraph 60 of the Regulations) are distributed, in accordance with the legislation between state budget, the special account of the Republican water inspection «Uzsuvnazorat» and the Fund for nature protection of the State Committee of the Republic of Uzbekistan on ecology and environmental protection.

11) Funds received on special accounts of the Republic Water Inspectorate “Uzsuvnazorat” are used in coordination with the Ministry of Water Resources of the Republic of Uzbekistan in the following order:

- 60 % - for the rehabilitation of the technical condition of the irrigation network and equipping water withdrawal points with water management and accounting tools, development of their material and technical base and training, as well as staff training, material stimulation of water consumers for economical and rational use of water resources;;
- 15% - to stimulate employees of operational organizations of the water industry and WUAs for the rational management of water resources;
- 25 % - to stimulate workers of the Republican Water Inspectorate “Uzsuvnazorat” and its structural divisions, to strengthen their material and technical base and to attract specialists on a contractual basis.

12) The procedure for using these funds is established by the Ministry of Water Resources in coordination with the Ministry of Finance of the Republic of Uzbekistan.

13) Resolution of the Cabinet of Ministers of August 3, 1993 No. 385 “On Limited Water Use in the Republic of Uzbekistan” has lost its force.

Water use and water consumption, water management and other activities on transboundary water bodies are carried out in accordance with international treaties of the Republic of Uzbekistan. If the international treaties of the Republic of Uzbekistan establish other provisions than those provided for by the Law on Water and Water Use, then the provisions of the international treaty shall apply.

To the extent that water use or water consumption in terms of transboundary water bodies of the Republic of Uzbekistan is not regulated by an international treaty of the Republic of Uzbekistan, it is carried out in accordance with the legislation of the Republic of Uzbekistan.

In general, aspects of water relations not specified directly in the Law of the Republic of Uzbekistan “On Water and Water Use” are regulated by other regulatory acts, including laws in other spheres of public relations, as well as by laws (Decrees and Orders of the President of the Republic of Uzbekistan, Decrees of the Cabinet of Ministers and etc.).

Legislative acts

Water relations in the Republic of Uzbekistan are also regulated by other legislation - water issues are contained in land and forest legislation and other legislative acts (on subsoil, in the field of nature protection, etc.).

This, in particular, the laws:

- 1) Law on “State Sanitary Supervision” (1992)³⁵;
- 2) Law on “Nature Protection” (1992)³⁶;
- 3) Law on “The State Border of the Republic of Uzbekistan” (1999)³⁷;
- 4) Law on “Forest” (1999)³⁸;
- 5) Law on “Safety of Hydraulic Structures” (1999)³⁹;
- 6) Law on “Ecological Expertise” (2000)⁴⁰;
- 7) Law on “State Cadaster” (2000)⁴¹;

³⁵ Law of the Republic of Uzbekistan of July 3, 1992, N 657-XII «On State Sanitary Supervision”

³⁶ Law of the Republic of Uzbekistan of December 9, 1992 N 754-XII «On Nature Protection»

³⁷ Law of the Republic of Uzbekistan of August 8, 1999 N 820-I “On the State Border of the Republic of Uzbekistan”

³⁸ Law of the Republic of Uzbekistan «On Forest» of April 15, 1999 No. 770-I

³⁹ Law of the Republic of Uzbekistan of August 8, 1999 N 826-I “On the Safety of Hydraulic Structures”

⁴⁰ Law of the Republic of Uzbekistan of May 25, 2000, No. 73-II «On Ecological Expertise»

⁴¹ Law of the Republic of Uzbekistan «On State Cadastre» of December 15, 2000, No. 171-II

8) Law on “Subsoil” (new edition) (2002)⁴².

INTERNATIONAL TREATIES OF THE REPUBLIC OF UZBEKISTAN

International treaties of the Republic of Uzbekistan in the field of water relations are an integral part of the water legislation of the Republic of Uzbekistan.

Among them, in particular, are two fundamental Conventions of a global nature, to which Uzbekistan has joined:

The UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, March 17, 1992), entered into force in 1996;

The Convention (UN) on the inhuman use of international watercourses (New York, May 21, 1997), entered into force in 2014

Uzbekistan’s accession to these Conventions implies, in particular, the development of legal and other measures for the implementation of the Conventions, including the improvement of water legislation.

International water relations of the Republic of Uzbekistan in Central Asia are regulated by a number of international Agreements, including, in particular:

Agreement “on joint actions to solve the problem of the Aral Sea and the Aral Sea region, ecological improvement and ensuring social and economic development of the Aral region” (Kzyl-Orda, March 26, 1993).

Parties: Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan:

1) Agreement between the 5 Central Asian countries “On cooperation in the joint management of the use and protection of water resources of interstate sources” (Almaty, February 18, 1992);

2) Agreement between Uzbekistan and Turkmenistan “On cooperation in water issues” (Chardjev, January 16, 1996);

3) Agreement between Kazakhstan, Kyrgyzstan and Uzbekistan “On the use of water and energy resources of the Syrdarya River Basin” (Bishkek, March 17, 1998); Tajikistan - Party to the Agreement since 1999;

4) Agreement between the 5 Central Asian countries on the status of the International Fund for the Aral Saving (IFAS) and its organizations (Ashgabat, April 9, 1999); and etc.

⁴² THE LAW OF THE REPUBLIC OF UZBEKISTAN «ABOUT ENERGY» (new edition) // Resolution of the Oliy Majlis of the Republic of Uzbekistan of December 13, 2002, No. 444-II «ON INTRODUCTION OF CHANGES AND ADDITIONS TO THE LAW OF THE REPUBLIC OF UZBEKISTAN «On mineral resources»

In addition, issues of water relations exist in a number of environmental Conventions to which Uzbekistan has acceded and on which it has relevant obligations, in particular:

- 1) Convention on biological diversity (1992);
- 2) Convention on wetlands of international importance, mainly as waterfowl habitats (1971);
- 3) Convention on combating desertification in those countries experiencing serious drought and / or desertification, especially in Africa (1994);
- 4) Framework Convention on climate change (1992)

Some aspects of water relations are regulated by the global instruments of international “soft” environmental law, in particular, it is:

- 1) Stockholm Declaration on the Environment (1972);
- 2) Adopted by the United Nations Conference on Environment and Development (RIO DE JANEIRO, 3-14 June 1992) The RIO DE JANEIRO Declaration on Environment and Development and Agenda 21 as a global action program for sustainable development in XXI century;
- 3) The JOHANNESBURG Declaration on Sustainable Development (2002) and the Plan of Implementation of the World Summit on Sustainable Development (September 4, 2002);
- 4) RIO DE JANEIRO Declaration (2012); and etc.
- 5) The resolution adopted by the UN General Assembly on September 25, 2015 “Transforming our world: the Sustainable Development Agenda until 2030” - the Sustainable Development Goals until 2030.

In accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 841 of 10/20/2018 “On Measures for the Implementation of National Goals and Objectives in the Field of Sustainable Development for the Period up to 2030”, 17 national goals in the field of sustainable development for the period up to 2030 were approved, including in the water sector.

6) PARIS AGREEMENT - an agreement under the United Nations Framework Convention on Climate Change that regulates measures to reduce carbon dioxide in the atmosphere since 2020. The agreement was prepared to replace the Kyoto Protocol during the Paris Climate Conference and adopted by consensus on December 12, 2015. Uzbekistan signed the Paris Agreement as the last among the countries of Central Asia - only April 19, 2017, but has not yet ratified it (see section 2.4 for more details).

In addition, the Republic of Uzbekistan is a member of the following international organizations whose activities are related to water resources: International Commission on Irrigation and Drainage (ICID), World Water Council (BBC), International Commission on Large Dams (ICP), Inter-Islamic Network on Management and water resources development, the Asia-Pacific Water Forum (APWF), the Global Water Partnership Network (GWP), etc.

On February 7, 2019, Uzbekistan, became the first member state of the Global Green Growth Institute among the CIS countries. Uzbekistan plans to implement joint projects with GGGI, primarily in the Aral Sea region, by attracting financial resources from the UN Green Climate Fund and other international donor organizations.

4.2. ORGANIZATION OF WATER RESOURCES MANAGEMENT IN UZBEKISTAN

Water management is carried out by the Ministry of Water Resources of the Republic of Uzbekistan. On February 12, 2018, the government of the Republic made a decision on the separation of water and agriculture. By the Decree of the President of the Republic of Uzbekistan No. UP-5418 of April 17, 2018 “On measures to fundamentally improve the system of state management of agriculture and water economy”, the Ministry of Water Resources and the Ministry of Agriculture of the Republic of Uzbekistan were created separately.

The main tasks and activities of the Ministry of Water Resources of the Republic of Uzbekistan:

- implementation of a common policy in the field of water resources management, as well as coordination of activities of state bodies, economic management bodies and other organizations in the field of rational use and protection of water resources, prevention and elimination of harmful effects of water;
- sustainable and rational provision of territories and sectors of the economy with water resources, taking measures to ensure the improvement and sustainability of land reclamation;
- ensuring reliable operation of the irrigation and reclamation system, reservoirs, pumping stations and other water and hydraulic structures, organization of protection of large and particularly important water facilities;
- increasing the responsibility of water users and water consumers for the careful and rational use of water resources, increasing the level of water use culture;
- introduction of science and technology, modern water-saving technologies, best practices in the water sector, innovative methods of water management and water use;
- organization of the system of advanced training for specialists in the field of water management, strengthening the integration of water management organizations with educational and scientific institutions, taking measures to introduce scientific achievements into practice;
- development of interstate relations on management and use of transboundary water resources, attraction of foreign investments and means of technical assistance (grants), as well as active participation in the activities of international organizations in the field of water management.

The structure of the Ministry of Water Resources and its subdivisions shown in Figures 4.1 – 4.8.

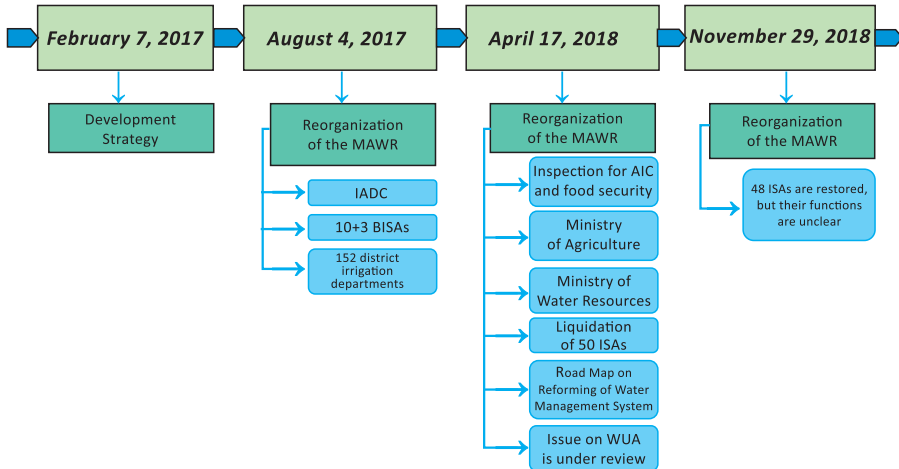
The organizational structure and structure of the central office of the Ministry of Water Resources, typical structures of the apparatus of Basin irrigation system administration (BISA), irrigation departments of districts, pumping station administrations and power engineering, land reclamation expeditions under BISA, as well as typical structures of reservoir management departments are approved by the Resolution of the Republic of

Uzbekistan No. PP -3672 of 04.17.2018 “On measures to organize the activities of the Ministry of Water Resources of the Republic of Uzbekistan”.

At the same time, 50 units of the Irrigation System Administration were liquidated as part of the Ministry of Water Resources. However, the reduced staff of the Irrigation System Administration actually was operating under the control of the BISA. With the release of Presidential Decree No. PP-4039 of November 29, 2018 “On Additional Measures to Improve the Activities of the Ministry of Water Resources of the Republic of Uzbekistan”, the former Irrigation System Administration and the Main Canal Authorities were returned to the modified organizational structure of the Ministry.

The role of the Irrigation System Administration in accordance with the decree number PP-4039 of November 29, 2018, focusing on the hydrographic distribution of water to the level of the district irrigation departments, which are responsible for the administrative decision of water demand issues. The creation of district irrigation departments under the Ministry of Water Resources enhances the horizontal interaction between water management, agriculture and local administration at the district level where main agricultural products are grown.

Review of institutional changes in the water sector (project of the Swiss Agency for Development and Cooperation, IFAS, 2019)



It should be noted that cotton-textile clusters were created in Uzbekistan in accordance with the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 53 of January 25, 2017 “On measures to introduce modern forms of cotton and textile production”.

This model involves the organization of a single production cycle, which includes the cultivation of raw cotton, primary processing, further processing at ginning enterprises and the production of final textile products with high added value.

Similar clusters are also being established for other key irrigated crops. The rapid growth of clusters is a serious challenge that can radically change the entire system of agriculture and water management in Uzbekistan.

The interaction of the AIC through the departments of irrigation with clusters of agricultural producers improves:

- (i) access to crop structure information for an accurate assessment of water demand,
- (ii) maintenance of the irrigation network, which will be funded by the local administration (district khokimiyats), starting in 2019,
- (iii) monitoring water use and
- (iv) participation of key stakeholders in improving water productivity at the district level.

In general, the Ministry of Water Resources is a legal entity and carries out its activities in accordance with the current legislation of the Republic of Uzbekistan and the Regulations on the Ministry of Water Resources of the Republic of Uzbekistan.

Currently, the Ministry's system has 13 Basin Irrigation System Administrations (BISA), 13 land reclamation expeditions under BISA, 48 Irrigation Systems Administrations (ISA), 152 districts irrigation departments, 13 irrigation stations and energy departments at BISA and other subordinate organizations and departments.

The structure of the Ministry of Water Resources of the Republic of Uzbekistan was approved by the Presidential decree № PP-3672 of April 17, 2018 and the Fund for water resources development was established under the Ministry. The main sources of the Fund's financing are determined:

- Starting from August 1, 2018, 30 % of the income from the tax payment for the use of water resources, with the exception of utilities;
- 30 % of revenues from administrative penalties for violation of water use and water consumption rules, as well as penalties for violation of the water intake procedure;
- Deductions from the part of the net profit left at the disposal of self-financed organizations that are part of the Ministry, on the basis of concluded agreements;
- Deductions of water management operational organizations of the Ministry at the expense of receipts for the services rendered by them on delivery of water resources for needs of the organizations for production of thermal electric energy and industrial goods;
- Charitable donations of individuals and legal entities;
- International grants and technical assistance;
- Other sources not prohibited by law.

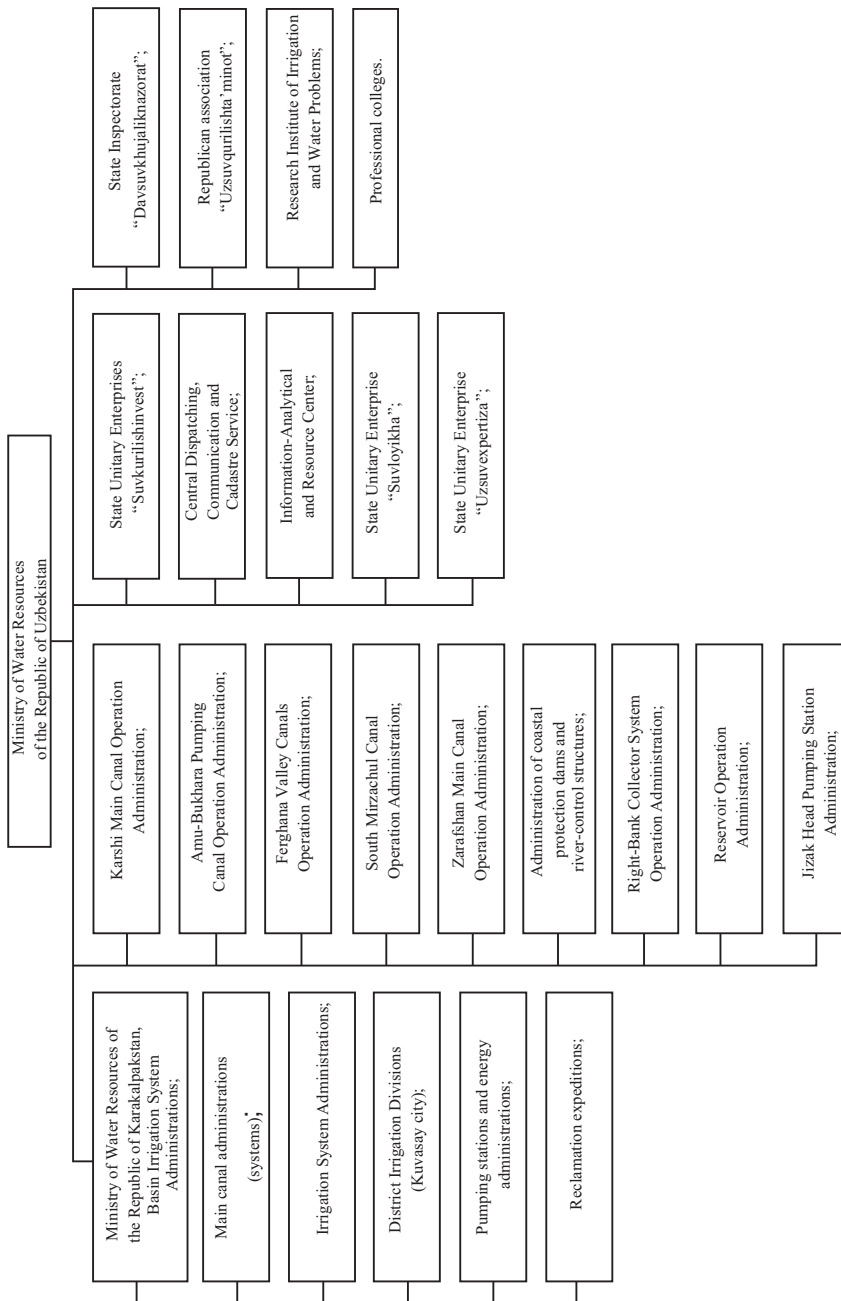


FIGURE 4.1. ORGANIZATIONAL STRUCTURE MINISTRY OF WATER RESOURCES OF THE REPUBLIC OF UZBEKISTAN (NOVEMBER 2018)

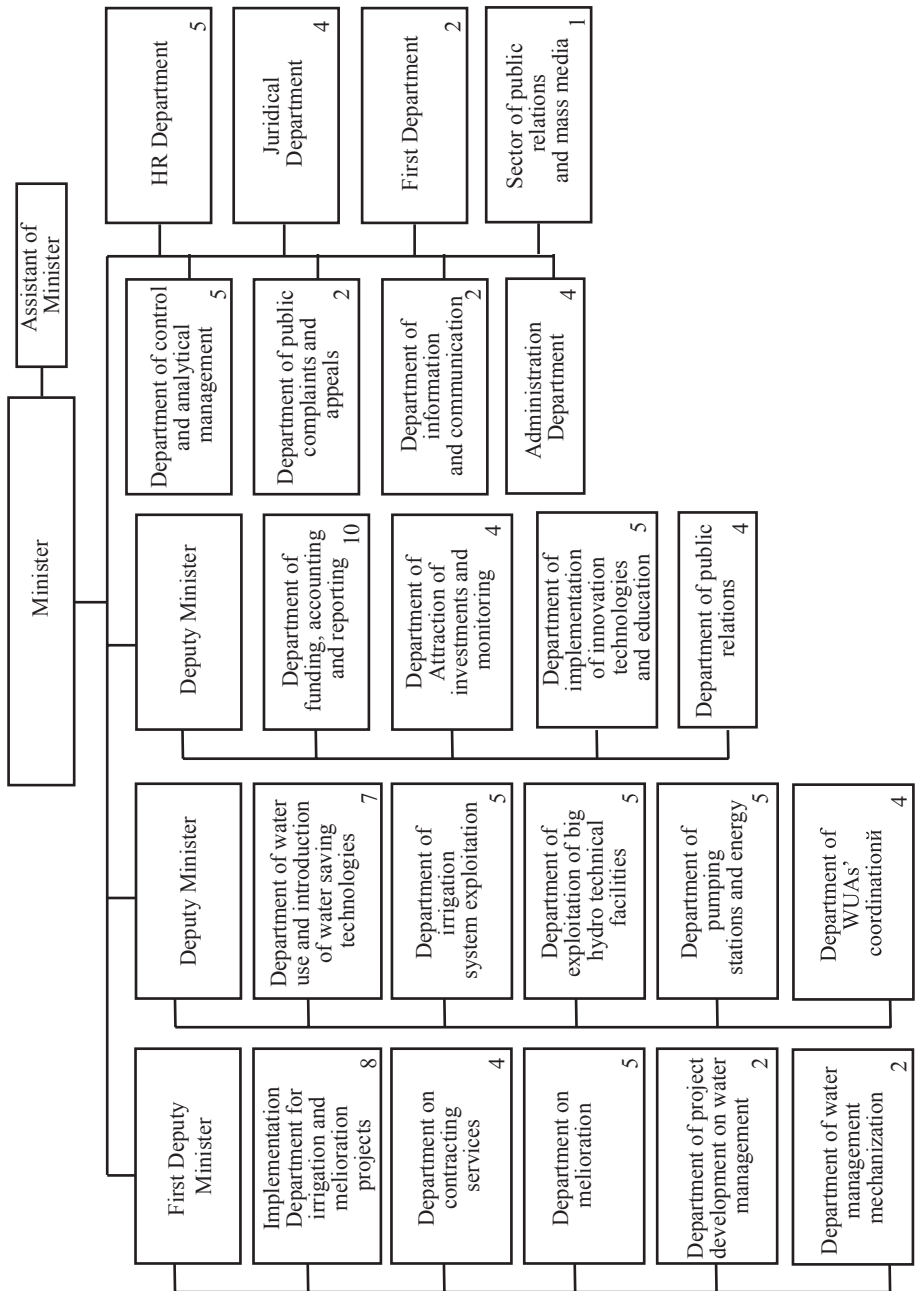


FIGURE 4.2. ORGANIZATIONAL STRUCTURE
MINISTRY OF WATER RESOURCES OF THE REPUBLIC OF UZBEKISTAN

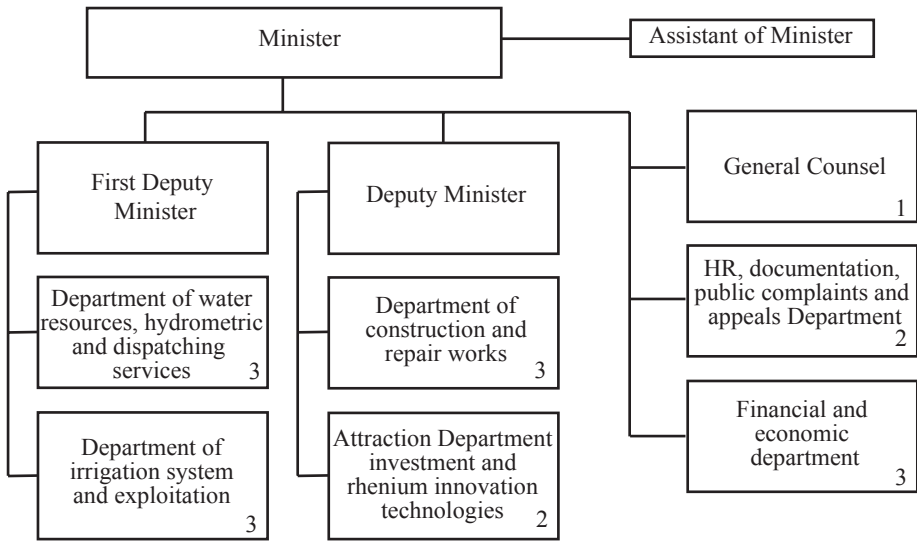


FIGURE 4.3. ORGANIZATIONAL STRUCTURE
MINISTRY OF WATER RESOURCES OF THE REPUBLIC OF KARAKALPAKSTAN

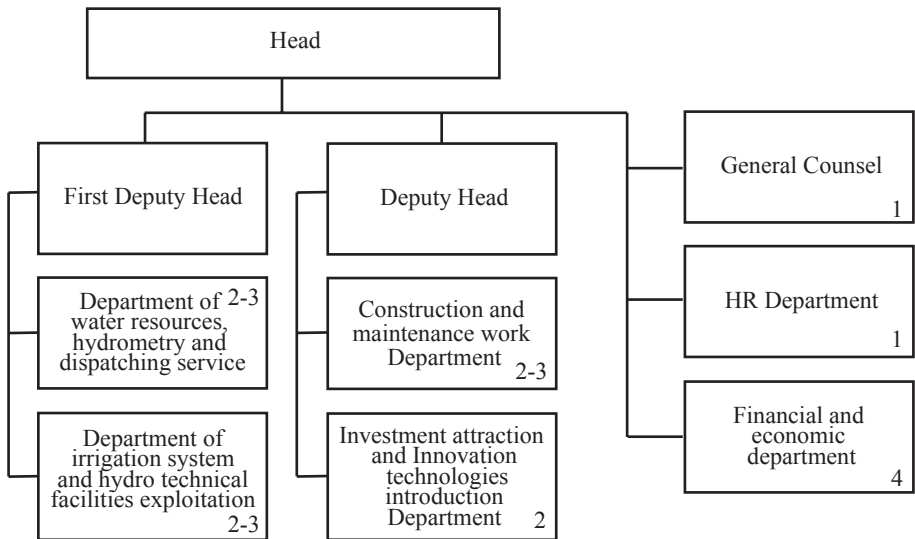


FIGURE 4.4. TYPICAL STRUCTURE
BASIN MANAGEMENT OF IRRIGATION SYSTEMS

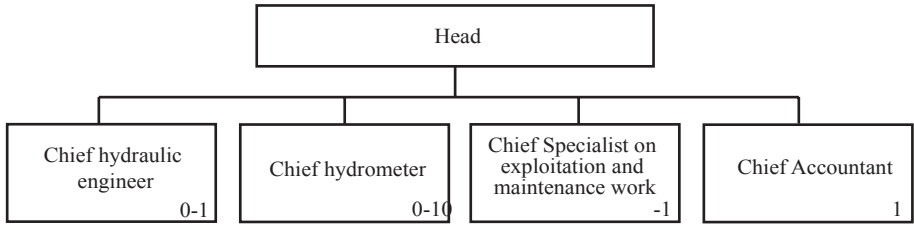


FIGURE 4.5. TYPICAL STRUCTURE DIVISIONS OF IRRIGATION DISTRICTS (KUVASAY CITY) AT THE BASIN ADMINISTRATIONS OF IRRIGATION SYSTEMS

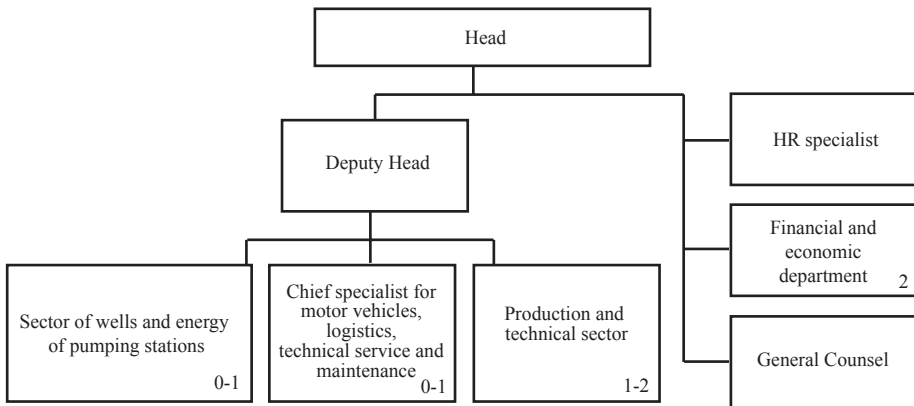


FIGURE 4.6. TYPICAL STRUCTURE ADMINISTRATIONS OF PUMPING STATIONS AND ENERGY AT THE BASIN ADMINISTRATIONS OF IRRIGATION SYSTEMS

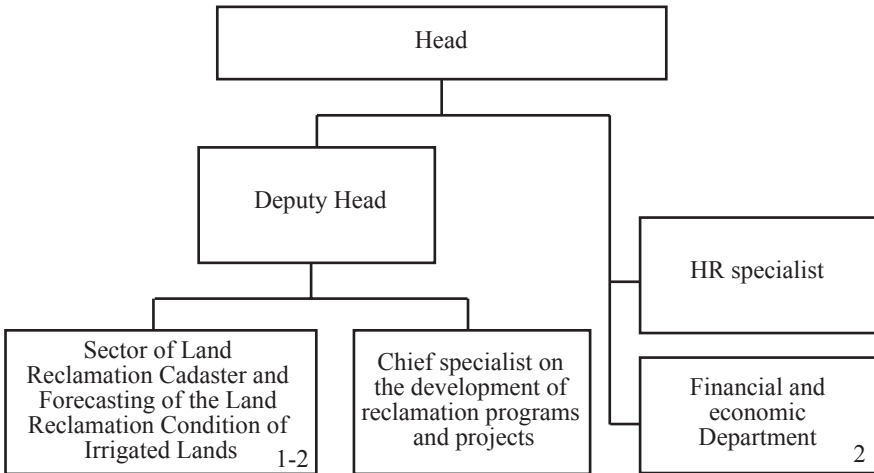


FIGURE 4.7. TYPICAL STRUCTURE MELIORATIVE EXPEDITIONS AT THE BASIN ADMINISTRATIONS OF IRRIGATION SYSTEMS

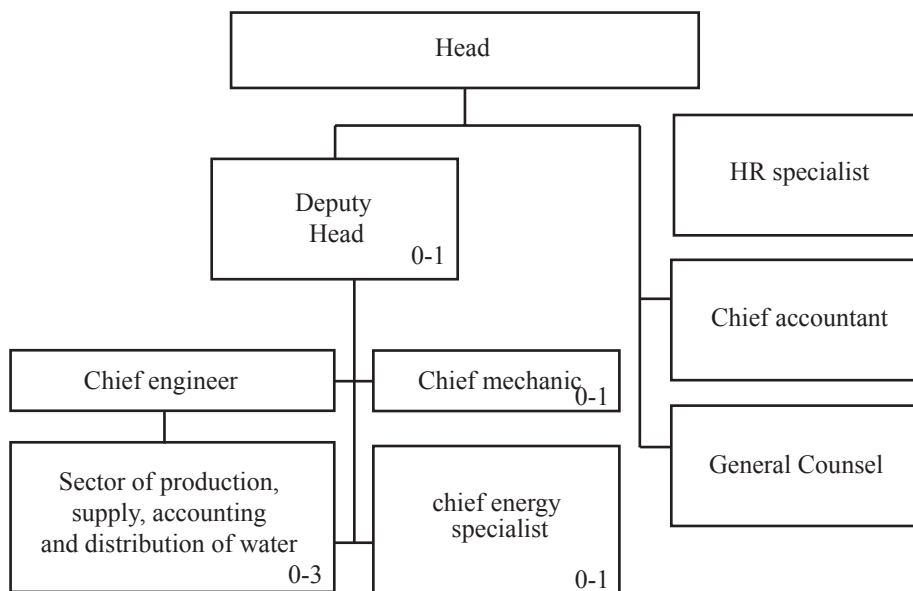


FIGURE 4.8. TYPICAL STRUCTURE MANAGEMENT OF OPERATION OF RESERVOIRS

Irrigation infrastructure

The total irrigated area of the Republic of Uzbekistan (as of January 1, 2018) is 4,291 million hectares of land. Of these, 2.2 million hectares of water are supplied by pumping stations.

There are 1858 pumping stations on the balance of the Ministry of Water Resources, where 4677 pumping units with an annual electricity consumption of 8.2 billion kW are installed.

The total length of the main and inter-farm irrigation network of the republic is 170.8 thousand km. Of this amount, the balance of basin irrigation systems (BAIS) is 27.3 thousand km (including 8.75 thousand km of main and inter-district canals, 18.5 thousand km - inter-farm channels). WUAs have 143.5 thousand km of on-farm canals on its balance. The main and inter-district irrigation network has 32960 hydraulic structures, including 314 large hydroelectric complexes.

Of 170,756 km of all types of canals in Uzbekistan:

- in the earthen channel - 124019 km
- in concrete facing - 24645 km
- in trays - 17664 km
- in pipelines - 4428 km

The efficiency of the main and inter-farm irrigation network in Uzbekistan is

considered to be quite good and the efficiency of main canals is 80%, and the inter-district irrigation network is 78%. The overall average efficiency of the irrigation network in Uzbekistan is 67%.

The total length of the collector-drainage network in Uzbekistan is 1243 33 km, of which 40,539 km are on the balance of the Hydro-reclamation expeditions of the Ministry of Water Resources. The length of open collectors is 31119 km, and closed drains 9420 km. WUA has 82131 km of collector-drainage network on its balance. The length of open collectors is 64537 km, closed drains - 19257 km.

There are 5,286 vertical drainage wells on the balance sheet of the Ministry of Water Resources.

In accordance with the estimates of the “Scheme for the integrated use of water resources of the Republic of Uzbekistan until 2027,” prepared by the “Vodproekt” Association of the Ministry of Water Resources of the Republic of Uzbekistan, the following is needed today:

- About 32% of the total length of inter-farm and main canals requires rehabilitation, and 25% - renewal;
- More than 42% of the on-farm irrigation network requires rehabilitation and 18% need updating;
- There are about 200 water intake hydraulic structures with a capacity of 10 to 300 m³/s, 118 require replacement and upgrading of hydro-mechanical equipment, and 65 hydro-posts require rehabilitation;
- The life of most of the pumping stations serving more than 2.2 million hectares has already expired. In total, 76 pumping stations that are unique (> 100 m³ / s), 496 - medium (up to 10 m³ / s) and 561 small (less than 1 m³ / s) require rehabilitation. Out of 4,677 units, 1,417 require upgrading;
- Of the 47 reservoirs surveyed, 21 are almost completely silted, and in 7 reservoirs the deposition level is now very close to the outlet facilities;
- About 20,000 km of open on-farm drainage requires cleaning, 19500 km of open and closed drainage requires reconstruction and renovation, and only 50% of closed horizontal drainage is in good working condition.

Stable investments in rehabilitation and modernization, as well as improved operation and maintenance, are needed to prevent further deterioration of the situation and ensure the stability of the agricultural system. The improvement of on-farm irrigation networks means, first of all, the reconstruction of old irrigation systems on the area of more than 1.5 million hectares. This is quite a difficult task, because it involves the interests of existing farmers, and, at the same time, the problem is very capital-intensive.

4.3. IMPLEMENTATION OF INTEGRATED WATER RESOURCES MANAGEMENT IN UZBEKISTAN

The foundations of the modern concept of integrated water resources management were put forward at the well-known conference in Dublin in 1992 in the form of four principles, which became the basis for the subsequent global water sector reforms.

Principle 1. Fresh water is a depletable and vulnerable resource, important for sustaining life, development and the environment.

Fresh water is a limited resource and this fact is confirmed by a quantitative analysis of the global hydrological cycle, from which it follows that on average in annual terms, there is a fixed amount of water. This volume cannot be significantly increased as a result of human activity, although it can be, as often happens, reduced as a result of anthropogenic pollution. Freshwater is a natural resource that needs to be maintained, guaranteeing the necessary water services that are provided by this resource. This principle also suggests that water is necessary for various purposes, functions and services; therefore, management should be holistic (integrated) and take into account both the ability to meet the demand for a resource, and the threat to its safety or excessive withdrawal.

According to this principle, it is logical that the river basin or its catchment area should serve as a unit of water management. Hence the so-called hydrographic approach to the organizational construction of water management.

Principle 2. The development and management of water management should be based on a comprehensive approach involving users, employees of planning organizations and policy makers at all levels.

Water is a resource, and each of us is stakeholder. Real participation takes place only when the parties concerned are involved in the decision-making process and its implementation, or at least have joint control over it. A multi-stakeholder approach is the best way to achieve long-term consensus and general agreement. Participation means taking responsibility, recognizing the impact of activities of this sector of the economy on other water users and aquatic ecosystems, as well as making commitments to improve water use efficiency and sustainable development of the resource. However, the possibility of universal participation is literally absurd, the implementation of this principle is possible only through the formation of representative non-governmental, local and industrial organizations created on a democratic basis, expressing group, territorial or other public interests. It should be noted that participation does not always lead to consensus, therefore arbitration or other mechanisms for resolving conflicts are also necessary.

Governments should assist in creating opportunities for the participation of all stakeholders, especially vulnerable social groups. It must be recognized that, at the present time, the simple creation of conditions for participation will give nothing to the

poorest groups if their participation is not provided with real mechanisms, structures and a system of social mobilization. Decentralization of decision making to the lowest level of final water users is the only strategy to increase participation.

Principle 3. Women play a central role in the provision, management and protection of water resources.

The role of women as the main suppliers and users of water in households and habitat advocates is widely used in the media to demonstrate the burden and worries they carry with a low level of provision. However, it has rarely been reflected in organizational activities aimed at the development and management of water resources. It is generally recognized that women play a key role in collecting and protecting water for communal purposes and, in many cases, performing the most difficult manual work in agricultural use, suffer the most from undersupply of products due to interruptions in irrigation or drainage. But at the same time, they play a much less influential role, compared to men, in management, problem analysis and decision-making processes related to water resources.

IWRM requires recognition of the role of women. In order to ensure the full and effective participation of women at all levels of decision-making, it is necessary to take into account the approaches by which various social formations distribute social, economic and cultural roles between men and women. There is an important relationship between the equal status of men and women, the proper use of their different gender characteristics, and sustainable water management. Involving men and women in influential roles at all levels of water management can accelerate the achievement of sustainability; and managing water in an integrated and sustainable way makes a significant contribution to achieving gender equality, improving the access of women and men to water and water-related services, responding to their immediate needs.

Principle 4. Water has economic value in all competing uses and should be recognized as an economic good as well as a social good.

Within the framework of this principle, it is first of all important to recognize the basic right of all people to have access to clean water and normal sanitary conditions at reasonable prices. Managing water as an economic commodity is an important way to achieve social goals such as efficient and equitable water use, and the promotion of saving and protecting water resources. Water, as soon as it is taken from a source, acquires cost indicators as an economic, ecological, and also social substance. Most of the past failures in water management are related to the fact that in the past conditions of the administrative system, economic categories were used in a distorted form, in particular, the price characteristics of water as a resource were not recognized, and the structure of the total cost of water and its sources were not considered. In the end, in the era of transition to a market economy, this led water economy and its financial stability to a state of loss of capacity and widespread degradation. At the same time, this situation turned out to be fair not only for the CIS countries that emerged on the remnants

of “imperfect” socialism, but also for the countries of Eastern and Central Europe, which retained the characteristics of “rudimentary” capitalism in their economies.

Cost and payment are two different things, and we must make clear distinctions between them. The cost of water with alternative uses is important for the rational distribution of water as an insufficient resource, being either a regulatory or an economic tool. A fee (or not a fee) for water (services for its supply to consumers) in combination with state participation and a subsidy system is used as an economic tool to cover the necessary costs for the sustainable functioning of the water management system, as well as to support vulnerable groups of the population. It is necessary to take into account that the correct use of these categories in government administration affects the behavior of various actors in terms of saving and efficient use of water, providing incentives for demand management, payback of services and the willingness of individual consumers to pay for additional water management services.

The recognition that water used under certain conditions, especially during water scarcity, takes the form of an economic benefit without being a “commodity”, becomes an important tool for decision-making in distribution of water between different sectors of the economy and between different water users within the sector. This is particularly important when the increase in the supply of water is further impossible, and for assessments of competing needs, for example, upon the occurrence of a water shortage.

In many countries of the world, where water users have been able to give priority to long-term interests rather than the desire for quick personal benefit and have started to cooperate with each other, the basin principle of water resources management with separate elements of integration has long been applied. Examples of collective action in water resources management show the common advantages of such an approach, especially given the dynamics of water relations, which can never get stuck in the “status quo”:

- 1) With the introduction of a single management organizational structure in the integrated hydrographic system, water consumption is brought into line with water requirements;
- 2) The system of agreed rules defines the rights and obligations of each water user and, at the same time, organizes water allocation and contribution to the operation of the system;
- 3) There is a common understanding that such consistency is beneficial for all, i.e. the average profit of each water user is higher when all water users cooperate rather than compete with each other.

Integrated water resources management (IWRM) is an effective practical tool, the implementation of which depends on a clear understanding of its essence. Therefore, it is necessary to present the essence of IWRM, decomposing it into key components (see Figure 4.9):

IWRM = Water Management Process (WRM) + Leadership System + Leadership and Management Tools

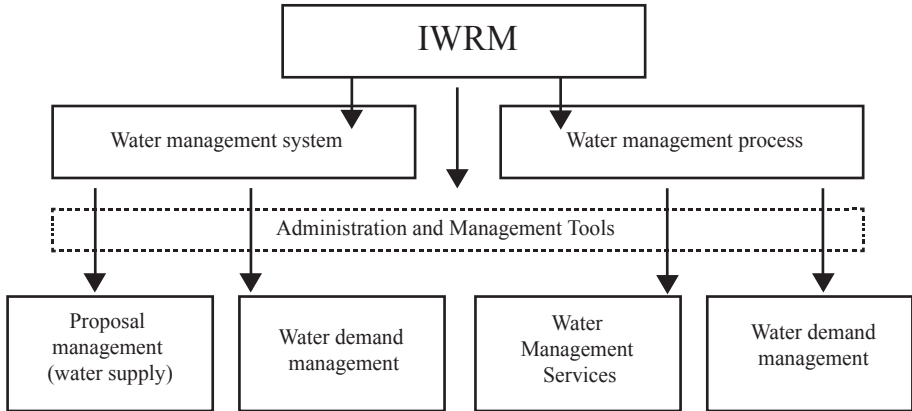


Figure 4.9. Structure of IWRM (SIC ICWC - Mirzaev N.N.)

The process of water management includes a set of interrelated components - the successive steps of this process (see Table 4.2). First of all, these are available water resources (surface, underground, etc.) and engineering and technical infrastructure for the collection, storage and supply of water to consumers and users. Management provides for a mandatory assessment of water needs, the order of water distribution, taking into account the constant balance between water resources and needs. After that, the necessary water supply services are assessed, and at the end of the process - the use and consumption of water. Water quality control and environmental compliance should also be included in the above process. In addition, the management process should include forecasting changes in the main factors and components of the water balance in the long term, as well as determine the mechanism of adaptation of the water use system to these changes. Of course, the results and effectiveness of the water management process should be continuously monitored and evaluated.

One of the main tasks associated with the maintenance of the engineering infrastructure (reservoirs, irrigation and drainage channels, hydraulic structures, water supply system, etc.) is its appropriate operation and maintenance, including maintenance of all necessary operating conditions and parameters of structures; their repair, modernization, and, if necessary, their reconstruction. Currently, the quality of operation and maintenance is determined by such indicators as costs (financial and material), cost recovery, efficiency and service life and security of the infrastructure.

The next component of the water management process is aimed at assessing and managing the water needs of all stakeholders. The main indicators of this component are the data of water intake at all water supply points, the required volume and time of supply.

Table 4.2. Components and indicators of water management process

Components	Governance	Tasks	Indicators
Available water resources		Monitoring Development Protection	Quantity, quality, mode, renewability, variability
Infrastructure and management of fixed assets		Operation and maintenance, Keeping water facilities operational	Cost / Efficiency / Cost Recovery / Reliability / Safety
Demand (requirements) for water		Demand (requirements) for water	Level / Volume / Quality / Time / Location
Water balance and water distribution planning (in conditions of shortage - limiting)		Public participation Plan (schedule) Rules	Water consumption rate Criteria for fair and rational distribution (right / share / quota / limit)
Services for the supply of water to consumers		Guaranteed water supply	Water availability / efficiency - minimum unproductive losses / stability / uniformity
Water use and productivity		Results (products based on water use), water saving	Productivity (more crop yield per drop of water) Specific water supply
Water Use Efficiency		Sustainable development	Sustainable Water Use Index
Water quality and environmental management		Compliance with environmental requirements	Indicators of quality and environmental water consumption
Monitoring and Evaluation		Daily maintenance	Online availability of information from the main water supply and distribution points
Long-term planning	Adapting to long-term change	Meeting water needs during the planned period	

After determining available water supplies and water requirements, the next component is water distribution planning. In other words, it is a process of finding a balance between available water resources and needs. In this case, the main tasks will be the maximum possible involvement of all stakeholders in the process of negotiations (coordination of water distribution) and the development of procedures (rules) for water distribution acceptable to all parties. The proposed indicator for this component is criteria of equity and rationality for establishing quotas or limits for water use (in the case of water deficit).

The next component of the process is the supply of water to water users from the source. The proposed indicators for assessing the quality of these services are uniformity

and stability (in time and space), sustainability of water supply with minimal non-production losses of water.

The last key component is water use, including irrevocable water consumption. In this case, the main task is to maximize the effective performance of water with its optimal use. The proposed indicator is the specific water productivity, i.e. the volume of water consumed per unit of output. Specific water consumption per unit of production should be close to the technological (biological) norms of water consumption. In the production and use of water, we must be guided by the principles of sustainable development (allowing future generations to use water to the same extent as today); and the proposed indicator could be the sustainable use index, the excess of which is unacceptable.

Water governance is an important component of IWRM

In the IWRM system, all the above-mentioned components of water resources management should be coordinated by an appropriate governance structure. The main objective of the guidelines is to provide equal democratic conditions to all stakeholders involved in the process of water resources management. The main components of the governance structure are: political commitment; institutional organization; legislative framework; financing and economic incentives; public participation; governance mechanisms and tools; and capacity-building. The governance structure is not constant – it must constantly adapt to changes: natural, political, social, economic and technological. In a broad sense, this may also apply to the rules of management, as they are the most vulnerable component of the modern management system and require the attention of all specialists of the water sector of each of the basins, as each basin and water management system has its own specifics.

It is important to achieve a common understanding of the importance of coordination at all levels of water management, as well as the contribution of each participant to integrated water resources management. A governance system covering all levels of the water management hierarchy should contribute to the achievement of indicators (Table 4.2). On the other hand, the governance structure should ensure horizontal integration of sectors. There should be a platform for active participation in the development process and coordinated decision-making by various stakeholders (government, NGOs, science, private sector, professional organizations) and water user sectors (agriculture, hydropower, environmental protection, water and sanitation, etc.).

The main criteria for assessing the success of such integration are: involvement (the right to vote), equity (the ability to express one's interests), transparency, efficiency, accountability, coherence, response, integrity, and ethical considerations. Governments, in the form of legislation, should define the framework within which water management organizations can work for the benefit of all sectors of the economy and all water users. The management system should provide conditions for achieving (or approaching) maximum water productivity by water users in all sectors (irrigated agriculture, industry, domestic water supply, etc.), as well as for the successful

survival of nature. This means that a minimum volume of water close to the required biological or technological water consumption should be used for the production of a unit of production, with minimal water losses throughout the process cycle, including water intake, water supply, water supply and water use.

Regional experience in practical implementation of IWRM

The practical implementation of IWRM in the water sector began even before the independence of the Central Asian countries. For a long time this process was implemented without a General strategy of adaptation of such approach to local conditions, with spontaneous implementation of only some elements and principles of IWRM in practice.

The most important step towards achieving IWRM was made within the framework of the regional project “IWRM in the Fergana valley”, implemented by specialists of water management organizations of Kyrgyzstan, Tajikistan and Uzbekistan under the coordination of SIC ICWC and IWMI, and financial support of the Swiss Agency for development and cooperation (SDC).

The overall objective of the project was “to contribute to the development of sustainable livelihoods, improving environmental sustainability, social harmony and promoting rural restructuring in the Central Asian states by improving the efficiency of water management using the example of the Fergana Valley”. Project activities were based on the implementation of engineering and technical measures in combination with organizational, legal and financial measures. Joint efforts of key stakeholders such as water management organizations, water user unions (main) canals, water committees (main) canals, WUAs/local communities, as well as farmers / end-users themselves have been mobilized to implement these activities. As a result, the concept of the following institutional structure for the implementation of IWRM principles was implemented (Figure 4.10).

Joint actions at each level and between levels were based on agreed procedures and methods for stabilizing water supply, ensuring equal (even) distribution of water and organizing public control by water users themselves. Thus, within the framework of the Fergana project, six IWRM principles were implemented: hydrographic construction of leadership, linking several levels of hierarchy, creating a platform for integrating sectors, linking planning for the sharing of different types of water, shifting the emphasis from supply management to managing water demand, and finally water saving. As can be seen in Figure 4.11, the Fergana project achieved this goal in the pilot zone of the Fergana Valley, reducing the specific water consumption per hectare. During the growing season, the saving of irrigation water in general from 2003 to 2012 amounted to 2,354 million m³, and on average for 1 year - 262 million m³, mainly due to institutional reforms and improved mutual discipline of water workers and water users.

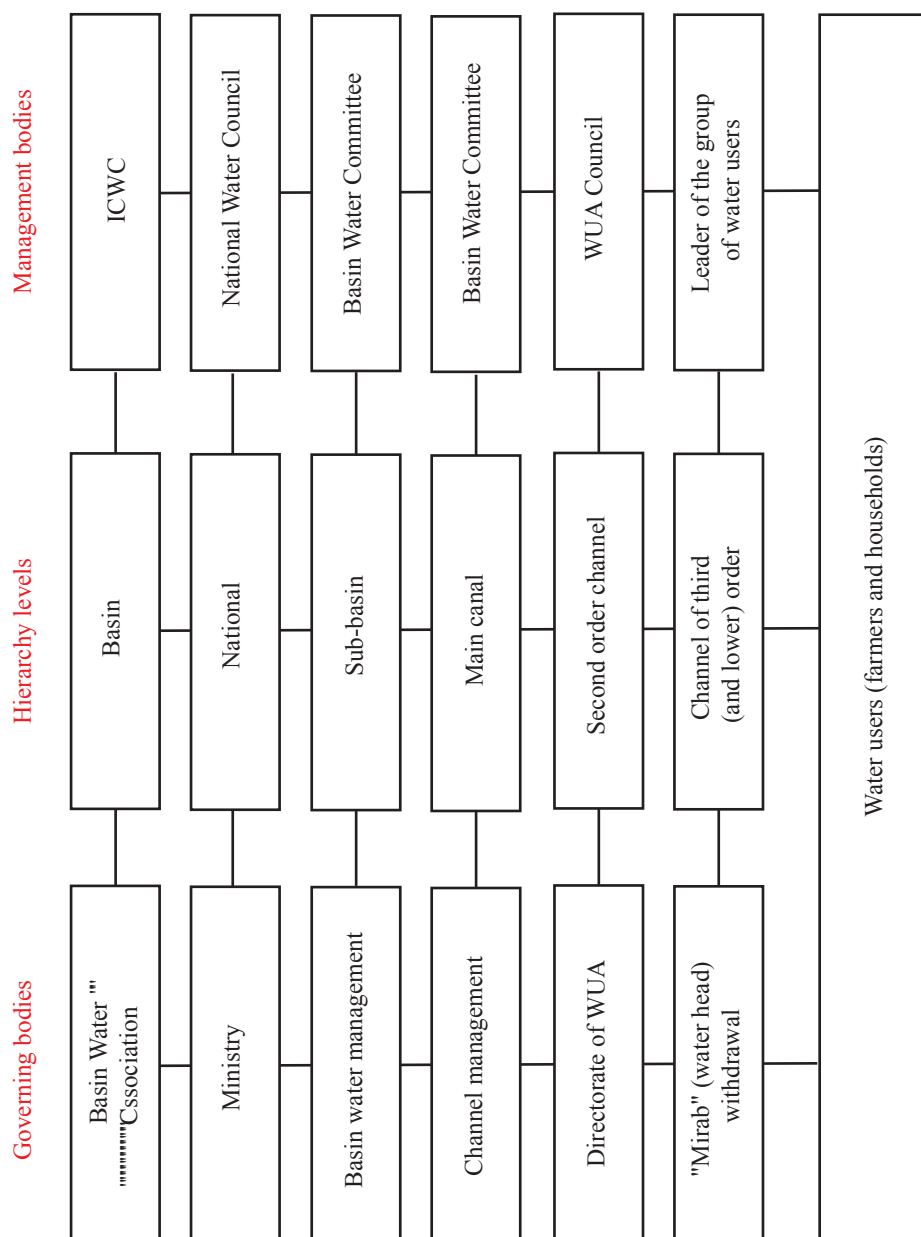


Figure 4.10. Levels of water management hierarchy for the implementation of the principles of IWRM in the interests of irrigated agriculture of the Fergana Valley (SIC ICWC - Mirzaev N.N.)

At the same time, on the territory covered by the project, there was an improvement

in the indicators of water use efficiency and water productivity at the level of farmers. These improvements, as a result, make it possible to increase the financial sustainability of farmers and WUAs. The financial sustainability of the WUA is the main condition for performing the main functions of the associations - taking care of the on-farm (inter-farm) irrigation network and providing water supply services to farmers. The “IWRM-Fergana” project covered an area in Uzbekistan of about 104 thousand hectares, and its success initiated the dissemination of IWRM experience in the framework of the RESP-2 project on an area of more than 250 thousand hectares in seven regions of Uzbekistan. Today, the total area of IWRM coverage in Uzbekistan is more than 450 thousand hectares or 15% of the total irrigated area.

In June 2004, the implementation of the project on “National Plan for IWRM and Water Efficiency of Kazakhstan” was launched with the support of UNDP, the Government of Norway, DFID (United Kingdom) and methodological assistance from the Global Water Partnership.

Decree of the Government of Kazakhstan No. 978 of October 11, 2006 “On signing an agreement between the Government of the Republic of Kazakhstan and UNDP on the project on “National Plan for Integrated Water Resources Management and Water Efficiency of Kazakhstan” approved the development of the Program on “Improving Integrated Water Resources Management and Water Efficiency of Kazakhstan to 2025”. The program is currently being implemented by eight basin water management organizations of the republic with the participation of all stakeholders.

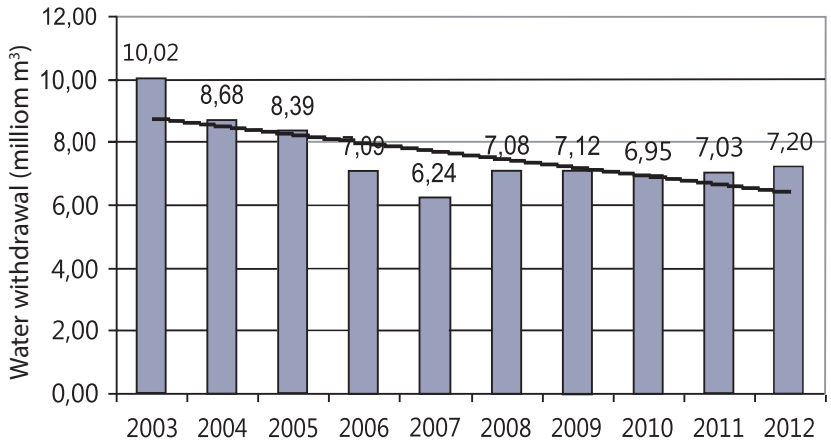


Figure 4.11. South Fergana Canal: Specific actual water supply from the canal during the vegetation period (per hectare, taking into account the water supply for double crops)

It should be emphasized the difference in approaches to the implementation of IWRM principles in Kazakhstan and Uzbekistan. In Uzbekistan, the process has started from “bottom-up” – from end users, i.e. from farmers to higher levels of water management hierarchy: WUA – Irrigation System-Basin, with the involvement of specific participants at these levels. Problems and barriers on the way to IWRM led to a better understanding of bottlenecks at the national level. As a result, the government of Uzbekistan in 2009 made an audit of the “Law on water and water use”, setting out the principles and procedures of IWRM. Special attention is paid to the system of support for WUAs and farmers. In Kazakhstan, the process was started “from top to bottom”: through the development of the national IWRM plan, the Water Code in 2003 and their implementation at the basin level. Unfortunately, lower levels of water management hierarchy are still ignored in Kazakhstan. As a result, real improvements in water efficiency are not clearly visible.

Nevertheless, the experience of Kazakhstan and Uzbekistan is taken into account by the water specialists of Kyrgyzstan and Tajikistan, who initiate the movement towards IWRM from two sides - from the bottom and the top at the same time. Obviously, such an approach will allow in these countries to get faster real results. The main general lesson should be clearly learned by all - the implementation of IWRM needs effective support from the government.

Future perspectives: from recommendations to practical solutions

As part of the wide dissemination of IWRM practices, the following recommendations should be followed:

- The institutional structure of the water sector should be reformed in order to separate functions – some bodies should be responsible for water supply services, others should be responsible for water use, and others should provide control. The combination of these features is not effective from the point of view of economic mechanisms and incentives. In addition, this separation will create incentives to minimize unproductive water losses – both in the supply and use of water.
- The institutional structure for water supply cannot be built within administrative borders - only on the hydrographic principle to avoid administrative pressure (hydro-egoism).
- Institutional structures responsible for the functions of water use and control can be created on the basis of the territorial-administrative principle, since economic and social-public activities are structured in states within administrative boundaries.
- The decision-making system for water management (as opposed to the water management process) should be organized on a bottom - up basis. This will minimize professional / sectoral hydro-egoism and put the whole process on a democratic track and involve all stakeholders.
- Investment in infrastructure will be not effective without adequate (above-mentioned) institutional reforms.
- Institutional changes are not effective without improving IWRM instruments,

in particular, without developing financial mechanisms to ensure the financial viability of institutional structures (especially at the grass-roots levels where water-based products are produced).

- During reforms, as well as in daily activities in water management, the focus should not be on the actions themselves, but on the results to which these actions will lead. Any institutional changes should improve the water management process and, therefore, be measured by appropriate water indicators - for example, an increase in the amount of water saved during each event.
- Orientation only on social justice or only on economic efficiency of water use in the modern world is not acceptable. It is necessary to seek consensus between social justice and economic efficiency, taking into account environmental stability.

Capacity development within IWRM

SIC ICWC with partners initiated an extensive regional program aimed at improving knowledge on water management for top and middle level specialists in parallel with the work on IWRM implementation. This program began in 2000 with the support of CIDA and the partnership of McGill University and Mount Royal College (Canada) in the established Training Center (Tashkent). The policy and strategy of training activities were determined, aimed at promoting and agitating the relevance of IWRM ideas for the region and its transformation into a program of actions for water management reform. At the initial stage, the training covered the leading employees of the relevant ministries and departments, then employees of regional and basin administrations, and subsequently specialists of the middle level of water management organizations. The main features of the training activities are:

- Basing on the results of research works carried out on general intergovernmental programs and various regional projects;
- Creating efficiency through decentralization and coverage of a large number of specialists by creating branches of the Training Center in Osh with support of SDC (for students of the Fergana Valley areas within the borders of the Kyrgyz Republic, the Republic of Tajikistan and the Republic of Uzbekistan) in Urgench with support of CIDA (for students of the Amurdarya regions and districts of Turkmenistan, Karakalpakstan and the Republic of Uzbekistan), as well as in Almaty city with support of USAID and in Bishkek with support of ADB;
- Thematic focus, the involvement of related industries.

Low-level training centers were established in the cities of Fergana, Andijan and Khujand within the IWRM-Fergana project in addition to the Osh branch of the training center providing trainings for regional and district water management organizations, canals and WUAs. Moreover, an experimental training center was established on the basis of the exemplary WUA “Akbarabad” in the district center of Kuva district of Fergana region to train farmers, representatives of WUAs and dekhkan farms, makhalya and village committees.

Capacity building activity within the “IWRM-Fergana” project have been carried

out since the initial phase of project development and its focus has been determined by the goals and objectives of each phase. For example, during the second phase of the project, when organizational reforms of water management (WUA, WCC, CM) were proposed and elements of water productivity were tested, there was a continuous process of social mobilization (problem analysis and identification of ways to overcome them, development of organizational structures, knowledge base, etc.). Specialists and field consultants on social mobilization met with the public, farmers, representatives of water management organizations, heads of local administration, etc. and explained them the organizational structure of IWRM, including the steps to improve the organizational structure of management on pilot canals, the procedure for creating a public body (which will later participate in the management system or WUAs, where their role (stakeholders) and votes will be crucial) and the essence of the transfer of part of powers from the state to the water users, the role of preserving the role of the state in managing water resources.

In parallel, the project specialists conducted training seminars for students of different levels (farmers, specialists of WUAs and canals) on various aspects of IWRM:

- Organizational and legal aspects of creation and development of new institutional structures of IWRM: WUAs, Canal Councils, water user groups, etc.;
- Improvement of the water use system, accounting and reporting in water use at the level of farms, WUAs and canals;
- Financial management of the WUA;
- Water dispute resolution methods for water users and WUA specialists and Councils in each pilot WUA
- Experience of effective implementation of irrigation and agrotechnical measures to increase the productivity of irrigation water and land;

During the 3rd phase of the project, the topics of training workshops were determined in accordance with the tasks set for this period - expanding and deepening the organizational, legal and management principles and methods of IWRM in selected areas of the Fergana Valley to achieve real public participation at all levels of the water hierarchy sustainability:

- Capacity-building of the new institutional structures established under the project;
- Basic organizational, legal, financial and economic measures for the sustainable operation of WUAs; preparation of business plans and plans for repair and restoration work in WUAs organized along the pilot canals.
- Exchange of experience of existing Advisory services in countries and the IWRM-Fergana project.
- Experience and problems of water management in the main canals and transboundary small rivers of the Fergana valley (Transboundary Small Rivers Component).

In addition, meetings and round tables of the National Coordination and Support groups (NCS) developed in each country during this phase were held to address the

issues of IWRM implementation in the countries, etc.

The subject of training in the subsequent phases of the project on institutional aspects and tools of IWRM is aimed at strengthening the role of institutional organizations of IWRM, increasing their financial and economic sustainability. Feature of trainings of this period is a series of practical trainings on the ground, i.e. on the job:

- Training on direct contracts between WUAs and local channels (Increasing the capacity of WUAs to draw up direct contracts between WUAs and local channels, as well as practical assistance to WUAs);
- Training on drawing up a water use plan taking into account the water needs of crops in each designated WUA
- Training in drawing up a management plan for fixed assets, especially how to make an inventory and determine the book value of fixed assets, etc.

The activities of the pilot training center established on the basis of the WUA “Akbarabad”, where trainers- mobilizers (agricultural technician, agronomist, entomologist) trained at the upper levels of the training pyramid, taught farmers not only methods of water accounting, water use and water distribution, but also all the issues aimed at increasing the productivity of land and water, confirmed the possibility and necessity of functioning of such consulting assistance.

In General, more than 900 seminars were held for more than 30 thousand participants during the period of the project.

To ensure the long-term sustainability of the results of the IWRM-Fergana project, it was decided to transfer the accumulated positive experience and project materials to local educational institutions specializing in the training of mid-level water specialists. To achieve this goal, working relationships were established and a memorandum of understanding was signed with the Markhamat Irrigation College. Among other things, seminars and trips to pilot sites were organized to exchange experience, all technical materials and developments were handed over to the college, and working groups with teaching staff were created with the aim of further adapting the experience through teaching aids and introducing them into the educational process.

In 2007, the Markhamat College introduced additional classes in IWRM to the educational process (50 academic hours - 20 theoretical and 30 practical classes). Since 2007, students of the 2nd and 3rd courses have been doing practical training in BISAs, helping BISA and WUAs staff, as well as hydraulic engineers.

In September 2015, Uzbekistan, along with other UN member States, supported the adoption of the global agenda 2030 and the Sustainable Development Goals.

At the end of 2017, the Government of Uzbekistan adopted a Plan of Practical Measures “Road Map” for the further development of cooperation between the Republic of Uzbekistan and the United Nations for 2017-2020. This document outlines more than a hundred basic measures to promote the achievement of the strategic priorities of the

“Strategy for Action 2017-2021” and fulfill the commitments of the Government to achieve the Sustainable Development Goals, as well as commitments under a number of UN human rights instruments.

The tasks of coordinating all types of water users (not only for irrigation - as it has been until now) were assigned to the new Ministry of Water Resources, which means it also includes achieving sustainable development goals related to water at the 2030 level, which Uzbekistan adopted before the UN and the world community. Among the 17 sustainable development goals, goal 6.5.1 is “to implement integrated water resources management (IWRM) at all levels by 2030, including through transboundary cooperation where appropriate”. This task supports the equitable and efficient use of water resources, which is of great importance for social and economic development, as well as for environmental sustainability.

In November - December 2017, Uzbekistan carried out an assessment of the progress of our country regarding the implementation of IWRM and presented to UNEP - the United Nations Environment Program - the results of this assessment, which showed where we are relative to the goal (SDG) 6.5.1. The assessment consisted of four sections, each of which is devoted to one key component of IWRM:

1. Favorable conditions: creation of conditions conducive to supporting the implementation of IWRM, which include the most typical political and legislative instruments, as well as strategic planning tools for IWRM.

2. Institutions and participation: the whole spectrum and roles of political, social, economic and administrative institutions and other groups of stakeholders that contribute to supporting the implementation of IWRM.

3. Management tools: tools and activities that will enable decision makers and users to make rational and informed choices among alternative actions.

4. Financing: budgeting and funding available from various sources that is used to develop and manage water resources.

Total score obtained by Uzbekistan on the indicator 6.5.1 (based on a 100-point scale) according to the results of the assessment:

Section	Average score
Section 1 Favorable Environment Conditions	38,3
Section 2 Institutions and Participation	52,7
Section 3 Management Tools	55,6
Section 4 Financing	34,0
The average score for the indicator 6.5.1	45,15

In the first section, the score is 38.3 - that is, the conditions for IWRM in Uzbekistan are at a moderately low level. This is explained by the fact that so far in Uzbekistan the law on water and water use of 1993 does not include the regulation of the principles of IWRM, and the new Ministry of Water Resources still does not have a common national strategy for the development of water resources.

The average score for the second section is 52.7 - that is, the potential of water management organizations for implementing IWRM in Uzbekistan is at a moderately high level.

The average score on the third section is 55.6 - that is, the tools used by water management organizations to manage and protect water resources in Uzbekistan are at a moderately high level.

The average score on the fourth section is 34.0 - that is, the level of financial aspects of water management in Uzbekistan is at a moderately low level.

Thus, from the conducted assessment it is clear that a lot remains to be done to fully and effectively implement the principles of IWRM in Uzbekistan.

4.4. PROBLEMS OF REGIONAL WATER USE AND MODERN CHALLENGES

As already noted, only slightly more than 10% of the total river flow in the Aral Sea basin is formed in the Republic as a whole. That means that we depend on water from our neighbors!

Today we face new challenges: population growth, increased demand for food, industrial development, climate change, intensive melting of glaciers and many other anthropogenic factors.

Further effective cooperation within the framework of the international Fund for saving the Aral Sea and the Interstate water coordination Commission (ICWC) is perhaps the only way to ensure water security and our common response to modern challenges.

TRANSBOUNDARY ASPECT⁴³

Uzbekistan has always been a supporter of constructive and constructive cooperation on the use of the transboundary water resources of the region.

With the active participation of Uzbekistan, key agreements on the joint use of water resources of interstate sources were prepared and signed, which are still the main documents for regional water use - the Agreement “On cooperation in the joint management of the use and protection of water resources of interstate sources” (Almaty, 1992) and the Agreement “On joint actions to solve the problem of the Aral Sea and the Aral Sea region, environmental improvement and the provision of social and economic development of the Aral region” (Kyzyl-Orda, 1993).

Uzbekistan has played a key role in the creation and operation of the International Fund for Saving the Aral Sea (IFAS) and its two commissions - the Interstate Commission for Water Coordination (ICWC) and the Interstate Commission for Sustainable Development. For 25 years, Uzbekistan has made a significant contribution to the financing of the activities of regional bodies of the IFAS system located on its territory - BWO “Amudarya”, BWO “Syrdarya”, SIC ICWC of Central Asia and the GEF IFAS Agency in Uzbekistan.

Since 2007, Uzbekistan has acceded to the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992) and the Convention on the Law of the Non-Navigational Uses of International Watercourses (New York, 1997) reaffirming its commitment to the norms and principles of international water law.

⁴³ This section was prepared with the participation of Ziganshina D. R. (SIC ICWC)

Uzbekistan has stepped up work to promote water cooperation with neighboring countries in the past two years, following the new foreign policy course of the country. President of the Republic of Uzbekistan Shavkat Mirziyoyev noted that “one of the main directions of our country’s foreign policy is to strengthen ties with our closest neighbors.” He defined the current policy of Uzbekistan in matters of regional cooperation as follows: “not to move away from sensitive issues, but to seek reasonable compromises”.

We seek and find such compromises during regular meetings in the framework of IFAS, ICWC and bilateral working groups with Kazakhstan, Turkmenistan and Tajikistan, which give positive results. We see the positive results of continuous dialogue and interaction today.

In particular, in November 2016, a Working Group was established to develop proposals for deepening cooperation in all areas of water relations between the Republic of Uzbekistan and the Republic of Kazakhstan. To date, 3 meetings of the Working Group have been held.

Also, during the visit of the President of the Republic of Kazakhstan to the Republic of Uzbekistan on September 15-16, 2017, a Roadmap on cooperation in the field of water relations between the Republic of Kazakhstan and the Republic of Uzbekistan was signed.

Similarly, within the framework of the State visit of the President of the Republic of Uzbekistan to Turkmenistan on March 9-10, 2017, an “Agreement between the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan and the Ministry of Agriculture and Water Resources of Turkmenistan on cooperation in water management issues” was signed.

The key point of this Agreement is that both of its parties take appropriate measures to ensure the allocation of water resources in accordance with ICWC protocol decisions. In dry periods on a parity basis, we are coordinated to limit water withdrawals in the middle reaches to prevent acute water shortages in the lower reaches of the Amudarya River. Taking into account environmental requirements, we consistently and comprehensively solve the problems of using collector-drainage water.

Also, a Working Group of the Republic of Tajikistan and the Republic of Uzbekistan on the rational use of water and energy resources was established. It should be noted that in the past nine months, we regularly hold meetings with Working Groups of Tajikistan and Uzbekistan on the rational use of water and energy resources. Both sides agreed to ensure joint interaction on the management of water resources of Transboundary Rivers and the exchange of relevant information based on mutual interests.

Similarly, Uzbekistan is taking measures to raise relations with the Kyrgyz Republic to a new level.

At the meeting of Mirziyoyev Sh.M. with the President of the Kyrgyz Republic Jeenbekov S. it was decided to create a joint bilateral water commission to develop constructive solution on issues in water and energy sectors.

Intergovernmental agreements on the mutually beneficial use of the Farkhad hydroelectric station with Tajikistan and the Kasansai reservoir with Kyrgyzstan have been reached. The Uzbek side expressed its willingness to consider participation in the construction of hydraulic structures in Tajikistan (Rogun HPP) and Kyrgyzstan (Kambarata HPP-1), subject to international standards, the interests of Uzbekistan and other countries in the region.

Despite significant achievements, many unresolved problems remain in the countries of Central Asia.

Improving the legal framework of cooperation

Tajikistan and Kyrgyzstan have repeatedly stated that the agreements signed in the early 1990s, which maintain the effect of the Soviet schemes for the integrated use and protection of the water resources of the Amudarya and Syrdarya Rivers, do not meet their current needs. The countries of the upper catchment require revision of the principles and limits of water distribution, as well as the introduction of an economic mechanism for regulating the flow of rivers by reservoirs in the interests of middle and lower reaches. But no specific criteria and proposals for revision have been received from them.

In the past two years, Uzbekistan has demonstrated willingness to discuss a renewed mechanism of interaction on regional water use issues, taking into account the interests of all the countries in the basin. The basis of Uzbekistan's current position is the need to find a compromise and base on the norms of international law. On this basis, Uzbekistan supported the initiation of a regional dialogue based on the draft conventions on the use of water resources in the Amudarya and Syrdarya River Basins, developed by the United Nations Regional Center for Preventive Diplomacy.

The updated mechanism of interaction should be based on assessed and scientifically based calculations of the costs and benefits of all the basin countries regarding the integrated use of the transboundary water resources of a region, taking into account the requirements of multi-year flow regulation and the impact of climate change.

Improving the organizational basis of cooperation

An important issue on the regional agenda is the reform of the IFAS system. Uzbekistan supports the strengthening of this multilateral platform for interaction and its transformation into an effective body for coordinating the actions of countries in matters of water use and sustainable development. The following main provisions determine the position of Uzbekistan in this matter:

1. Step-by-step reform with maximum preservation of the existing capacity and experience of regional cooperation
2. Emphasis on the development of internal rules and procedures to enhance the effectiveness of regional institutions and improve interaction between them
3. Equal material and technical equipment of regional organizations and creation of favorable work conditions in all countries.
4. Development and implementation of an updated approach for the financing of regional organizations, which provides for a more equitable (not necessarily equal) contribution to regional cooperation of all countries of the basin
5. Development and implementation of new personnel policy of regional organizations; creation of working and expert groups for constant interaction between experts of the countries on technical issues
6. Development and implementation of a new approach for interaction with key stakeholders (hydropower, environment, hydrometeorological services, Ministry of Economy), including the creation of BVI Councils, for better planning and control.

Afghanistan's engagement

A separate issue that requires a balanced and deliberate approach is the relationship with Afghanistan on water issues. About 13% of the Amudarya flow is formed in Afghanistan, but country does not participate in the regional structure of water allocation. The total water consumption of Afghanistan from the Pyanj and Amudarya rivers for 1965 was estimated at 2.11 km³/year, and today it is about 3 km³/year. Irrigation development plans in northern Afghanistan may lead to an increase in water consumption of up to 6 km³/year by 2050. In combination with the growing water demand due to population growth and the impact of climate change, an increase in Afghanistan's water intake can significantly complicate the water and environmental situation in underlying states.

Focus on real practical actions and innovations

Uzbekistan's position should be focused on specific practical actions aimed at reducing the negative effects of natural and anthropogenic phenomena, joint implementation of water conservation programs and increasing water and land productivity, improving the quality of water accounting, contributing to the creation of a regional information system and the exchange of hydrological forecasts.

The key elements of regional cooperation that Uzbekistan should maintain and develop are the strengthening and development of information and analytical potential, increasing the potential of personnel and the scientific substantiation of improvement, the optimal development of the water sector.

It should be noted that in some issues of cooperation not all countries of the region are taking practical steps for cooperation. For example, Tajikistan does not support the initiatives of Uzbekistan and Kazakhstan on the exchange of information on flow,

forecasts, water use, and the introduction of automated water accounting; and does not participate in the activities of working groups.

Innovation is the basis for the development of modern society. Therefore, regional and international cooperation of Uzbekistan on water issues should be based on the use of international best practices, technologies and practices, as well as the involvement of innovative products and approaches to solve existing problems.

4.5. ROLES AND TYPES OF BASIN ORGANIZATIONS

This Handbook uses the term “basin organization” when referring to any formal or informal structure that deals with the management of water resources within the basin. Basin organizations are created with different organizational structures, depending on the tasks, legal and administrative systems, availability of personnel and financial resources. These are usually, but not always, formal, legally formalized structures. However, in some cases, less formal structures also work. But under any organizational structure, basin organizations should remain public sector organizations, as water management is a public sphere of activity.

Although official basin organizations are part of the public sector, effective water management also requires broad participation in water management by various stakeholders, which can be represented by community groups, economic sectors, non-governmental organizations and private enterprises.

The role of river basin organizations and their mandate

Basically, basin organizations are organizations that unite a number of structures necessary to manage a basin. Their mandate should cover the perspective of the “big picture” and provide a leading role in solving water management problems at the basin level. This means maintaining full awareness and participation in their work of decision makers and economic actors from all sectors and at all levels of both the public and private sectors.

Basin organizations can take various forms: decision-making organizations according to their charter or advisory bodies, governing bodies, development agencies and regulatory bodies. Often, they work together with other government agencies and administrative bodies. Responsibility for water management, water regulation and the provision of water services should be shared between different agencies in order to streamline their activities and ensure accountability (Box 4.5.1).

Box 4.5.1. The distribution of responsibilities for water management, regulation and provision of water services

Regulation (ministries or other government bodies):

- development and implementation of regulatory documents on pricing;
- development of water quality standards;
- developing legislation for standards and policies;
- authorization and control of water intakes and discharges, and work on the modification of river flows and ecosystems;
- audit of water sector performance for compliance with standards.

Management (natural resource manager or pool management agency):

- implementation of strategic water management assessments;
- developing policies and strategies that are consistent with regional and national goals and standards;
- oversight of strategic water research;
- water resources development plans;
- water allocation;
- financing of basin action plans;
- management of the quantity and quality of surface and groundwater;
- coordination of interdepartmental relations and actions;
- developing capacity building programs for the water sector;
- supporting public awareness and participation.

Provision of services (public, private or mixed organizations):

- construction and operation of water supply and sewage networks, wastewater treatment plants, drainage and irrigation systems;
- infrastructure maintenance;
- provision of technical assistance and advice;
- payment for services;
- work under some forms of legal agreements, usually with an operating rights regulator and a resource manager for water utilization.

Basin organizations operate in accordance with their individual mandates, usually defined at the highest level by the central government, to meet the challenges and implement government policies. The mandate, in many respects, depends on the reasons for embarking on the implementation of basin initiatives, and reflects important problems solved in the basin. It is very important to clearly define the boundaries of the mandate (according to the law for official organizations), the reporting hierarchy and clarify who sets the “rules” for decision-making and public participation.

Key tasks

Although basin organizations perform many tasks, there is a tendency to focus on three main areas of activity:

- monitoring, study, coordination and regulation,
- planning and financing
- development and management.

A comprehensive assessment of water resources management in agriculture (CA), together with the Global Water Partnership and the International Network of Basin Organizations, has compiled a list of the main objectives of integrated water

management at the basin level in three regions (Box 4.5.2.). Depending on the purpose for which the basin organization was created and the management structures, the organization can perform some or all of these functions. Considering the perspectives of integrated water resources management, while performing these tasks, it is important that the basin organization remains flexible in its management, works with all levels of the water management hierarchy and in partnership with users.

Box 4.5.2. Main functions of basin organizations

Monitoring, study, coordination and regulation

- **Data collection.** The collection, management and transmission of data on the availability of water resources, water consumption (including environmental requirements) and water quality to support various basin functions.
- **Preventive actions, monitoring and reinforcement.** Monitoring and control of pollution of water resources, the level of salinity and volumes of groundwater pumping ensure their dynamics within certain limits; and the strengthening of relevant laws and regulations helps prevent the degradation / use of natural resources above the level of their natural recovery and restore ecosystems.
- **Coordination.** Harmonization of policies and actions is undertaken in the basin by state and non-governmental organizations for appropriate management of land and water resources.
- **Conflict resolution.** Providing negotiation and litigation mechanisms.

Planning and Financing

- **Water allocation.** Determination of the mechanisms and criteria by which water resources are distributed among the sectors and water users, as well as environmental requirements are provided.
- **Planning.** Preparation of medium-term and long-term plans for the development and management of water resources in the basin.
- **Resource mobilization.** Providing financing, for example, by collecting a water charge or water tax

Development and management

- Construction of facilities. Design and construction of water infrastructure.
- Operation of facilities. Operation of water infrastructure.
- Operation and management. Ensuring the normal operation of dams, navigation channels and water distribution infrastructure, as well as water treatment facilities; ensuring the delivery of water to the place of its use; ensuring coordinated management of surface and groundwater.
- Preparing to combat the water element. Flood protection and emergency response, drought / flood plans and protection mechanisms.
- Protection and preservation of ecosystems. Prioritization and implementation of ecosystem conservation measures, including public awareness companies.

Types of basin organizations

The catalyst for cooperation in the basin at the transboundary level may be the need to resolve the conflict, provide guarantees for navigation, regulate floods, as well as the need for cooperation in the design and construction of infrastructure, as well as its joint operation.

Basin Commissions or Administrations

For many decades, intergovernmental commissions or administrations of transboundary river basins have been established on the basis of bilateral or multilateral treaties or agreements concluded by the basin countries. Basin commissions can only have advisory functions - the development of recommendations and the implementation of educational programs and monitoring, but they can also perform supervisory functions and work on the implementation of the tasks set by government plans or an interstate agreement (Box 4.5.3).

Box 4.5.3. US Interstate Joint Commission - Canada: an organization for transboundary monitoring, research and coordination

The Interstate Joint Commission (IJC), established under the Border Water Treaty of 1909, helps the governments of the United States of America and Canada prevent or resolve transboundary disputes, mainly related to water use or environmental issues. IJC conducts a study of problems, issues recommendations and licenses certain types of activities for border or transboundary water bodies.

The IJC also informs governments about emerging transboundary problems, with the goal of taking the necessary measures at an early stage of their development. The IJC works on the basis of established committees for control, research and supervision, as well as an advisory committee, working groups of experts and accredited officials. These committees and groups created by IJC also assess the environmental quality of the Great Lakes and other transboundary watersheds and identify emerging transboundary problems related to air quality.

The boundary waters Treaty allows the governments of the United States and Canada to refer a matter to the Commission for consideration and decision. In these cases, the IJC usually instructs the research Committee or the working group of experts to examine the facts and make recommendations.

More information can be found on the website: <http://www.ijc.org>

Commissions are usually established by an official government decree and may or may not have a permanent Secretariat. They often define General rules (e.g. for navigation) and, if necessary, decide on the allocation of available resources between different categories of use, regions and (for transboundary basins) between basin

countries. They can also coordinate flood or drought prevention activities, as well as pollution reduction measures, develop and implement multi-year plans to coordinate and strengthen activities at the basin level.

In America and Africa, these commissions and administrations may own water infrastructure and hydropower plants. In the European Union, Interstate Commissions coordinate the implementation of the water framework Directive by EU member States. In countries with a Federal structure (e.g. Brazil, Australia), such commissions may be organized by the Central Government and States, provinces or regions to coordinate political activities and activities in transboundary river basins or aquifers.

Similarly, representatives of different ministries involved in water resources management can come together within the national Commission to coordinate different activities in the same river basin or aquifer and to exchange information or data. In some cases, if another mandate is needed to implement new policy directives, the government may amend the Statute to give the Commission the necessary powers (Box 4.5.4).

Box 4.5.4. Murray-Darling Basin Administration: Superseded by Commission

In 1986, a national government and five Australian states created the Murray-Darling Basin Commission (MDBC). MDBC has become a platform for consultation on the joint management of natural resources in the basin. In 2008, MDBC was replaced by the new Murray-Darling Basin Administration with much broader powers. The new administration has jurisdiction over the entire basin (1,061,469 km²) and provides integrated management of the basin's water resources, ensuring sustainable development, by:

- development of a basin plan for approval by a (national) minister, including setting water use limits that ensure the sustainability of surface and groundwater sources in the basin;
- recommendations to the Minister for approving state water use plans (previously approved by state or territory governments);
- development of water rights information services that facilitate trade in water rights in the Murray-Darling Basin;
- accounting and monitoring of water resources in the basin (previously it was the responsibility of states or territories);
- information gathering and research;
- public involvement in basin resource management.

The new administration will set limits on the volume of water (from surface and underground sources) that can be used in the basin as a whole and by individual users. It will identify risks to the basin's water resources, such as climate change, and develop strategies to manage these risks. Relevant requirements will be developed for state water management plans, as well as environmental facilities, prioritization of water use and development tasks for the basin's water resources. A water quality and mineralization management plan will be prepared and rules for the sale of water rights will be established.

More information can be found on the website:

<http://www.environment.gov.au/water/mdba/index.html>

Basin directorates or agencies

The basin management or agency performs the planning and its other duties, according to the charter of the organization. They can prepare and implement rules and regulations, or coordinate development projects, usually relying in their activities on the principles of the civil service, serving the community with some autonomy within the national legal framework. They can play the role of arbiter when interested parties ask them to decide on conflict situations that arise. They are usually responsible for carrying out the tasks of medium-term planning and for collecting taxes for water withdrawal and wastewater discharges, which provide the means to finance the operations or investments necessary to achieve the goals. In some cases, they may also be responsible for developing water policy, researching, collecting or preparing data, sharing information and raising public awareness.

Basin associations or councils

The basin council can be a formal or informal group that includes government officials, parliamentarians, and representatives of non-governmental organizations and ordinary people who gather to discuss water issues. The councils are usually set up to make recommendations to the government. The council, unlike the commission, which also consists of experts, has no administrative powers. Basin associations or councils (sometimes called syndicates) often work in parallel with the official administration and represent different categories of users, non-governmental organizations or local community groups.

These associations or councils can play various roles, for example, develop recommendations, raise public awareness, engage in educational programs on the management of natural resources of the basin, and also support the exchange of information. Sometimes, they are created to solve specific problems or for particular types of basins.

Box 4.5.5. Organization of water management in basins: comparison by countries

Functions	France	Spain	Brazil	Mexico	Morocco
Development of water policy - approval (water withdrawals, discharges)	Government services	BWO (Confederation)	Federal or state services	National Water Commission	BWO (Hydrographic Basin Agency)
User registration	BWO (Water Agency)	BWO (Confederation)	BWO (Basin Committee and Water Management Agency)	National Water Commission	BWO (Hydrographic Basin Agency)

Strategic Planning (General Plan)	BWO (Basin Committee)	BWO (Confederation)	BWO (Basin Committee)	BWO (Basin Council)	BWO (Hydrographic Basin Agency)
Management of concessions for large enterprises (sale of raw water)	Private constructors	BWO (Confederation)	Private constructors	National Water Commission	BWO (Hydrographic Basin Agency)
Water charges (pollution, water intake, basin action plan)	BWO (Water Agency)	BWO (Confederation)	BWO (Water Agency)	BWO (new basin organization)	BWO (Hydrographic Basin Agency)
Drinking water supply and sanitation (community)	Municipalities	Municipalities and autonomous authorities	Municipalities or state	Municipalities or state	Municipalities and National Water Supply Company
Irrigation (community)	Constructors and Associations	Associations	State and Associations	Associations	Department of Agriculture
Monitoring, data collection	Government services	BWO (Confederation)	Federal or state services	National Water Commission	BWO (Hydrographic Basin Agency)
	BWO (Water Agency)	Autonomous authorities	Basin Agency	Provinces / States	Various (private)
	Various (private)		Provinces + municipalities		
BWO - Basin water organization Source: International Network of Basin Organizations					

Corporations or Companies

In addition to the various types of basin organizations described above, there are also corporations or companies building water infrastructure in river basins. These companies usually receive long-term concessions from the government for the construction of infrastructure and manage the infrastructure for a fixed period. Basically, they provide services, supply water, and can collect payment for various types of water use, such as navigation, flood control, irrigation, and hydropower production. In most cases, they have a private status; therefore, they do not play a supervisory role in water management, because this can lead to a conflict of interest with society. However, they can create committees to consult with users. To ensure an integrated approach and distribution of responsibility for management and policy in the public interest, a separate government unit should be mandated to supervise such corporations and companies, as they should be treated as water users, not basin organizations.

Additional roles of water management bodies in basins

Different types of basin organizations can operate in the same basin, complementing each other. For example, in the Rhone basin in France, the Interstate Commission for the Protection of Lake Geneva (France / Switzerland), the Rhone Basin Committee and the Water Agency (for planning, financing and implementing the European Framework Water Directive), as well as the National Rhone Company (created for the construction of dams, protective structures, hydroelectric power stations, navigation facilities and water supply infrastructure) work together. In such cases, the role and mandate of each organization should be clearly defined by national laws and interstate treaties. Examples of the functions of water management organizations in the basins of the five countries are given in Box 4.5.5.

4.6. INTERSTATE COMMISSION FOR WATER COORDINATION IN CENTRAL ASIA

The collapse of the USSR in 1991 and the formation of five independent states in Central Asia transformed previously the internal waters of one country into transboundary waters. In order to maintain stability in water management, the heads of water departments of Kazakhstan (N. Kipshakbayev), the Kyrgyz Republic (Melnichenko V.), Tajikistan (Nurov A.), Turkmenistan (Ilamanov A.) and Uzbekistan (Giniyatullin R.) met on October 12, 1991 in Tashkent and approved the application. This Statement referred to the need for *“creating joint organizational structures for coordination,” since “only the unification and joint coordination of our actions can contribute to effectively solving the region’s water management problems in the face of increasing environmental tensions”*

It is noteworthy that the Statement begins with the following words:

We, heads of water management bodies of the Republics of Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan, being professionals, appreciated the inevitability of a difficult situation due to the all-pervasive water shortage and aggravating environmental tensions in the Aral Sea basin, based on the historical commonality of the peoples of Central Asia and Kazakhstan and their equal rights and responsibility for ensuring the rational use of water resources in the region, we consider necessary: [...]

Thus, thanks to professionalism and foresight, the heads of water management departments put forward, and then implemented the most important initiative to create a coordinating body to ensure the peaceful management of water resources in the context of the collapsing economic and other ties.

The agreement between the Republic of Kazakhstan, the Kyrgyz Republic, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan “On cooperation in the joint management of the use and protection of water resources of interstate sources” was signed in record time - already after 4 months on February 18, 1992 in Almaty, which, on parity conditions, became the basis for the creation of the Interstate Commission for Water Coordination (ICWC) on regulation, rational use and protection water resources of interstate sources, including the first leaders of water management organizations.

At the beginning, the organizational basis of the ICWC was two basin associations - BWO “Amudarya” and BWO “Syrdarya”. Later, by the decision of the ICWC of December 5, 1992, the Scientific Information Center (SIC) on water management issues was first established on the basis of SANIIRI, and since 1996 as an independent executive body. The Secretariat was established on October 10, 1993, a center was created on October 23, 1998 for Central Asian advanced training courses for water workers at the SIC ICWC, and on October 23, 1999 the Metrology Coordination Center (CMC) was established.

By the decision of March 26, 1993, in Kzyl-Orda, the Heads of Central Asian States confirmed the creation of the ICWC and its powers, and also included it in the newly created Interstate Council on the Aral Sea Basin (Interstate Council). As a result of the merger of the Interstate Council and the International Fund for the Aral Sea Saving (IFAS) in 1997, ICWC became part of the IFAS.

During the meeting of the Heads of State in Ashgabat on April 9, 1999, the Agreement “On the Status of IFAS and its Organizations” was signed, which assigned ICWC and its executive bodies the status of international organizations. The support provided by the Heads of State of Central Asia is a manifestation of a deep understanding of the key role of joint water management for the development of countries, the well-being of peoples and the preservation of peace and stability in the region

Mandate and tasks of ICWC

The ICWC is the **only intergovernmental body** created and authorized by the Heads of Central Asian States **to make binding decisions** on current and future issues of interstate water sharing and water use.

ICWC is responsible for:

- Determination of water management policy in the region, development of its directions taking into account the needs of all sectors of the national economy, integrated and rational use of water resources, a promising water supply program for the region and measures for its implementation;
- Development and approval of annual water consumption limits for each of the republics and the region as a whole, as well as the corresponding schedules of reservoir operation modes, their adjustment according to updated forecasts depending on the actual water availability and the current water situation.

The main purpose of the establishment of the ICWC is to approve the principles of collegial decision-making on general water issues, as well as measures to implement jointly planned programs based on mutual respect for the interests of the parties.

Main tasks

- Defining a common water policy and developing its main directions;
- Development and approval of water consumption limits, operating modes for large reservoirs and water distribution management;
- Development and implementation of environmental programs;
- Development of recommendations on the creation of a uniform pricing policy and compensation for possible losses, as well as policies on the legal framework for water use;
- Coordination of activities for the implementation of major water management works and the sharing of the existing potential of water management of states;
- Creation of a unified information base on the use of water resources, monitoring

of irrigated lands and adjacent areas, as well as a general hydrometeorological support;

- Coordination of joint research on the scientific and technical support of regional water management problems and the implementation of schematic studies;
- Assistance in the development of cooperative relations on the introduction of water-saving technologies and other advanced measures to improve water use;
- Development of joint programs for the prevention and elimination of emergencies and natural disasters.

Structure

The ICWC consists of the first heads of water management departments of the Central Asian countries. As of 2018, the authorized water management agencies of the countries are (Fig.4.12):

- Ministry of Agriculture of the Republic of Kazakhstan;
- Department of Water Management and Land Reclamation of the Ministry of Agriculture, Food Industry and Land Reclamation of the Kyrgyz Republic;
- Ministry of Energy and Water Resources of the Republic of Tajikistan;
- Ministry of Agriculture and Water Resources of Turkmenistan;
- Ministry of Water Resources of the Republic of Uzbekistan.

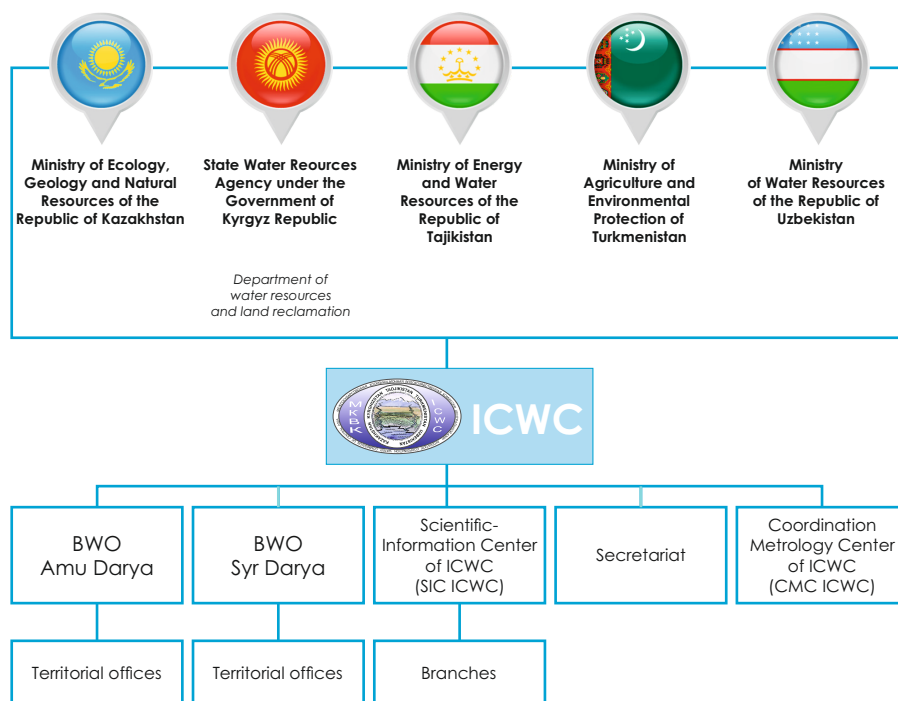


Fig.4.12. Structure of ICWC

ICWC creates Executive bodies to carry out the tasks and implement the planned programs. In the composition there are five ICWC Executive bodies - BWO “Amudarya”, BWO “Syrdarya”, SIC, Secretariat and CMC (Fig.4.13).

BWO “Amudarya” provides operational management and distribution of water resources of the Amudarya River Basin between states, timely and uninterrupted water supply to water consumers within the established limits (agreed with the states) and sanitary and environmental releases to the Aral Sea and Aral Sea zones.

Similar tasks in the Syrdarya River Basin are performed by the BWO “Syrdarya”.

The ICWC Secretariat ensures the execution of ICWC instructions, as well as preparing, jointly with other executive bodies, program activities and draft decisions for ICWC meetings, monitors the receipt of funds from the ICWC founding states to finance the executive bodies of ICWC (for operational works, capital construction, other works), coordinates international relations.

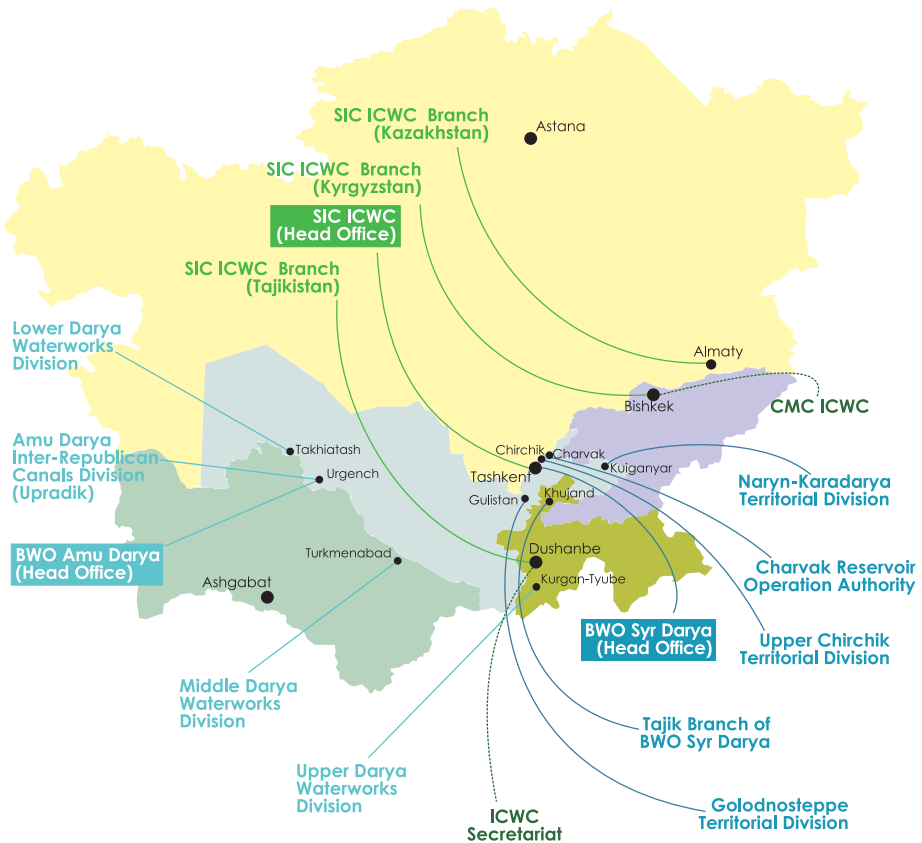


Fig.4.13. ICWC Executive Bodies

SIC ICWC provides organizational and technical support for ICWC activities in the regional and international arenas, promotes cooperation in transboundary water management and development, and assists in achieving sustainable water management in Central Asia through information support, training, networking, research and expert advice.

The training center at SIC ICWC develops teaching materials and programs in various areas of the water sector, conducts training and needs assessment, prepares trainers and coordinates regional activities of branches, develops programs for distance courses.

CMC coordinates the technical policy and its practical implementation in the field of metrological support of ICWC programs and decisions on the use, protection and accounting of water resources in sources and water management systems.

ICWC Members

ICWC Founders



N. Kipshakbaev
(Kazakhstan)



M. Zulpuev
(Kyrgyzstan)



A. Nurov
(Tajikistan)



A. Ilamanov
(Turkmenistan)



R. Giniyatullin
(Uzbekistan)

Active Members of ICWC (2017)



Ye. Nysanbaev
(Kazakhstan)



K. Tashtanaliev
(Kyrgyzstan)



S. Rakhimzoda
(Tajikistan)



N. Sapardurdyev
(Turkmenistan)



Sh. Khamraev
(Uzbekistan)

Fig.4.14. ICWC members

Organization of activities

ICWC organizes its activities through regular and extraordinary meetings, as well as through the practical work of the executive bodies.

Meetings

The ICWC meetings are held quarterly, alternately in one of the respective countries, chaired by the host ICWC member in accordance with the “Regulations”. If necessary, ICWC members can meet in extraordinary meetings, including in individual basins. Each of the ICWC members has the right to “veto” the discussed decision.

As of September 1, 2018, 74 ICWC meetings were held.

Of them: in Kazakhstan - 23, the Kyrgyz Republic - 12, Tajikistan - 10, Turkmenistan - 15, Uzbekistan - 14.

The meetings are attended by: ICWC members - heads of water departments of countries, their deputies, heads of water resources and water management departments, heads of executive bodies.

Representatives of the Government of the host country, the Ministry of Foreign Affairs (MFA), heads of regional and district administrations, representatives of the Academy of Sciences, directors of research institutes and design institutes, representatives of executive bodies are usually present as invited guests.

ICWC cooperation tools

7. The system of planning and operational management of water resources

The ICWC implements a set of measures and procedures to ensure equitable and fair distribution of water along the entire length of interstate sources, taking into account the needs of natural complexes and their development for the future through its executive bodies - BWO “Amudarya” and BWO “Syrdarya”. There is also interaction with the Coordination Dispatching Center “Energy” (CDC “Energy”) and national ministries and departments - producers of electricity.

Special attention is paid to the introduction of automation in water management systems. With the financial support of international partners, automated control and monitoring systems for the head- works of the Dustlik Canal (CIDA), the Upper -Chirchik hydroelectric complex (USAID), the Uchkurgan hydroelectric complex and the whole complex of the BWO Syrdarya head-works in the Fergana Valley (SDC) were developed and put into operation. Construction of similar systems on three pilot canals in Uzbekistan, the Kyrgyz Republic and Tajikistan (SDC) has been completed.

8. Working and expert groups for strategic and regulatory documents preparation

Over the years of ICWC activity, working and expert groups of country representatives were created to solve various tasks. The merit of such working groups is the preparation and submission for consideration by the ICWC or countries of a number of strategic policy documents, which formed the basis for the further development

of water cooperation in Central Asia. Among such documents are, in particular, the “Concept for solving the Aral Sea and Aral Region problems taking into account the socio-economic development of the region”, “The main provisions of the Regional Water Strategy”, “Principle approaches for strategic planning of transboundary water resources use”.

The ICWC pays great attention to the drafting of new and improving existing agreements in the field of water management of interstate sources and flow regulation by reservoirs and waterworks. Thus, within the framework of the regional technical assistance of the ADB in 2005–2008, within the framework of the ICWC, a large amount of work was carried out by members of five national intersectoral working groups and a regional working group to prepare a draft of the new Agreement “On the use of water and energy resources of the Syrdarya River Basin” and procedural obligations and recommendations on improving the rules for regulating and managing water and energy resources in the Syrdarya River Basin”. These documents were repeatedly discussed at ICWC meetings and were generally agreed upon, but the process of their consideration and signing at the national level was not completed.

Currently, countries are considering a draft Agreement on Information and Analytical Support for Integrated Management, Use and Protection of Water Resources in the Aral Sea Basin and Organization of Interstate Information Exchange. The work on its preparation was started as part of the implementation of the Second Program of the Aral Sea Basin (ASBP-2) and continued in 2013-2014 by the ICWC. Developed working group met on January 5-6, 2014 in Tashkent to finalize the draft Agreement in coordination with the ICWC members. At the 63rd meeting of the ICWC (April 18 - 19, 2014, Tashkent), the ICWC members decided to submit to the relevant ministries and departments of their countries a revised draft Agreement and consider the results at subsequent meetings.

At the 63rd meeting of the ICWC (Tashkent, April 2014), the “Plan for the implementation of the main directions for strengthening the activities of the ICWC” was approved and recommended, which includes four positions:

- Water saving.
- Implementation of the IWRM as a tool for “green” development and adaptation to climate change.
- Improving the quality and accuracy of water accounting.
- Strengthening the capacity of regional and national organizations by developing training.

The working groups that held their first meetings in 2017 were formed to implement the Plan at the regional level.

Joint regional projects and research

The ICWC coordinates and monitors the implementation of joint research on the

development of scientific and technical solutions for regional water management problems and the development of projects of regional importance involving the existing scientific and technical potential of the water management from the founding states and the implementation of the results obtained within these projects. In 1994, the SIC ICWC Research Plan was developed and implemented by scientific institutes of participating Central Asian states. The financing of the Plan was carried out by water departments on a shared basis.

The ICWC executive bodies also carry out projects of regional importance under the grants of international organizations and donors with the involvement of local specialists. These projects helped to shape a style of joint work among water specialists and water users of the middle and lower levels of the water hierarchy, which has become an already accepted tradition of exchange and interaction, mutual enrichment in the direction of introducing everything new in the region's water industry.

1. Information, analytics and publishing

The ICWC informs decision-makers, specialists and the public about its activities through the official website (icwc-aral.uz) and the CAWater-Info Portal on Water Resources and Ecology in Central Asia (cawater-info.net).

Portal CAWater-Info

CAWater-Info is a decision support system for water management issues in the Aral Sea basin. It allows you to make informed decisions on operational management at all levels of the water management hierarchy, as well as to predict scenarios and trends in the development of the region in the medium and long term.

CAWater-Info contains a huge amount of information - over 45 gigabytes and includes 44 websites. Up to 8,000–9,000 people from various regions of the world visit the portal resource daily.

Structural information is divided into 4 main blocks - Database, Knowledge Base, Analytical Tools, and Model Apparatus.

Key information on the portal is collected and processed by SIC ICWC in close cooperation with BWO "Amudarya" and BWO "Syrdarya". Other information bodies of the IFAS system, national agencies, international and non-governmental organizations should be also noted among the information partners of the portal.

The ICWC executive bodies are actively involved in the work of the coordination group on the development of a single information space in the field of water resources and environment management in Central Asia. The coordination group was established in 2014 with the support of the Economic Commission for Europe and the United Nations with the aim of developing a regional platform for more effective information management and decision-making support by the founding states and the IFAS bodies.

4.7 SUSTAINABLE DEVELOPMENT GOALS -'2030

On September 25, 2015, the UN member states adopted the “Agenda for Sustainable Development until 2030”. The agenda includes 17 comprehensive and interrelated sustainable development goals, which cover 169 targets. In March 2016, a system of 230 global indicators for monitoring the SDGs was identified. It is expected that countries will create their own tracking system based on the regular compilation of statistical data on 230 SDG indicators.

The international “Report on the Index and Indicators for the SDGs” shows that at the end of 2016 Uzbekistan still had a certain lag for most of the SDG indicators (Table 4.3).

Table 4.3. Indicators of the SDGs for Uzbekistan

	Sustainable development goals	Degree of achievement
1.	Poverty reduction	
2.	Food Security, Sustainable Agriculture	
3.	Healthy lifestyle and well-being	
4.	Inclusive Education, Continuing Education	
5.	Gender equality, women's empowerment	
6.	Rational use of water resources and sanitation	
7.	Sustainable and modern energy sources	
8.	Inclusive and sustainable growth, full-time employment	
9.	Strong infrastructure and industrialization, innovation	
10	Reducing inequality within and between countries	
11	Smart and sustainable cities	
12	Rational consumption and production	
13	Combating climate change and its negative impact	
14	Rational use of the oceans, seas and marine resources	n.s.
15	Rational use of ecosystems and forests	
16	Building peace-loving and open societies for sustainable development	
17	Global Partnership for Sustainable Development	

Notice:

	All target indicators are marked in green (achieved)
	Increasing
	Average
	Low

Source: Report on the Index and DSC Indicators, (SDG Index and Dashboards Report) 2017, prepared by the Bertelsmann Stiftung and Sustainable Development Solutions Network.

At the end of 2017, the Government of Uzbekistan adopted a Plan of Practical Measures “Road Map” to further develop the cooperation of the Republic of Uzbekistan with the United Nations for 2017-2020. This document outlined more than a hundred basic measures to promote the achievement of the strategic priorities of the “Strategy for Action 2017-2021” and the fulfillment of the Government’s commitments to achieve the Sustainable Development Goals and the monitoring of their indicators, as well as obligations under a number of UN human rights instruments.

On October 20, 2018, the Government of Uzbekistan adopted Resolution No. 841 “On Measures to Implement National Sustainable Development Goals and Objectives for the Period up to 2030”. The signed document sets 16 national sustainable development goals and 127 related objectives for 2030.

The document also provides for the preparation of regular national reports on the implementation of the SDGs in Uzbekistan, as well as the gradual integration of sustainable development goals into state development programs and budgets of Uzbekistan. Implementation of the national SDGs is entrusted to the Deputy Prime Minister, Minister of Finance of the Republic, Kuchkarov J.

National goals and objectives in the field of sustainable development for the period up to 2030, according to the Resolution of the Cabinet of Ministers of October 20, 2018, No. 841

National Goals *	National tasks	Responsible executors
<p>Goal 1. The overall reduction in the level of poverty of the population.</p>	<p>Task 1.1. Eliminate the extreme form of low-income among population by 2030.</p>	<p>Ministry of Economy, Ministry of Finance, Central Bank, Ministry of Employment and Labor Relations, Ministry of Health, Union of Youth of Uzbekistan, Republican Council for the Coordination of the Activities of Citizens' Self-Government Bodies, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 1.2. Halve the proportion of poor men, women and children of all ages, in all its manifestations, by 2030</p>	<p>Ministry of Health, Association of "Uzbekozikovkatzahira", Ministry of Pre-School Education, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 1.3. Strengthening the targeting and effectiveness of the system of social protection of the population, improving the quality of social protection services, achieving full coverage of all those in need with social protection measures.</p>	<p>Ministry of Health, Ministry of Agriculture, Ministry of Finance, "Uzbekozikovkatzahira" Association, "Uzbekozikovkatholding" Holding Company, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 1.4. By 2030, provide favorable economic and financial conditions for equal access of the entire population, including the poor and vulnerable, to basic resources (land, bank loans, etc.), new technologies and financial services, including microfinance.</p>	<p>Ministry of Economy, Ministry of Innovation Development, Central Bank, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 1.5. By 2030, increase the resilience of socially vulnerable segments of the population, reduce their vulnerability and vulnerability to extreme events and other economic, social and environmental shocks and disasters caused by climate change.</p>	<p>State Committee on Ecology and Environmental Protection, Ministry of Health, Ministry of Emergency Situations, Ministry of Economy</p>
	<p>Task 1.a. Mobilize significant resources from a wide range of sources, including through enhanced development cooperation, in order to ensure sufficient and predictable resources for the implementation of programs and strategies to eliminate the poverty of the population in all its forms.</p>	<p>State Investment Committee, Ministry of Finance, Ministry of Economy</p>

<p>Goal 1. The overall reduction in the level of poverty of the population.</p>	<p>Task 1. b. Develop and improve mechanisms for strategic development forecasting, monitoring and evaluation, taking into account the interests of low-income citizens and gender aspects, in order to facilitate accelerated investment in measures to eliminate the poverty of the population.</p>	<p>Ministry of Economy, Ministry of Employment and Labor Relations, Women's Committee of Uzbekistan, National Center for Human Rights</p>
<p>Goal 2. Strengthen food security, improve nutrition and promote sustainable agriculture.</p>	<p>Task 2.1. By 2030, to ensure the balance and high quality of food in the necessary volumes with access to all segments of the population, especially the socially vulnerable segments of the population, including infants, and year-round access to vital and safe food.</p>	<p>Ministry of Health, Association of "Uzbekozikovkazahira", Ministry of Pre-School Education, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 2.2. By 2030, eliminate all forms of malnutrition, including achieving internationally agreed targets for combating growth retardation and weight retention in children under five years old, and meet the nutritional needs of adolescent girls, pregnant women and nursing women and the elderly by 2025.</p>	<p>Ministry of Health, Ministry of Agriculture, Ministry of Finance, «Uzbekozikovkazahira» Association, «Uzbekozikovkatholding» Holding Company, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Problem 2.3. By 2030, significantly increase the average productivity of agricultural food production and the incomes of food agricultural producers.</p>	<p>Ministry of Agriculture, Council of Farmers, Dekkhan Farms and Households, "Uzbekozikovkatholding" Holding, Central Bank, Council of Ministers of the Republic of Karakalpakstan and regional khokimiyats</p>
	<p>Task 2.4. By 2030, ensure the creation of sustainable food production systems and introduce agricultural practices that can increase the productivity of agricultural production.</p>	<p>Ministry of Agriculture, Academy of Sciences, Holding Company "Uzbekozikovkatholding"</p>
	<p>Task 2.5. Ensure the preservation of the genetic diversity of seeds and cultivated plants, as well as farm and domestic animals and their respective wild species, including through proper maintenance of various seed and plant banks.</p>	<p>Ministry of Agriculture, Academy of Sciences, Holding Company "Uzbekozikovkatholding"</p>
	<p>Task 2. a. Increase investment, including through increased international cooperation into rural infrastructure, agricultural research and information, technology development and the establishment of plant and animal genetic banks in order to strengthen agricultural production capacity.</p>	<p>State Investment Committee, Ministry of Agriculture, Academy of Sciences, Ministry of Foreign Affairs, Ministry of Foreign Trade</p>

<p>Goal 2. Strengthen food security, improve nutrition and promote sustainable agriculture.</p>	<p>Task 2.b. Eliminate and prevent the introduction of trade restrictions and the appearance of distortions in the global markets for agricultural products.</p> <p>Task 2.c. Take measures to ensure the proper functioning of the markets for food products and facilitate timely access to market information, including food reserves, in order to help limit excessive volatility in food prices.</p>	<p>Ministry of Foreign Trade, Ministry of Foreign Affairs, Ministry of Agriculture, Ministry of Economy</p> <p>Ministry of Agriculture, Ministry of Economy, Central Bank</p>
<p>Goal 3. Ensuring a healthy lifestyle and promoting well-being for all at any age.</p>	<p>Task 3.1. By 2030, reduce maternal mortality by one third.</p> <p>Task 3.2. By 2030, reduce the death rate of newborns and children under the age of five.</p> <p>Task 3.3. Reduce the incidence of tuberculosis and HIV among the population and ensure the fight against hepatitis, waterborne diseases and other infectious diseases.</p> <p>Task 3.4. By 2030, reduce premature mortality by 30% among the population of cardiovascular, cancer, diabetes and chronic respiratory diseases.</p> <p>Task 3.5. Improve the prevention and treatment of addiction to psychoactive substances, including substance abuse and alcohol abuse (reducing harmful alcohol consumption by 10%).</p> <p>Problem 3.6. By 2025, halve the number of traffic accidents, including accidents that occurred due to traffic violations by pedestrians.</p> <p>Task 3.7. By 2030, ensure universal access to sexual and reproductive health services, including family planning and raising the age of marriage for girls under eighteen years of age, and incorporating reproductive health issues into national strategies and programs.</p> <p>Task 3.8. Ensure universal coverage of health services, including protection due to high health care costs, access to quality basic health care services and access to safe, effective, quality and affordable basic medicines and vaccines for all.</p>	<p>Ministry of Health, Women's Committee</p> <p>Ministry of Health</p> <p>Ministry of Health</p> <p>Ministry of Health</p> <p>Ministry of Health</p> <p>Ministry of Health</p> <p>Ministry of Internal Affairs, Ministry of Preschool Education, Ministry of Public Education, Union of Youth of Uzbekistan</p> <p>Ministry of Health, Ministry of Justice, Women's Committee of Uzbekistan, Union of Youth of Uzbekistan, Ministry of Higher and Secondary Special Education, Ministry of Public Education, Republican Council for the Coordination of Citizens' Self-Government Activities</p> <p>Ministry of Health, Agency for the Development of the Pharmaceutical Industry under the Ministry of Health</p>

<p>Goal 3. Ensuring a healthy lifestyle and promoting well-being for all at any age.</p>	<p>Task 3.9. Reduction in the number of deaths and diseases as a result of water and air pollution, toxic effects of chemicals, including chemical production and burial sites.</p> <p>Task 3.a. Strengthen, as necessary, the implementation of the World Health Organization Framework Convention on Tobacco Control (international agreement adopted in May 2003).</p> <p>Task 3.b. Assist in research and development of vaccines and drugs for the treatment of infectious and noncommunicable diseases, ensure the availability of low-cost essential drugs and vaccines in accordance with the Doha Declaration (a cycle of negotiations under the auspices of the World Trade Organization (WTO) "TRIPS Agreement and public health", which affirms the right of developing countries to fully use the provisions of the Agreement on Trade-Related Aspects of Intellectual Property Rights Regarding flexibility for the purpose of protecting public health and, in particular, ensuring access to medicines for all.</p> <p>Task 3.c. The consistent increase in health financing, improving the quality of training and the provision of medical services, ensuring decent wages.</p> <p>Task 3.d. Ensuring the implementation of the International Health Regulations (IHR - a basic WHO document, a modern version of the rules was adopted on 25.05.2005 at the 58th World Health Assembly) and preparedness for the implementation of measures in public health emergencies.</p>	<p>Ministry of Health, Ministry of Housing and Communal Services, State Committee on Ecology and Environmental Protection</p> <p>Ministry of Health</p> <p>Ministry of Health, Agency for the Development of the Pharmaceutical Industry under the Ministry of Health, Agency for Intellectual Property</p> <p>Ministry of Health, Ministry of Finance, Ministry of Economy, Ministry of Employment and Labor Relations</p> <p>Ministry of Health, Ministry of Emergency Situations</p> <p>Ministry of Public Education, Ministry of Preschool Education, State Inspectorate for Supervision of the Quality of Education under the Cabinet of Ministers,</p> <p>State Testing Center, Youth Union of Uzbekistan</p>
<p>Goal 4. Provide inclusive and equitable quality education and promote lifelong learning opportunities for all.</p>	<p>Task 4.1. By 2030, raise to a qualitatively new level primary and general secondary education, which allows achieving demanded and effective learning outcomes while maintaining universal coverage.</p>	<p>Ministry of Public Education, Ministry of Preschool Education, State Inspectorate for Supervision of the Quality of Education under the Cabinet of Ministers,</p> <p>State Testing Center, Youth Union of Uzbekistan</p>

	<p>Task 4.2. By 2030, provide all girls and boys with access to improved systems for the development, care and preschool education of young children, so that they are ready for primary education.</p> <p>Task 4.3. By 2030, provide all women and men with equal access to affordable and high-quality secondary special, higher, vocational and additional education.</p> <p>Task 4.4. By 2030, significantly increase the number of young and adult people with in-demand skills, including professional technical skills, for finding jobs, getting decent work and doing business.</p> <p>Task 4.5. Ensure equal access to education and vocational training at all levels for people with disabilities, improving the conditions of educational institutions, taking into account the interests of children with disabilities, ensuring a safe and effective learning environment for all.</p> <p>Task 4.7. By 2030, ensure that all students and pupils acquire the knowledge and skills necessary to promote sustainable development.</p> <p>Task 4a. Improving educational environments that provide a safe and effective learning environment for all.</p> <p>Task 4b. By 2020, significantly increase the coverage of higher education, the number of loans and grants, including international, for studying in universities.</p> <p>Task 4c. By 2030, significantly increase the number of qualified teachers (tutors), including through international cooperation in the training, retraining and advanced training of teachers and instructors.</p> <p>Task 5.1. Eliminate everywhere all forms of discrimination against all women and girls, including incorporation into legislation and effective implementation of the principles of the elimination of indirect discrimination in law enforcement practice.</p>	<p>Ministry of Preschool Education, Ministry of Public Education</p> <p>Ministry of Higher and Secondary Special Education, Ministry of Public Education, Ministry of Employment and Labor Relations, State Testing Center</p> <p>Ministry of Higher and Secondary Special Education, Ministry of Information Technology Development, Ministry of Employment and Labor Relations, Ministry of Economy, Chamber of Commerce and Industry</p> <p>Ministry of Education, Ministry of Higher and Secondary Special Education, Community of people with disabilities</p> <p>Ministry of Public Education, Ministry of Higher and Secondary Specialized Education</p> <p>Ministry of Public Education, Ministry of Higher and Secondary Special Education, State Committee on Investments</p> <p>Ministry of Higher and Secondary Special Education, State Committee on Investment</p> <p>Ministry of Higher and Secondary Special Education, Ministry of Public Education</p> <p>Women's Committee of Uzbekistan General Prosecutor's Office, Ministry of Justice, National Center for Human Rights, ministries, state committees and departments</p>
<p>Goal 4. Provide inclusive and equitable quality education and promote lifelong learning opportunities for all.</p> <p>Goal 5. Achieve gender equality and empower all women and girls</p>		

Goal 5. Achieve gender equality and empower all women and girls	Task 5.2. Eliminate all forms of violence against women, including in the form of human trafficking, sexual and other forms of exploitation.	Ministry of the Interior, General Prosecutor's Office, State Security Services, Ministry of Justice, Women's Committee of Uzbekistan
	Task 5.3. Preventing early and forced marriage.	The Ministry of Internal Affairs, General Prosecutor's Office, Ministry of Justice, Women's Committee of Uzbekistan, Scientific and Practical Center "Oyila" under the Cabinet of Ministers
	Task 5.4. Recognize and value unpaid care and household work, providing public services, infrastructure and social protection systems, and promoting the principle of shared responsibility in the household and the family, taking into account national conditions.	Farmers, dekhkan and household owners' council, Ministry of Employment and Labor Relations, Women's Committee of Uzbekistan, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent
	Task 5.5. Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life.	Women's Committee, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent
	Task 5.6. Ensuring universal health coverage for comprehensive reproductive health care.	Ministry of Health
	Task 5.Ah. Expand programmes to support women in the realization of their rights and interests in the socio-economic sphere.	Women's Committee of Uzbekistan Ministry of Employment and Labor Relations Chamber of Commerce and Industry
	Task 5.b. Increase the use of high-performance technologies, in particular information and communications, to promote the empowerment of women.	Women's Committee of Uzbekistan, Ministry of Information Technology and Communications
Task 5.c. To fully integrate the principles of gender equality in the process of adopting government programs at different levels of government.	Women's Committee of Uzbekistan, Council of Ministers of the Republic of Karakalpakstan, regional hokimiyats and Tashkent city, National Center for Human Rights	

<p>Goal 6. Conservation and rational use of water resources for sustainable development, ensuring their availability and development of sanitation for all.</p>	<p>Task 6.1. By 2030, ensure universal access to safe drinking water.</p>	<p>Ministry of Housing, Ministry of Water Resources, Council of Ministers of the Republic of Karakalpakstan, regional and khokimiyats of Tashkent</p>
	<p>Task 6.2. By 2030, ensure universal and equal access to adequate sanitation facilities, paying special attention to the needs of socially vulnerable groups of the population.</p>	<p>Ministry of Health, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 6.3. By 2030, significantly reduce any pollution of the aquatic environment, including as a result of activities on land, and increase the scale of safe reuse of wastewater.</p>	<p>State Committee on Ecology and Environmental Protection, Ministry of Water Resources, Ministry of Housing and Public Utilities, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 6.4. By 2030, significantly increase water use efficiency in all sectors of the economy.</p>	<p>Ministry of Water Resources, Ministry of Housing and Communal Services, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 6.5. By 2030, ensure integrated water resources management at all levels, including, if necessary, through transboundary cooperation.</p>	<p>Ministry of Water Resources, Center of Hydrometeorological Services “Uzhydrometb”</p>
	<p>Task 6.6. By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.</p>	<p>State Committee on Ecology and Environmental Protection, State Committee on Forestry, Ministry of Water Resources, the Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
<p>Goal 7. Providing access to affordable, reliable, sustainable and modern energy sources for all.</p>	<p>Task 6.b. Support and strengthen the participation of citizens' self-governing bodies in the improvement of water management and sanitation.</p>	<p>Ministry of Water Resources, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent, the Ministry of Housing and Communal Services, the Ministry of Health, Republican Charitable Foundation “Makhalia”</p>
	<p>Task 7.1. By 2030, ensure universal access to affordable, reliable and modern energy supply.</p>	<p>Ministry of Economy, JSC “Uzbekenergo”, JSC “Uzbekneftegaz”, State Committee for the Promotion of Privatized Enterprises and the Development of Competition, JSC “National Energy Saving Company”</p>
<p>Task 7.2. By 2030, significantly increase the share of energy from renewable sources in the energy balance.</p>	<p>Ministry of Economy, Ministry of Innovation Development, JSC “Uzbekenergo”, JSC “Uzbekneftegaz”, JSC “National Energy Saving Company”</p>	

<p>Goal 7. Providing access to affordable, reliable, sustainable and modern energy sources for all.</p>	<p>Task 7.3. By 2030, double the energy efficiency improvement rate.</p> <p>Task 7.b. By 2030, expand infrastructure and upgrade technologies for modern and sustainable energy supply.</p> <p>Task 8.1. To achieve a significant increase in gross domestic product per capita by 2030.</p>	<p>JSC “Uzbekenergo” JSC “National Energy Saving Company”, Ministry of Economy, Ministries, State Committees and Agencies JSC “Uzbekenergo”, JSC “National Energy Saving Company”, Ministry of Economy, State Committee on Investments, ministries, state committees and departments Ministry of Economy, Central Bank</p>
<p>Goal 8. Promote sustainable and inclusive economic growth through increased productive employment and decent work for men and women.</p>	<p>Task 8.2. Increase productivity in the economy through diversification, technological upgrading and innovation, including by removing the focus on high-value-added and labour-intensive sectors.</p> <p>Task 8.3. Creating favorable conditions aimed at ensuring decent work and expanding productive employment of the population, especially young people, people with disabilities, by implementing active and passive measures in the labor market, protecting private property, supporting and removing barriers to the accelerated development of small and large businesses and entrepreneurship.</p> <p>Task 8.4. Throughout the period until the end of 2030, gradually increase the global efficiency of resource use in consumption and production systems and strive to ensure that economic growth is not accompanied by environmental degradation, as foreseen in the Ten-Year Strategy of Action to Transition to Use of Reasonable Consumption and Production Models.</p> <p>Task 8.5. By 2030, ensure sustainable and productive employment and decent work for all women and men, including young people and persons with disabilities, and equal pay for work of equal value.</p>	<p>Ministry of Economy, Ministry of Development of Information Technologies and Communications, Ministry of Innovation Development, economic management bodies Ministry of Employment and Labor Relations Ministry of Economy, Chamber of Commerce, Union of Youth of Uzbekistan, Federation of Trade Unions of Uzbekistan Ministry of Economy, State Committee on Ecology and Environmental Protection, Ministry of Agriculture, State Committee on Forestry Ministry of Employment and Labor Relations, Ministry of Finance, Federation of Trade Unions of Uzbekistan, Chamber of Commerce and Industry, Union of Youth of Uzbekistan, Community of people with disabilities</p>

<p>Goal 8. Promote sustainable and inclusive economic growth through increased productive employment and decent work for men and women.</p>	<p>Task 8.6. By 2020, significantly reduce the proportion of young people who do not work, do not study and do not acquire professional skills.</p> <p>Task 8.7. Strengthen control and monitoring to prevent the worst forms of child and forced labor.</p> <p>Task 8.8. Protect labor rights and ensure safe working conditions for employees.</p> <p>Task 8.9. By 2030, to ensure the sustainable development of tourism, contributing to the creation of new jobs and increased demand for local products.</p> <p>Task 8.10. Strengthen the ability of national financial institutions to promote and expand access to banking, insurance and financial services for all.</p> <p>Task 8.b. By 2020, develop and implement a global strategy for youth employment and implement the Global Jobs Pact of the International Labor Organization (adopted on July 7, 2009 at the International Labor Conference).</p>	<p>Union of Youth of Uzbekistan, Ministry of Public Education, Ministry of Higher and Secondary Special Education, Ministry of Employment and Labor Relations, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>Ministry of Employment and Labor Relations, Prosecutor General's Office, Ministry of Justice, Federation of Trade Unions of Uzbekistan, ministries and departments</p> <p>Ministry of Employment and Labor Relations, Ministry of Justice, General Prosecutor's Office, Federation of Trade Unions of Uzbekistan</p> <p>State Committee for Tourism Development, Ministry of Foreign Affairs, Ministry of Employment and Labor Relations, Ministry of Economy</p> <p>Central Bank, Ministry of Finance, Ministry of Economy, State Tax Committee, State Customs Committee</p>
<p>Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and innovation.</p>	<p>Task 9.1. Develop high-quality, reliable, sustainable and resilient infrastructure, including territorial and cross-border infrastructure, in order to support the economic development and well-being of people, paying particular attention to ensuring affordable and equitable access to resources for all.</p>	<p>State Committee for Roads Ministry of Economy, Ministry of Information Technology Development, State Investment Committee, "Uztransgaz" JSC, "Uzbekenergo" JSC</p>

<p>Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and innovation.</p>	<p>Task 9.2. Promoting inclusive and sustainable development of the industry with a significant increase in its share in GDP by 2030 due to the advanced development of the processing industries, the creation of new and modernization of existing enterprises with the wide use of resource-saving and environmentally friendly technologies.</p>	<p>Ministry of Economy, "Uzavtosanoat" JSC, Association "Uztukimachilikisanoat", JSC "Uzbekneftegaz", JSC "Uzkimiyosanoat", economic management bodies</p>
	<p>Task 9.3. Expand the access of small industrial enterprises and microfirms to financial services, including low-cost loans, and strengthen their integration into production value chains and sales markets.</p>	<p>Ministry of Economy, Central Bank, State Investment Committee State Tax Committee, State Customs Committee</p>
	<p>Task 9.4. By 2030, modernize the infrastructure and retrofit industrial enterprises, making them sustainable by improving the efficiency of resource use and wider use of clean and environmentally friendly technologies and industrial processes, with the participation of all interested countries in accordance with their individual capabilities.</p>	<p>Ministry of Innovation Development, State Committee on Ecology and Environmental Protection, economic management bodies</p>
	<p>Task 9.5. Intensify scientific research aimed at increasing the technological potential of economic sectors, including by creating favorable conditions for innovation and a significant increase in the number of employees in the field of research and development (R & D), increasing public and private expenditures on R & D.</p>	<p>Ministry of Innovation Development, Academy of Sciences, Ministry for the Development of Information Technologies and Communications, Ministry of Economy, Ministry of Higher and Secondary Special Education, Ministry of Construction, Union of Youth of Uzbekistan</p>
	<p>Task 9. b. Support the development, research and innovation of domestic technologies, including through the creation of a political climate conducive to, inter alia, industrial diversification and increased value added in the commodity sectors.</p>	<p>Ministry of Innovation Development, Ministry of Economy, Ministry of Foreign Trade, Chamber of Commerce and Industry</p>
<p>Goal 10. Reduce inequality in all its manifestations within the country.</p>	<p>Task 9. c. Significantly expand access to information and communication technologies and strive to ensure universal and affordable access to the Internet.</p>	<p>Ministry of information technology development and communications</p>
	<p>Task 10.1. By 2030, progressively achieve and sustain income growth of the poorest 40 per cent of the population at levels above the national average.</p>	<p>Ministry of Economy, Ministry of Employment and Labor Relations, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>

<p>Goal 10. Reduce inequality in all its manifestations within the country.</p>	<p>Task 10.2. Support by law and encourage the active participation of all people in social, economic and political life, regardless of their age, gender, disability, nationality, religion and social status.</p> <p>Task 10.3. To ensure in practice the full and strict implementation of anti-discrimination norms and provisions of the law, especially in relation to representatives of socially vulnerable groups of the population.</p> <p>Task 10.4. Adopt appropriate policies, especially fiscal and wage policies and social protection policies, and progressively achieve greater equality.</p> <p>Task 10.7. Promote orderly, safe, regulated labour migration and effective migration policies.</p>	<p>Federation of Trade Unions of Uzbekistan Supreme Court, General Prosecutor's Office, Chambers of Oliy Majlis (by agreement), National Center for Human Rights, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>The Ministry of Employment and the Ministry of Public Education, the General Prosecutor's Office</p> <p>State Tax Committee, Ministry of Economy, Ministry of Employment and Labor Relations</p> <p>Ministry of Employment and Labor Relations</p> <p>Ministry of Internal Affairs</p>
<p>Goal 11. Ensuring the openness, security, resilience and environmental sustainability of cities and towns.</p>	<p>Task 11.1. By 2030, ensure universal access to affordable housing and housing services.</p> <p>Task 11.2. By 2030, provide access to safe, affordable, affordable, and environmentally sustainable transport systems by improving road safety, in particular, by increasing the use of public transport, paying particular attention to the needs of socially vulnerable people.</p> <p>Task 11.3. By 2030, expand the scale of urbanization which is open and environmentally sustainable, and the possibilities for integrated and sustainable human settlements planning and management.</p>	<p>Ministry of Housing and Communal Services, Ministry of Economy, Central Bank, Ministry of Construction, State Committee for Ecology and Environmental Protection, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>Ministry of Internal Affairs, State Committee on Ecology and Environmental Protection, Ministry of Economy, "Uzavtotrans" Agency, Ministry of Employment and Labor Relations, State Committee for Highways, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>Ministry of Construction, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>

<p>Goal 11. Ensuring the openness, security, resilience and environmental sustainability of cities and towns.</p>	<p>Task 11.4. Intensify efforts to protect and preserve cultural and natural heritage sites.</p> <p>Task 11.5. By 2030, significantly reduce the number of dead and injured by disasters, especially women and children, and significantly reduce the direct economic damage caused by disasters, paying particular attention to the protection of socially vulnerable groups of the population.</p> <p>Task 11.6. By 2030, reduce the negative impact of urban ecology on the population, including by focusing on air quality and the disposal of urban and other wastes.</p> <p>Task 11.7. By 2030, expand the area of green areas, recreation parks, playgrounds for children in cities and towns with the creation of necessary conditions for recreation for people with disabilities.</p>	<p>State Committee on Ecology and Environmental Protection, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>Ministry of Emergency Situations, Ministry of Internal Affairs, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>State Committee on Ecology and Environmental Protection, Ministry of Housing and Communal Services, Council of Ministers of the Republic of Karakalpakstan, regional hokimiyats and hokimiyats of Tashkent</p> <p>Ministry of Construction, Ministry of Culture, State Committee on Ecology and Environmental Protection, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>
<p>Goal 12. Ensure the transition to rational consumption and production patterns.</p>	<p>Task 12.1. Implement the Ten-Year Action Strategy for Transitioning to the Use of Rational Models of Consumption and Production (“Rio + 20” Conference, 2012).</p> <p>Task 12.1. Implement the Ten-Year Action Strategy for Transitioning to the Use of Rational Models of Consumption and Production (“Rio + 20” Conference, 2012).</p> <p>Task 12.4. By 2030, achieve the environmentally sound use of chemicals and all wastes throughout their life cycle in accordance with agreed international principles and substantially reduce their release into air, water and soil in order to minimize their negative impact on human health and the environment.</p> <p>Task 12.5. By 2030, substantially reduce waste by adopting measures to prevent their formation, reduce, recycle and reuse.</p> <p>Task 12.6. Recommend enterprises, especially large ones, to apply sustainable production methods and reflect information on the rational use of resources in their reports.</p>	<p>Ministry of Innovation Development, State Committee on Ecology and Environmental Protection</p> <p>Ministry of Innovation Development, State Committee on Ecology and Environmental Protection</p> <p>State Committee on Ecology and Environmental Protection, Ministry of Health, Ministry of Agriculture, “Uzkimyosanoat”. JSC</p> <p>State Committee on Ecology and Environmental Protection, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p> <p>State Committee on Ecology and Environmental Protection, State Committee for the Promotion of Privatized Enterprises and the Development of Competition, State Committee for Statistics</p>

<p>Goal 12. Ensure the transition to rational consumption and production patterns.</p>	<p>Task 12.7. Expand the use of environmental standards in public procurement.</p> <p>Task 12.8. By 2030, provide people with relevant information and knowledge on sustainable development and lifestyles in harmony with nature.</p> <p>Task 12.b. Develop and implement tools for monitoring the impact of tourism on sustainable development, which contributes to job creation, the development of local culture and the production of products.</p> <p>Task 12.c. To rationalize characterized by ineffective subsidies of fossil fuels, leading to its wasteful consumption by removing market distortions, taking into account national conditions, including by reforming taxation and phasing out of subsidies, where they exist, to account for their environmental consequences, fully taking into account the special needs and conditions of countries and minimizing the possible negative consequences for their development thus to protect the interests of the needy and vulnerable segments of the population.</p>	<p>State Committee on Ecology and Environmental Protection, National Project Management Agency</p> <p>State Committee on Ecology and Environmental Protection, Ministry of Public Education, Union of Youth of Uzbekistan</p> <p>State Committee for Tourism Development, Ministry of Economy, Ministry of Employment and Labor Relations</p> <p>Ministry of Economy, Ministry of Finance, State Tax Committee</p>
<p>Goal 13. Take urgent action to combat climate change and its effects.</p>	<p>Task 13.2. Include climate change response measures in the policy and development strategy at the national level, paying special attention to the measures implemented in the Aral Sea zone.</p> <p>Task 13.3. Improve education and awareness, as well as the ability of people and institutions, organizations and enterprises to mitigate the effects of climate change, to adapt to them and to early warn of the risks of dangerous climatic events.</p>	<p>State Committee on Ecology and Environmental Protection, Ministry of Emergency Situations, Center of Hydrometeorological Service "Uzhydromet", Ministry of Economy</p> <p>State Committee on Ecology and Environmental Protection, Center of Hydrometeorological Service "Uzhydromet", Ministry of Emergency Situations, Union of Youth of Uzbekistan, mass media</p>

<p>Goal 15. Protecting and restoring terrestrial ecosystems and promoting their rational use, sustainable forest management, combating desertification, halting and reversing land degradation and halting the loss of biodiversity.</p>	<p>Task 15.1. Ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems, including forests, wetlands, mountains and drylands, in accordance with the obligations arising from international agreements.</p>	<p>State Committee on Forestry, Ministry of Water Resources, State Committee on Ecology and Environmental Protection, State Committee on Land Resources, Geodesy, Cartography and State Cadastre, Council of Ministers of the Republic of Karakalpakstan and regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 15.2. Promote the introduction of methods for the rational use of all types of forests, eliminate deforestation, restore degraded forests, and significantly expand forest afforestation and reforestation.</p>	<p>State Committee on Forestry, State Committee on Ecology and Environmental Protection, State Committee on land resources, geodesy, cartography and state cadastre</p>
	<p>Task 15.3. By 2030, combat desertification, restore degraded lands and soils, including lands affected by desertification, droughts and floods, and achieve a neutral balance of land degradation.</p>	<p>Ministry of Water Resources, State Committee on Forestry, State Committee on Ecology and Environmental Protection, State Committee on Geology and Mineral Resources, Center of Hydrometeorological Service “Uzhydromet”, Council of Ministers of the Republic of Karakalpakstan and regional khokimiyats and khokimiyat of Tashkent</p>
	<p>Task 15.4. By 2030, ensure the preservation of mountain ecosystems, including their biodiversity, in order to increase their ability to provide the benefits necessary for sustainable development.</p>	<p>State Committee on Ecology and Environmental Protection, Ministry of Agriculture, State Committee on Forestry</p>
	<p>Task 15.5. Take meaningful measures to curb the degradation of the natural habitats of animals, reduce the number of endangered species.</p>	<p>State Committee on Ecology and Environmental Protection, State Veterinary Committee, State Committee on Forestry, Ministry of Water Economy, Academy of Sciences</p>
	<p>Task 15.7. Immediately take measures to put an end to poaching and smuggling of protected species of flora and fauna and to solve problems related both to the demand for and supply of illegal wildlife products.</p>	<p>State Committee on Ecology and Environmental Protection, State Committee on Forestry</p>
	<p>Task 15.8. Take measures to prevent the invasion of alien invasive species and significantly reduce their impact on terrestrial and aquatic ecosystems, as well as to take measures to prevent the number limitation or destruction of their priority species</p>	<p>State Committee on Ecology and Environmental Protection, Ministry of Water Resources, Academy of Sciences, State Committee on Forestry, Council of Ministers of the Republic of Karakalpakstan, regional hokimiyats and hokimiyat of Tashkent</p>
	<p>Problem 15.9. Ensure that ecosystems and biodiversity values are taken into account in the development of national strategies and programs for the development of industries and economic sectors.</p>	<p>State Committee on Ecology and Environmental Protection, Ministry of Economy, Academy of Sciences, State Committee on Forestry, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>

<p>Goal 15. Protecting and restoring terrestrial ecosystems and promoting their rational use, sustainable forest management, combating desertification, halting and reversing land degradation and halting the loss of biodiversity.</p>	<p>Task 15 a. Mobilize and significantly increase financial resources from all sources for the conservation and sustainable use of biological diversity and ecosystems.</p>	<p>State Committee on Ecology and Environmental Protection, State Committee on Forestry, Ministry of Finance</p>
<p>Goal 16. Contribute to building a peaceful and open society for sustainable development, ensuring access to justice for all and creating effective, accountable and participatory institutions at all levels.</p>	<p>Task 16.1. Reduce the prevalence of all forms of violence and reduce death rates from this phenomenon.</p>	<p>Ministry of Internal Affairs, General Prosecutor's Office, Women's Committee of Uzbekistan</p>
	<p>Task 16.2. Eliminate all forms of violence against children and women.</p>	<p>Ministry of Internal Affairs, General Prosecutor's Office, Ministry of Public Education, Ministry of Health, Ministry of Preschool Education, Union of Youth of Uzbekistan, Women's Committee of Uzbekistan</p>
	<p>Task 16.3. Promote the rule of law and ensure equal access to justice for all.</p>	<p>Supreme Court, General Prosecutor's Office, Ministry of the Interior, Ministry of Justice</p>
	<p>Task 16.4. By 2030, significantly reduce illicit financial flows and arms flows, step up efforts to locate and recover stolen assets and fight all forms of organized crime.</p>	<p>General Prosecutor's Office, State Security Service, Ministry of Internal Affairs</p>
	<p>Task 16.5. Significantly reduce corruption and extremism in all their forms.</p>	<p>General Prosecutor's Office, State Security Service, Ministry of Internal Affairs, Ministry of Justice</p>
	<p>Task 16.6. Increase the efficiency, accountability and transparency of government agencies at all levels of government.</p>	<p>Ministry of Justice, Independent Institute for Monitoring the Formation of Civil Society, Supreme Court, General Prosecutor's Office</p>
	<p>Task 16.7. Increase the participation of citizens, businesses and civil society institutions in the preparation and decision-making process at all levels of government.</p>	<p>Ministry of Justice, Chamber of Commerce, ministry and department, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>

<p>Goal 16. Contribute to building a peaceful and open society for sustainable development, ensuring access to justice for all and creating effective, accountable and participatory institutions at all levels.</p>	<p>Task 16.10. To increase the information openness of state authorities and administration for the realization of the right of citizens to information and to ensure the protection of fundamental freedoms of citizens.</p> <p>Task 16.a. Strengthen relevant national institutions by expanding their cooperation at the national and international level in the prevention of violence, combating terrorism, extremism and other types of crime.</p>	<p>Uzbek Agency for Press and Information, Public Council for the Coordination and Monitoring of Activities for Ensuring the Openness of the Activities of Public Authorities and Management, Ministry for the Development of Information Technologies and Communications, Ministry of Justice, Ministries, State Committees and Agencies</p> <p>Ministry of Internal Affairs, State Security Service, National Center for Human Rights, Prosecutor General's Office, ministries, state committees and departments</p>
<p>Goal 17. Strengthen implementation tools and revitalize the Global Partnership for Sustainable Development.</p>	<p>Task 17.1. Strengthen the mobilization of resources from internal and external sources in order to provide the necessary level of socio-economic programs.</p> <p>Task 17.3. Mobilize additional financial resources from external sources for the implementation of socio-economic development programs.</p> <p>Task 17.4. Maintain the level of public debt at a level that ensures the stability of the financial and economic state of the country.</p> <p>Task 17.6. To expand international cooperation in the field of science, technology and innovation, to stimulate the exchange of knowledge in the interests of deepening structural reforms.</p> <p>Task 17.8. To ensure by 2019 the full-scale operation of a technology bank and a mechanism for the development of science, technology and innovation and expand the use of high-performance technologies, in particular, information and communication technologies.</p> <p>Task 17.13. Increase macroeconomic stability, including through policy coordination and policy coherence.</p> <p>Task 17.14. To formulate long-term mechanisms for integrating the principles of sustainable development into decisions making, developed and implemented strategies and programs.</p>	<p>Ministry of Economy, Council of Ministers of the Republic of Karakalpakstan, regional and khokimiyats of Tashkent, ministries, state committees and departments</p> <p>State Investment Committee, Central Bank</p> <p>Ministry of Finance, Central Bank, Ministry of Economy</p> <p>Ministry of Innovation Development, Academy of Sciences, Ministry of Higher and Secondary Special Education, State Committee on Investments, Agency for Intellectual Property</p> <p>Ministry of Innovation Development, Ministry of Information Technology and Communications Development, ministries, state committees and departments</p> <p>Ministry of Economy</p> <p>Ministry of Economy, Council of Ministers of the Republic of Karakalpakstan, regional khokimiyats and khokimiyat of Tashkent</p>

Goal 17. Strengthen implementation tools and revitalize the Global Partnership for Sustainable Development.	Task 17.17. Encourage effective partnership between the public and private sectors, civil society institutions in the implementation of socio-economic development programs.	State Committee on Investments, State Committee on Privatization, De-monopolization and Development of Competition, Chamber of Commerce
	Task 17.18. By 2020, significantly increase the availability of high-quality, up-to-date and reliable data disaggregated by income level, gender, age, race, nationality, citizenship, social stratum, location, and other characteristics that are significant to national conditions.	State Committee on Statistics, Ministry of Economy, Ministry of Finance
	Task 17.19. By 2030, relying on current initiatives, develop, in addition to the gross domestic product, indicator and other indicators to measure progress in achieving sustainable development, to increase the capacity in the field of statistics.	State Committee on Statistics

* The sequence numbers of the Goals and Objectives correspond to the numbering of the global Sustainable Development Goals adopted at the UN Summit in September 2015. The Resolution approved the establishment of the Coordination Council for the implementation of the National Sustainable Development Goals and Objectives for the period up to 2030, as well as the "Road Map" to organize the implementation of the National Sustainable Development Goals and Objectives for the period until 2030.

4.8 EXISTING AND ADOPTED NEW STANDARD ACTS AND PROGRAMS FOR 2017-2021

The list of main legislative acts (with amendments and additions made in subsequent years from the date of adoption), which regulate various aspects of water relations in the Republic of Uzbekistan, directly or indirectly.

Constitution of the Republic of Uzbekistan (1992)

Land Code of the Republic of Uzbekistan (1998)

Code of the Republic of Uzbekistan “On Administrative Responsibility” (1995)

Tax Code of the Republic of Uzbekistan (2008)

Criminal Code of the Republic of Uzbekistan (1995)

Law of the Republic of Uzbekistan “On the Safety of Hydraulic Structures” (1999)

Law of the Republic of Uzbekistan “On Public Associations” in the Republic of Uzbekistan (1991)

Law of the Republic of Uzbekistan “On the Protection and Use of the Animal World” (1997)

Law of the Republic of Uzbekistan “On the Protection and Use of Plant World” (1997)

Law of the Republic of Uzbekistan “On Nature Protection” (1992)

Law of the Republic of Uzbekistan “On Protected Natural Territories” (2004)

Law of the Republic of Uzbekistan “On Ecological Expertise” (2000)

Law of the Republic of Uzbekistan “On Introducing Amendments and Additions to some Legislative Acts of the Republic of Uzbekistan in connection with the economic reforms in agriculture and water management” (2009)

Law of the Republic of Uzbekistan “On Amendments to Certain Legislative Acts of the Republic of Uzbekistan in connection with the improvement of the system for organizing and conducting geological exploration” (2011)

Law of the Republic of Uzbekistan “On Water and Water Use” (1993)

Law of the Republic of Uzbekistan “On Local Government” (1993)

Law of the Republic of Uzbekistan “On the State Border of the Republic of

Uzbekistan” (1999)

Law of the Republic of Uzbekistan “On State Statistics” (2002)

Law of the Republic of Uzbekistan “On State Control of Activities of Economic Entities” (1998)

Law of the Republic of Uzbekistan “On State Sanitary Monitoring” (1992)

Law of the Republic of Uzbekistan “On State Cadaster” (2000)

Law of the Republic of Uzbekistan “On Protection of the Population and Territories from Natural and Man-Made Emergencies” (1999)

Law of the Republic of Uzbekistan “On Forest” (1999)

Law of the Republic of Uzbekistan “On international treaties of the Republic of Uzbekistan” (1995)

Law of the Republic of Uzbekistan “On Metrology” (1993)

Law of the Republic of Uzbekistan “On Non-State Non-Profit Organizations” (1999)

Law of the Republic of Uzbekistan “On guarantees of activity of non-state non-profit organizations” (2007);

Law of the Republic of Uzbekistan “On subsoil” (new edition, 2002);

Law of the Republic of Uzbekistan “On Certification of Products and Services» (1993);

Law of the Republic of Uzbekistan “On Standardization” (1993);

Law of the Republic of Uzbekistan “On Technical Regulation” (2009);

Law of the Republic of Uzbekistan “On the Sanitary-Epidemiological Safety of the Population”, (2015);

Law of the Republic of Uzbekistan “On amendments and additions to the Law of the Republic of Uzbekistan “On normative legal acts” (2012).);

Law of the Republic of Uzbekistan “On Sanitation and Epidemiological Safety of the Population” (2015);

Law of the Republic of Uzbekistan “On Environmental Control” (2015);

Resolution of the President of the Republic of Uzbekistan “On Measures to Further Improve the System of Protection of Water Bodies” of September 25, 2017.

Decree of the President of the Republic of Uzbekistan “On Measures for Further Improvement of the Structure of the State Committee of the Republic of Uzbekistan on Geology and Mineral Resources” No. PP-27 of January 10, 2017

Decree of the President of the Republic of Uzbekistan “On the establishment of the State Inspectorate for Control over the Use of Drinking Water under the Cabinet of Ministers of the Republic of Uzbekistan” No. UP-5018 of 04.18.2017

Decree of the President of the Republic of Uzbekistan “On Measures to Improve the Efficiency of Work with Privatized Enterprises” No. PP-2895 of April 18, 2017.

Decree of the President of the Republic of Uzbekistan “On Improving the System of Public Administration in the Field of Ecology and Environmental Protection” No. UP-5024 of April 21, 2017

Decree of the President of the Republic of Uzbekistan “On the Organization of Activities of the Ministry of Housing and Communal Services of the Republic of Uzbekistan” No. PP-2900 of 04.18.2017

Resolution of the President of the Republic of Uzbekistan “On measures to ensure the organization of the activities of the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection” No. PP-2915 of 04.21.2017

Resolution of the President of the Republic of Uzbekistan “On Measures to Streamline the Control and Accounting of the Rational Use of Groundwater Resources for 2017-2021” No. PP-2954 of 04.05.2017

Decree of the President of the Republic of Uzbekistan “On the Establishment of the State Committee of the Republic of Uzbekistan on Forestry” No. UP-5041 of 05.11.2017

Decree of the President of the Republic of Uzbekistan “On the Organization of the Activities of the State Committee of the Republic of Uzbekistan on Forestry” No. PP-2966 of 05.11.2017

Decree of the President of the Republic of Uzbekistan “On Measures to Organize the Activities of the Joint-Stock Company “Uzbekgidroenergo” No. PP-2972 of 18.05.2017

Decree of the President of the Republic of Uzbekistan “On Amendments to the Decree of the President of the Republic of Uzbekistan” of October 29, 2007, No. UP-3932 “On Measures for the Fundamental Improvement of the Land Reclamation Improvement System” No. UP-5074 of 07.06.2017

Decree of the President of the Republic of Uzbekistan “On the Establishment of a Fund for Targeted Financing of State Purchases of Agricultural Products and Equipment with Agricultural Equipment under the Cabinet of Ministers of the Republic of Uzbekistan” No. UP-5095 of 27. 06.2017

Decree of the President of the Republic of Uzbekistan “On the Organization of the Activities of the Fund for Target Financing of Government Procurement of Agricultural Products and Equipment for Agriculture under the Cabinet of Ministers of the Republic of Uzbekistan” No. PP-3096 of 27. 06.2017

Decree of the President of the Republic of Uzbekistan “On Measures for the Radical Improvement of the Activities of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan” No. UP-5134 of 04.08.2017

Decree of the President of the Republic of Uzbekistan “On Measures to Further Improve the Activities of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan” No. PP-3172 of 04.08.2017

Decree of the President of the Republic of Uzbekistan “On the Complex of Organizational Measures for the Timely and Effective Defoliation of Cotton in 2017” No. PP-3229 of 21. 08.2017

Decree of the President of the Republic of Uzbekistan “On Amendments to Certain Acts of the President of the Republic of Uzbekistan (Decree of the President of the Republic of Uzbekistan of May 24, 2017 No. PP-3003 “On Measures for Radically Improving the System of Training Engineering and Technical Personnel for the Agriculture and Water Economy”) No. UP-5190 of 12.09.2017

Decree of the President of the Republic of Uzbekistan “On Measures to Fundamentally Improve the System of Protection of the Rights and Legitimate Interests of Farmers, Dekhkan Farms and Owners of Homestead Lands, Effective Use of Acreage of Agriculture” No. UP-5199 of 09.10.2017

Decree of the President of the Republic of Uzbekistan “On Measures to Ensure the Rational Use of Energy Resources” No. PP-3379 of 08.11.2017

Decree of the President of the Republic of Uzbekistan “On Measures for the Fundamental Improvement of Payment Discipline in the Provision of Water Supply and Sanitation Services” No. UP-5241 of 16.11.2017

Since 2018, new tariffs for water supply services have been introduced, which will now be provided according to the prepayment. Collection of payments from consumers is entrusted to the Bureau of Enforcement under the General Prosecutor’s office of Uzbekistan. These measures are provided for by the Decree of President Shavkat Mirziyoyev “on measures to radically improve the payment discipline in the provision of water supply and sanitation services” of November 16, 2017.

The Decree of the President of the Republic of Uzbekistan of November 13, 2017 № PP-3384 “on measures to accelerate introduction of an automated system of control and accounting of electric energy and natural gas” procurement from foreign companies of the first batch of metering devices of electric energy, software, related equipment and other technical means was approved in the framework of project, as well as all relevant contracts were conducted.

In accordance with the Decree Of the President of the Republic of Uzbekistan of May 18, 2017 № UP-5044, a new organization JSC “Uzbekgidroenergo” was established, which included hydroelectric power plants and contractors for the design and construction of hydropower facilities.

In accordance with the Decree of the President of the Republic of Uzbekistan of July 26, 2017, No. PP -3147 “On measures to improve the management structure and increase the efficiency of coal industry enterprises”, previously included in the structure of the company “Uzbekugol” JSC (coal production), then were transferred to Uzbekistan JSC “Temir Yollari”.

In accordance with the Decree of the President of the Republic of Uzbekistan of May 29, 2017 No. UP -5059 “On measures to further strengthen payment discipline in the supply and consumption of electric energy and natural gas, as well as to fundamentally improve the system of enforcement proceedings”, the Compulsory Enforcement Bureau was established at the General Prosecutor’s Office of the Republic to solve the issues of compliance with contractual obligations in the supply and consumption of electric energy in collaboration with JSC “Uzbekenergo”.

Decree of the Cabinet of Ministers of 10.08.2018 No. 645 approved measures for the widespread introduction of modern information and communication technologies in the activities of agricultural organizations.

Starting from 2018, a gradual transition of farms activity to multidisciplinary mode starts. With those who do not managed to transfer to multi-disciplinary activity, land lease contracts will be terminated from the beginning of 2022. Farmers, dekhkan farms and owners of farmer households may deprive the right to land due to inefficient use of land.

Minutes of the meeting of the Cabinet of Ministers of the Republic of Uzbekistan of August 2, 2018 No. 01-02 / 1-2288 “On measures to develop a concept of integrated socio-economic development of the Republic of Uzbekistan until 2030”.

Resolution of the President of the Republic of Uzbekistan of November 29, 2018, №. PP-4039 “On additional measures to improve the activities of the Ministry of Water Resources of the Republic of Uzbekistan”.

Presidential Decree of January 8, 2019, No. UP-5614 “On additional measures to ensure the further development of the economy and improve the efficiency of

economic policy”. Under this Decree, the Economic Council (A. Aripov), together with the responsible departments, was entrusted with preparing and submitting to the Administration of the President of the Republic of Uzbekistan the draft Strategy for the Development of the Water Resources Management and Irrigation Sector - before September 1, 2020.

In pursuance of the Decree of the President of the Republic of Uzbekistan dated October 3, 2018 № PP-3956 “On additional measures to improve the system of public administration in the field of ecology and environmental protection” of January 15, 2019, the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan №29 “On approval of the Regulations on the State Committee of the Republic of Uzbekistan on ecology and environmental protection” was adopted

Decree of the President of the Republic of Uzbekistan No. UP-5635 of January 17, 2019 “On the state program for implementing the strategy of action in five priority areas of development of the Republic of Uzbekistan in 2017–2021 within the “Year of active investment and social development”. The Decree approved the State Program for the implementation of the Action Strategy for the five priority areas of development of the Republic of Uzbekistan in 2017-2021 in the “Year of Active Investments and Social Development” (hereinafter referred to as the State Program of 2019), providing for the implementation of projects totaling 16.9 trillion soums and 8.1 billion US dollars aimed at:

in the area of improving the system of state and public construction - the revitalization of the parliament in making important decisions and monitoring the implementation of laws, optimizing the executive system, continuing administrative reform, widespread use of modern management methods, developing public services, creating a unified personnel policy aimed at attracting qualified specialists to public service, revising the powers and responsibilities of local government bodies, expanding their independence;

in the area of ensuring the rule of law and further reforming the judicial and legal system - ensuring the true independence of the judiciary, taking the necessary measures to ensure peaceful life, public safety and legality, early warning of crime, improvement and liberalization of criminal legislation;

in the development of the economy and active investment attraction - ensuring macroeconomic stability, creating the necessary conditions for healthy competition, further improving the business environment and investment climate, a significant reduction in the state presence in the economy, maintaining high economic growth shares, continued liberalization of currency regulation;

in the field of social development - reducing unemployment among the population, increasing citizens’ incomes, developing science and continuing education, improving the quality and coverage of the population with medical services, increasing social support for women and young people, improving people’s living conditions, providing

decent housing and increasing their well-being, approval of a healthy lifestyle in society, the popularization of physical culture and sports, the development of tourism;

in the field of security, interethnic harmony and religious tolerance, as well as foreign policy - increasing the country's defense capability, strengthening the capacity of the Armed Forces of the Republic of Uzbekistan, forming a national defense industry complex, ensuring environmental safety, rational use of water and other natural resources, further improving the efficiency of foreign policy activities based on the principles of openness, equitable and mutually beneficial cooperation.

Table 4.5. New regulations and programs adopted for the period 2017-2021

Program	No. and date of adoption of the document	Type of document	Duration of the program	Industries
“A comprehensive program to mitigate the effects of the Aral disaster, the restoration and socio-economic development of the Aral Sea region for the period 2015-2018.”	№255 of 29.08.2015	Resolution of the Cabinet of Ministers	2018.	
About the program of measures to ensure structural reforms, modernization and diversification of production for 2015-2019	№ UP-4707 of 04.03.2015	Presidential Decree	2019	Structural transformation
“On improving the quality of development of pre-project documentation of investment projects”.	№ PP-2836 of 15.03.2017	Resolution of the President		Structural transformation
On measures to organize the activities of the State Investment Committee of the Republic of Uzbekistan	№ PP-2868 of 4.04.2017	Resolution of the President		Structural transformation
About the Program of Measures for the Further Development of Hydropower for 2017–2021	№ PP-2947 of 02.05.2017	Resolution of the President	2021	Structural transformation
About the Program of Measures for the Further Development of Renewable Energy, Improving Energy Efficiency in the Sectors of the Economy and the Social Sphere for 2017-2021	№ PP-3012 of 26.05.2017	Resolution of the President	2021	Industry
About the Program of measures for the further development of the pharmaceutical industry of the republic for 2016-2020	№ PP-2595 of 16.09.2016	Resolution of the President	2020	Industry
On measures to further develop the resource base, deepen the processing of fruit and vegetables, meat and dairy products, increase production and export of food products in 2016-2020	№ PP-2505 of 05.03.2016	Resolution of the President	2020	Industry
On additional measures to further extend processing and the creation of facilities for the storage of fruits and vegetables in 2017-2018	№ PP-2716 of 06.01.2017	Resolution of the President	2018	Industry
On measures for further modernization, technical and technological transformation of the agricultural machinery industry for 2017-2021	Project	Resolution of the President	2021.	Industry

Program for the integrated development of crop production, further improvement of crop breeding and seed production, the introduction of advanced intensive agro technologies for 2016-2020	№ PP-2460 of 29.12.2015	Resolution of the President	2020	Industry
On measures for the organization of soybeans production and increase cultivation of soybeans in the country for 2017-2021	№ PP-2832 of 14.03.2017	Resolution of the President	2021	Agriculture
About measures for further improvement of ameliorative condition of irrigated lands and rational use of water resources	№ PP-1958 of 19.04.2013	Resolution of the President	2017	Irrigation Melioration
On measures to fundamentally improve the system of protection of the rights and legitimate interests of farmers, dekhkan farms and owners of homestead lands, the effective use of agricultural lands	№UP-5199 of 9.10.2017	Presidential Decree	2021.	Agriculture
The program of measures for the organization of enterprises for the fodder production in 2017-2018	The program of measures of the Cabinet of Ministers of 15.03.2017 № 03-35-12	Program of measures	2018	Agriculture
State program on improvement of ameliorative condition of irrigated lands and rational use of water resources	Project	Resolution of the President	2018-2022	Irrigation Melioration
On measures for the fundamental improvement and development of the waste management system for 2017-2021	№ PP-2916 of 21.04.2017	Resolution of the President	2021	Infrastructure
On measures to implement the project on “Construction of Sergeli line of Tashkent subway”	№ PP-2664 of 29.11.2016	Resolution of the President	2020.	Transport
On measures to implement the project on “Construction of the second stage of Yunusabad line of the Tashkent subway”	№ PP-2653 of 07.11.2016	Resolution of the President	2018	Transport
On the Program of Integrated Development and Modernization of Drinking Water Supply and Sewage Systems	№ PP-2910 of 20.04.2017	Resolution of the President	2021	Water supply and sewage
On the Heat Supply Development Program	№ PP-2912 of 20.04.2017	Resolution of the President	2022.	Heat supply

On approval of the Program for the stable and safe passage of water through the waterways of the Republic of Uzbekistan	№ 13 of 21.01.2014	Resolution of the Cabinet of Ministers	2015 and up to 2020	Bank protection
On additional measures to improve the work of the system of municipal drainage in cities and regional centers of the republic	№ 304 of 08.11.2013	Resolution of the Cabinet of Ministers	2017	Drainage networks
On the State Program for Development of the Aral Region	PP-2731 of 18.01.2017	Resolution of the President	2021	Republic of Karakalpakstan and Khorezm region
On the Program of Measures for the further improvement of the reclamation state and lowering of the groundwater level, the fundamental renewal of the architectural and planning development of Gulistan in conjunction with the development of social, transport and engineering infrastructure	PP-2401 of 04.09.2015	Resolution of the President	2019	Syrdarya region
On additional measures for economic development and employment of the population of Muynak district of the Republic of Karakalpakstan in 2017-2018	PP-2803 of 28.02.2017	Resolution of the President	2018.	Social and economic development of the region
On approval of the parameters of projects on development of industry, agriculture and services in the Republic of Karakalpakstan for 2017-2018	№ 111 of 28.02.2017	Resolution of the Cabinet of Ministers	2018.	Social and economic development of the region
On measures to create additional favorable conditions for entrepreneur activities in the Republic of Karakalpakstan and Khorezm region	PP-2843 of 17.03.2017	Resolution of the President	2021	Social and economic development of the region
On approval of for the projects on development of industry, agriculture and services sector of Surkhandarya region for 2017-2018.	№ 182 of 5.04.2017	Resolution of the Cabinet of Ministers	2018	Social and economic development of the region
On the program of measures for the projects on development of industry, agriculture and services in Navoi region in 2017-2018.	№ 366 of 9.06.2017	Resolution of the Cabinet of Ministers	2018	Social and economic development of the region

On additional measures for further improvement of standard of livelihood in remote steppe regions of Navoi region	PP-2925 of 25.04.2017	Resolution of the President	constantly	Social and economic development of the region
On the program of measures for the integrated socio-economic development of the Nurata district of Navoi region	№ 157 of 25.03.2017	Resolution of the Cabinet of Ministers	2019	Social and economic development of the region
On approval of parameters for the projects on development of the industry, agriculture and services sector of Khorezm region for 2017-2018	№ 16 of 17.01.2017	Resolution of the Cabinet of Ministers	2018	Social and economic development of the region
On the program of measures for the integrated development of Bukhara region in 2017-2018	№ 287 of 15.05.2017	Resolution of the Cabinet of Ministers	2018	Social and economic development of the region
On approval of parameters for the projects on development of the industry, agriculture and services sector of Kashkadarya region for 2017-2018.	№ 183 of 05.04.2017	Resolution of the Cabinet of Ministers	2018	Social and economic development of the region
On the program of measures for the integrated development of Samarqand region in 2017-2018	№ 394 of 20.06.2017	Resolution of the Cabinet of Ministers	2018	Social and economic development of the region
On the program of measures for the integrated development of Ellikkal region of the Republic of Karakalpakstan in 2017-2018	№ 453 of 03.07.2017	Resolution of the Cabinet of Ministers	2018.	Social and economic development of the region
“Ensuring the implementation of initiatives and proposals of the President of the Republic of Uzbekistan, voiced at the Summit of Heads of State Founders of IFAS on August 24, 2018 in Turkmenistan”	№ 965-f of 16.11.2018	Resolution of the Cabinet of Ministers	2019-2021	Social and economic development of the region
On measures for the integrated socio-economic development of the Muynak district of the Republic of Karakalpakstan	№37 of 16.01.2019	Resolution of the Cabinet of Ministers	2019-2021	Social and economic development of the region
“On measures for cardinal improvement of the system of implementation of the State policy in the field of economic development”	UP of 12 .01.2019	Resolution of the President	2021	Socio-economic development of the country

On additional measures for the implementation of the program “Obod kishlok” in 2019	№ PP-4201 of 20.02.2019	Resolution of the President	2019	Socio-economic development of the country
On approval of the concept of development of nuclear energy in the Republic of Uzbekistan for the period 2019-2029	№ PP-4165 of 7.02. 2019	Resolution of the President	2029	Socio-economic development of the country
On measures to fundamentally improve the processes of urbanization	of 10.01.2019	Resolution of the President	2030	Socio-economic development of the country
About measures to increase the effectiveness of work to combat desertification and drought in the Republic of Uzbekistan	№ PP-4204 of 22.02.2019	Resolution of the President	2023	Roadmap for the period 2019-2023

Within the framework of this activity, the Center “Development Strategy” was established, the main activity of center is to implement the Strategy of Action in five priority areas of development of the Republic of Uzbekistan in 2017-2021. The center puts forward reasonable proposals for the effective implementation of the Strategy of Action, including the preparation of draft laws, regulations and other acts provided for by the state program, establishes cooperation with international organizations, research, information and analytical and educational institutions.

5. GENERAL INFORMATION ABOUT UZBEKISTAN

Uzbekistan is a double locked country and has no access to an ocean, that is, to get access to the ocean, it is necessary to cross the territory of two neighboring countries. It has an area of 448,840 square kilometers and lies between 37 ° and 46 ° north latitude, and 56 ° and 74 ° east longitude. Uzbekistan 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 north-west, Turkmenistan to the southwest, Kazakhstan to the north, and Tajikistan to the south-east and Kyrgyzstan to the north-east, Uzbekistan is not only one of the largest states in Central Asian but also the only Central Asian state to border all of the other four. Uzbekistan also shares a short border with Afghanistan to the south.



Fig. 5.1. Map of Uzbekistan

Uzbekistan is the most populous country in Central Asia. Its population is about 32.65 million people (2018), which is almost half of the total population of Central Asia. 50.6% of total population live in cities and 49.4% in rural areas. The population of Uzbekistan is very young: 35% are people younger than 14 years old. According to official sources, Uzbeks make up the majority (80%) of the total population. Other ethnic groups include 5.5% Russians, Tajiks 5.0%, Kazakhs 3%, Karakalpakhs 2.5%, Tatars 1.5%, about 1% ethnic Koreans and about 1.5% of other nationalities.

The Republic of Uzbekistan is administratively divided into the Republic of Karakalpakstan, 12 veloyats (regions), 159 tumans (rural areas), 119 large and medium-sized cities, 114 urban-type settlements and 1,472 villages. Large cities are Andijan, Bukhara, Samarkand, Namangan and Tashkent.

On 31 August 1991, the Parliament of the Republic of Uzbekistan declared the independence of Uzbekistan. After independence, the country chose a peaceful democratic policy with an open market economy and joined the international economic community as a full-fledged member. In the same month, Mr. Islam Karimov was elected as the first President of the new country by the new Parliament.

The Republic of Uzbekistan is a presidential constitutional Republic. The President of Uzbekistan is the head of state. Executive power is implemented by the Government. Legislative power - the Oliy Majlis of the Republic of Uzbekistan - consists of two Chambers - the Legislative Chamber (lower chamber) and the Senate (upper chamber). Judicial power is exercised on the basis of the Law of the Republic of Uzbekistan “On Courts”.

Most of the territory of Uzbekistan has a continental, dry (arid) climate, with a small amount of annual precipitation (200-300 mm). According to Uzhhydromet, the average high temperature in summer is usually about 40°C, while the average winter temperature is about -23°C. Less than 10% of the territory is suitable for crop production. This is mainly in river valleys and oases. The rest of the territory is a vast desert (Kyzylkum) and mountains.

Territory	448 900 km ² , the 55th largest country in the world
Population	32653.9 thousand people in January 2018, the average density - 72.7 people per km ²
National currency	Soum (the average rate for 2017 amounted to 4,210 soums for 1 USD) On 05.09.2017 there was a liberalization of the foreign exchange market. The exchange rate as of the end of December 2017 was 8120.07 soums per 1 USD.
Gross Domestic Product (GDP)	In 2017 amounted to 249 136.4 billion soums GDP structure: Agriculture - 17.3%, industry - 23.9%, construction - 6.1%, net taxes - 10.2%, other - 42.5%
Industry	Total amount - 144 185.3 billion soums (2017)
Agriculture	Total volume - 67 967.0 billion soums (2017), including: crop production - 46 890.6 billion soums (69%); Livestock - 21 067.4 billion soums (31%)
Leading branches of agriculture	Cotton, wheat, vegetables, fruits, grapes, melons, silkworm, Karakul, meat, eggs and milk
Leading exporting products and their share in exports of 2017	Cotton fiber (3.4%), energy (13.8%), services (25.2%), non-ferrous and ferrous metals (6.6%) machinery and equipment (2.6%), chemistry products (6, 4%), food (9.8%), other (11.8%)

Leading importing goods of 2017	Machinery and equipment (38.9%), energy carriers (5.7%), chemical products (16.5%), services (7.5%), non-ferrous and ferrous metals (9.8%), food products (9, 8%), others (11.8%)
Place in the global economy	5th place for cotton export, 7th place for cotton fiber production, 2nd place for Karakul production, 4th place for gold reserves, 7th place for gold mining, 7th place for uranium mining, 14th place in gas production
Source	Statistics Committee of the Republic of Uzbekistan

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