EU Programme on "Sustainable Management of Water Resources in Rural Areas of Uzbekistan"

Component 1: "National Policy Framework for Water Governance and Integrated Water Resources Management and supply part"

ASSESSMENT OF THE CURRENT SITUATION OF THE SHAKHRIKHANSAY IRRIGATION SYSTEM IN ANDIJAN REGION

Analytical Report

Tashkent 2018

Programme funded by the EUROPEAN UNION

germaniya hamkorligi DEUTSCHE ZUSAMMENARBEIT

Исполнитель:

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

IWMI International Water Management Institute

This publication was prepared with the support of the European Union and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in the framework of the Programme «Sustainable management of water resources in rural areas in Uzbekistan». Information and opinions expressed in this publication are the sole responsibility of the authors and do not reflect the official position or policy of the European Union or the GIZ.

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[1] The same organizations remain as members of the working group, but some employees may change due to leaving their position.

Acknowledgment

The authors are grateful to Dr. Caroline Milow, GIZ "Transboundary Water Management in Central Asia" Programme Director and Representatives of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH – Alexandr Nikolayenko, Paluaniyaz Pirniyazov, Muzaffar Ernazarov, Dr. Guzal Khodjaeva, Ziyoda Abdullayeva and Rakhat Ganiev for their support, comments and feedback throughout the development of this report. The authors also thank Petra Schmitter and Herath Manthrithilake (IWMI Researchers) for their contributions and feedbacks, which helped to improve the content of this report. The authors also gratefully acknowledge the help of Mirzakhayot Ibragimov in editing this report.

Finally, authors thank the Ministry of Water Resources of the Republic of Uzbekistan and the Narin-Karadarya Basin Irrigation System Authority (BISA) for assisting in the preparation of this report.

Published by

The European Union Programme
"Sustainable Management of Water Resources in Rural Areas of Uzbekistan"
Component 1: "National Policy Framework for Water Management and
Integrated Water Resources Management (IWRM)" implementeb by GIZ.

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ABBREVIATIONS

AS	Adaptive strategy
BISA	Basin Irrigation System Authority
COP	Coefficient of performance
DID	District Irrigation Divisions
EU	European Union
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
GRP	Gross regional product
GWL	Ground water level
HS	Hydro technical structure
SUE	State Unitary Enterprise
HPP	Hydro Power Plant
ISD	Irrigation System Department
ISM	Irrigation Systems Management
IWMI	International Water Management Institute
IWRM	Integrated Water Resources Management
MCA	Main Channel Administration
MCM	Main channel management
MMCO	Management of main channel operation
MWR	Ministry of Water Resources
O&M	Operation and maintenance
PS	Pumping station
PTN	Production and technical needs
PSM	Pumping station management
RE	Reclamation Expedition
SFC	South Fergana Canal
SWOT Analysis	Data processing technique based on determination of strengths and weaknesses of the analyzed object, as well as opportunities and threats

PREAMBLE

The responsibilities of the research team of the International Water Management Institute (IWMI) under the 1st Component "The National policy framework for water governance and Integrated Water Resources Management" of the Programme "Sustainable water management in rural areas in Uzbekistan" funded by the European Union, were to conduct a situational analysis for the Aksu river and Shakhrikhansay irrigation system basins in Uzbekistan to provide basic information and research on the development of river basin management plans.

«Situation analysis» is a popular term that is widely used to study management issues in different sectors, including business, health, education, natural resource management and the environment. Therefore, the definition of the term varies depending on the topic and scope of research.

Despite the differences, a method, consisting of evaluation, integration and interpretation, is common to each concept. This shapes the understanding of the current state of the river basin. It is important that situational analysis efforts lead to a better understanding of the processes and conditions occurring in river basins and the causes of one or another state of these basins. Thus, this analysis is the main tool that helps to plan further actions.

It must be recognized that the situational analysis is an important step taken to support the development of the basin plan. The scope of such analysis varies from information on the state of water resources, socio-economic conditions and institutional mechanisms in the basin to a detailed description of the issues included in the strategic actions presented in the last parts of the basin plan documents. Understanding the physical, technical and institutional problems of a particular river basin is crucial for defining appropriate goals and objectives, as well as developing activities that can help to address problems and needs fronting the river basin and a more extensive research area. The most important observation is that although the situation analysis for each basin plan is conducted and presented differently, there are some common features.

The literature review did not reveal any specific examples of the situational analysis of river basins in Uzbekistan. However, the previous technical report of the IWMI Office in Central Asia, which provides an overview of existing river basins in Uzbekistan, presents analysis and assessment of the situation in Andijan, Fergana, Namangan, Syrdarya, Kashkadarya, and Surkhandarya regions of Uzbekistan. Brief situational analyzes of pilot river basins were conducted in this study in order to identify the current conditions for the development and future implementation of basin management plans. Studies included key social and economic issues, including demography, geography, legislation, regional and local management, climatic and meteorological conditions, water infrastructure, water management and use (for irrigation and drinking purposes), land use, and environmental issues.

Recommended plan for the content of the situational analysis report of the Aksu river and Shakhrikhansay irrigation system basins was compiled based on the project objectives and the results of the literature review (see Annex 1).

Given that the situational analysis will be used as the basis for developing a river basin management plan, the plan should be comprehensive and provide both qualitative and quantitative information on the physical, environmental, political, social, and economic conditions in each basin.

INTRODUCTION

The report on “Assessing the current situation of the Shakhrikhansay irrigation system basin in Andijan region” was prepared under Component 1: “The National policy framework for water governance and Integrated Water Resources Management and supply part” implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH with financial support of the European Union.

The Fergana valley is located in the basin of the Karadarya River and the left bank of the Syrdarya River. The Ferghana Valley irrigation is a holistic irrigation system, ringed by the main canals feeding each other – the Big Fergana Canal (BFC), the Big Andijan Canal (BAC) and the Southern Fergana Canal (SFC), which are conventionally called the Fergana Irrigation System (FIS). Shakhrikhansay basin is considered one of the subsystems of FIS. Shakhrikhansay Irrigation system originates from the Andijan Water Reservoir and delivers water to 59,487 ha of irrigated land in Kurgantepa, Jalalkuduk, Khodjaabad, Bulakbashi, Asaka, Shakhrikhan and Markhamat districts of Andijan region, and 55,544 ha of irrigated land in Kuvasay city, Kuva, Altyaryk, Kushtepa, Tashlak and Fergana districts of Fergana region. During the water abundance years, the Shakhrikhansay River feeds the BFC from the end part, which increases water availability to 12,079 ha of irrigation land in the command zone of BFC. Initially, Shakhrikhansay was the small river which later on 1887 was transferred to irrigation system.

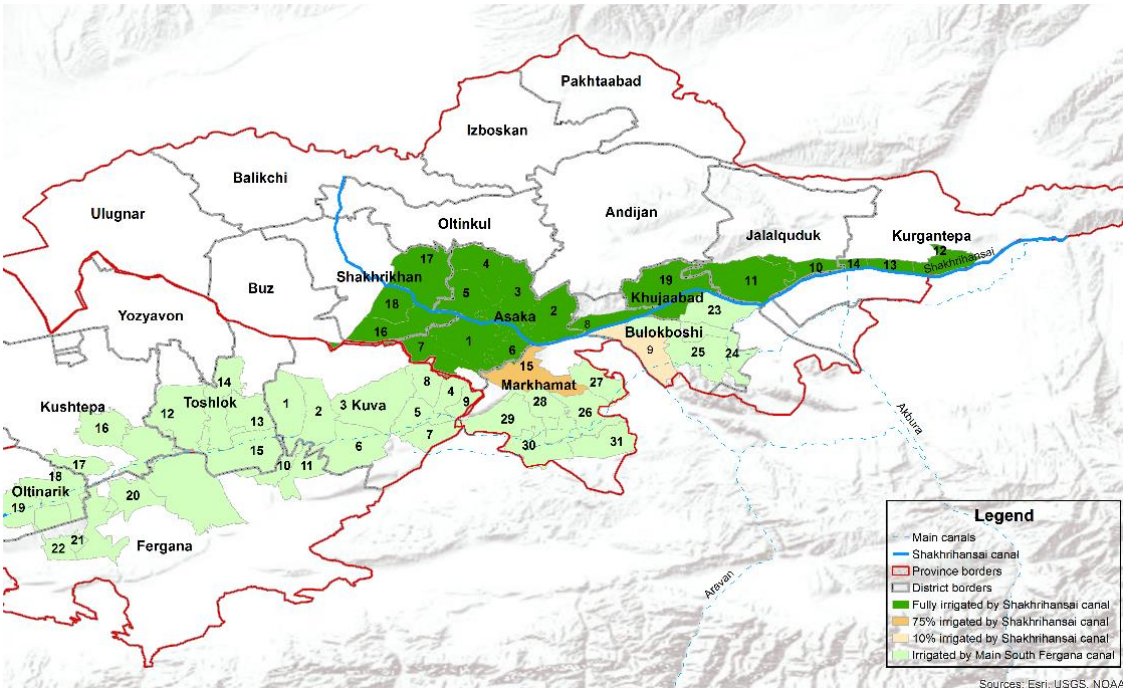

Figure 1. Map of the “Shakhrikhansay” Irrigation System Basin

SFC is considered to be one of the Shakhrikhansay diversions and is transboundary river providing water for 3,049 ha of irrigated land in Andijan region, 5,929 ha of irrigated land in the Kyrgyz Republic and 55,544 ha of irrigated land in Fergana region.

Considering that the project on “Sustainable water resources management in rural areas of the Republic of Uzbekistan” is a national project and it was initially agreed to choose the upstream part of Shakhrikhansay for the basin planning, this report analyzes the current situation of the basin only within the Andijan region, the upstream part of Shakhrikhansay, without taking into account the command zone of SFC in the Fergana region. It should be noted that the management of the Shakhrikhansay main canal is up to 374 + 10 station and SFC is carried out by the Operational Management Department (OMD) of the SFC within the Unified Dispatch Office of the management of the main canals of the Fergana Valley.

Table 1. Permissible area of the basin of the Shakhrikhansay irrigation system

Districts	Total irrigated area, ha	Percentage of area irrigated from the Shakhrikhansai canal, %
Kurgantepa	27308	7,1
Jalalkuduk	23297	23,1
Khojaabad	11565	40,4
Bulakbashi	12460	74,2
Asaka	16218	92,2
Shakhrikhan	21277	40,3
Markhamat	187534	7,9

The operation of FIS involves the Naryn-Karadarya and the Syrdarya-Sokh Basin Irrigation System Administrations (BISA), the Department of main canals of the Fergana Valley, which includes OMD BFC, OMD BAK and OMD SFC, OMD of Andijan Reservoir, and the Pumping Station Managment (PSM) Departments of Andijan and Fergana regions. Operation of the "Shakhrikhansay" Subsystem involves the OMD SFC, the "Shakhrikhansay" and "Isfayram-Shakhimardan" Irrigation System Departments (ISD). As part of the "IWRM – Fergana" project, the upper section of Shakhrikhansay (up to station 374+10) was transferred to the OMD SFC.

Shakhrikhansay canal is the oldest major canal on left bank of Karadarya system. It is located on the territory of Andijan region, Fergana valley. Initially, it was built to transfer part of the water flow from the Karadarya River to the Aravansay River.

Construction of the canal was carried out in the period from 1882 to 1888. Operation was started in 1888. Initially, the canal was in the earthen engineering canal. In the process of operation, the costs increased, the canal became wandering (meandering), and canal moved to the canyon (old flood riverbed) due to the subsidence of loess soils. In some places it reachев up to 600 m wide and up to 20 m deep.

A comprehensive approach was used in this situation analysis to assess the conditions of all processes and features in the basin of the Shakhrikhansay irrigation system. This broad approach provides an overview of the state of the basin, identifies previously unknown problems in the basin and identifies linkages between different problems and challenges.

It combines a variety of tools and methods of assessment/research, key information interviews, site observations, in order to gain a broad understanding of the problems, needs, programs and gaps in the river basin. Both quantitative and qualitative data and information have been collected and analyzed to develop effective action plans. The aim of the analysis is to get a deep understanding of the technical, cultural, political, legislative, physical and socio-economic factors affecting the management of the basin of the Shakhrikhansay irrigation system.

The research included the study of the legislative framework in water resources management; national programs and strategies for the development of pilot basins; water resources; natural conditions; socio-economic situation, including demography; the current state of water management.

Finally, the analysis has been carried out to identify the strengths and weaknesses of existing water management mechanisms, as well as the opportunities and risks (SWOT analysis) existing in the basin in order to effectively support the development of the basin management plan.

THE LEGISLATIVE FRAMEWORK OF WATER RESOURCES MANAGEMENT (RIVER BASIN PLANNING)

a. Legislation of the Republic of Uzbekistan on water resources management (with emphasis on the application of the basin planning approach)

Water resources management and water relations in the Republic of Uzbekistan are regulated by:

1. The law of the Republic of Uzbekistan No. 837-XII «On water and water use» of May 6, 1993. It ensures rational use of water for the needs of the population and economy sectors, protection of water from pollution, contamination and depletion, prevention and elimination of harmful effects of water, improvement of water bodies, as well as protection of the rights and legitimate interests of enterprises, institutions, organizations, farms, dekhkan farms and citizens in the field of water relations.

2. The law of the Republic of Uzbekistan No. 662-II «On farming» of May 6, 2004. It regulates relations in the creation, operation, reorganization and liquidation of farms.

3. The law of the Republic of Uzbekistan No. 604-I "On dekhkan farms" of April 30, 1998, defining the legal basis for creating, operating and liquidating dekhkan farms, regulating their rights and obligations and regulating relations with other legal entities and individuals.

4. The regulation on water protection zones and other water reservoirs, rivers, main canals and collectors, as well as sources of drinking and domestic water supply, medical, culture and health purposes in the Republic of Uzbekistan, approved by the Resolution of the Cabinet of Ministers No. 174 of April 7, 1992. It defines the procedure for determination of the protective zones of water bodies and sanitary zones of water facilities, as well as establishes the procedure for economic activities to prevent pollution of water resources.

5. The regulation on the procedure for the development and maintenance of the State water cadaster of the Republic of Uzbekistan, approved by the Cabinet of Ministers' Resolution No. 11 of 7 January 1998. It determines the order of comprehensive study and assessment of natural water resources, their use based on quantitative and qualitative indicators, registration of the right on water use and the regimes of its economic use.

6. The regulation on the procedure for water use and water consumption in the Republic of Uzbekistan, approved by the Resolution of the Cabinet of Ministers No. 82 of March 19, 2013. It defines the procedure for water use and water consumption, water intake and water metering.

7. The regulation on the procedure for issuing permits for special water use or water consumption, approved by the Resolution of the Cabinet of Ministers No. 171 of June 14, 2013. It establishes the procedure for issuing permits for special water use or water consumption when using surface and groundwater in the Republic of Uzbekistan.

8. The regulation on the procedure of state environmental control, approved by the Resolution of the Cabinet of Ministers No. 216 of August 5, 2014. It defines the procedure for state environmental control, as well as the legal framework for the activities of state bodies implementing this type of environmental control.

9. The regulation on the procedure for issuing permits for water drilling, approved by the Resolution of the Cabinet of Ministers No. 430 of June 27, 2017. It defines the procedure for issuing a hydrogeological certification, permitting requirements and conditions and procedures for issuing permits for water drilling, as well as registration or liquidation of production water wells drilled without permission.

10. The regulation on the state monitoring of groundwater, approved by the Resolution of the Cabinet of Ministers No. 430 of June 27, 2017, which defines the goal, main tasks, facilities and procedures for conducting state monitoring of groundwater in the Republic of Uzbekistan.

11. The Regulation on the work procedures on clearing riverbeds and strengthening their banks approved by the Resolution of the Cabinet of Ministers No. 1009 of December 21, 2017. It defines the procedures of work on clearing river canals, sai, streams, and strengthening their banks.

12. The Decree of the President of the Republic of Uzbekistan No. UP 5418 of April 17, 2018, "On measures for the radical improvement of the state system on agriculture and water management", defining the main tasks and activities of the Ministry of Water Resources.

13. Hydraulic structures safety regulations approved by the Order No. 342 of the Minister of Emergency Situations of June 7, 2018. They establish requirements for the safe use of hydraulic structures, their electrical support, communication, alarm and lighting systems, as well as the organization of their control and monitoring.

Specially authorized bodies of state administration in the field of water use are the Ministry of Water Resources of the Republic of Uzbekistan (on surface water), the State Committee of the Republic of Uzbekistan on Geology and Mineral Resources (on groundwater) and the State Inspectorate for Supervision of Geological Study of the Subsoil, the Safe Conduct of Work in the Industry, Mining and Household sectors under the Cabinet of Ministers of the Republic of Uzbekistan (on thermal and mineral waters), which operate within their competency (Article 8 of the Law № 837-XII "On water and water use").

State control over the use and protection of waters is carried out by the local government bodies, the State Committee of the Republic of Uzbekistan for Ecology and Environmental Protection, the State Inspectorate for Supervision of Geological Study of the Subsoil, the Safe Conduct of Work in the Industry, Mining and Household sectors under the Cabinet of Ministers Of the Republic of Uzbekistan, the Ministry of Health of the Republic of Uzbekistan, the Ministry of Water Resources of the Republic of Uzbekistan in the manner prescribed by the legislation. Departmental control over the use of waters is carried out by the bodies of the State Committee of the Republic of Uzbekistan on geology and mineral resources (Article 9 of Law No. 837-XII).

Regarding the targeted use, water consumption is divided into drinking, household, medical, resort, recreational, fisheries, industrial, energy, agricultural and other consumption. Depending on the amount of water taken from a water body, water consumption is subdivided into general and special water consumption. General water consumption is individual water consumption to meet personal drinking, household, recreational, and medical needs, including watering animals and other needs, without the use of special facilities and devices that affect the state of water and water bodies.

Special water consumption is water consumption carried out by legal entities and individuals using special facilities and devices that affect the state of water and water bodies. In some cases, water consumption without the use of special facilities and devices can also be attributed to special water consumption, but it has an impact on the state of water and water bodies. Water resources are provided for consumption in accordance with the requirements and conditions provided by Law (Article 21^2 of the Law No. 837-XII).

Water bodies are provided for use primarily to meet the drinking and household needs of the population (Article 25 of Law No. 837-XII).

[2] Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 82 of March 19, 2013. More information: https://www.norma.uz/deyatelnost_otdelnyh_otrasley/ob_utverjdenii_polojeniya_o_poryadke_vodopolzovaniya_i_vodopotrebleniya_v_respublike_uzbekistan

Water bodies shall be provided for separate use in whole or in part by the Cabinet of Ministers of the Republic of Uzbekistan or other authorized state body in accordance with the procedure established by the legislation. Water bodies are provided for separate use with the obligatory registration of a permit for special water use or water consumption (Article 26 of Law No. 837-XII).

Permission for special water use or water consumption through intake from natural water bodies is issued by the following authorities: Ecology and Environmental Protection Authorities, in coordination with the Ministries of Water Resources — on surface water bodies; Geology and Mineral Resources Authorities — on groundwater; State Inspectorate for Supervision of Geological Study of the Subsoil, the Safe Conduct of Work in the Industry, Mining and Household sectors — on mineral and thermal waters.

Permission for special water use or water consumption from artificial water bodies is issued by:

- The Ministry of Water Resources of the Republic of Uzbekistan- for basin management of irrigation systems, management of main canals (systems), management of reservoir operation, organizations operating trans-boundary water bodies, water bodies of inter-regional importance, large and especially important water facilities, pumping stations (PS), energy and communication facilities, land reclamation expeditions, as well as other water users and water consumers — using water from water bodies of national or inter-regional importance;

- Basin management of irrigation systems- for District Irrigation Departments, as well as other water users and water consumers — using water from water bodies of regional or inter-district importance;

- District Irrigation Departments, water consumer associations, as well as other water users and water consumers — using water from water bodies of district importance;

- Water Consumer Associations - for farmer households and dekhkan farms, self-government bodies of citizens and other water consumers located in the area of their service — using water from water bodies for agricultural needs in coordination with the District Department of Agriculture (Article 27 of Law No. 837-XII).

In accordance with the legislation of the Republic of Uzbekistan, water use can be planned for river basins, basin irrigation systems and economic regions. Thus, the provision of Article 108 of Law No. 837-XII allows to plan water use with consideration of the data of the State Water Cadaster, water management balances, schemes for the integrated use and protection of water. The water balances are compiled based on the data on river basins, basin irrigation systems and economic regions (Article 27 of Law No. 837-XII) to assess the availability and extent of water use.

General and basin (territorial) schemes for the integrated use and protection of waters 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 (Article 111 of Law No. 837-XII).

b. National water obligations on water allocation in the Shakhrikhansay Basin

Water allocation in the Shakhrikhansay basin is carried out in accordance with the "Regulations on the procedure for water use and water consumption in the Republic of Uzbekistan"[3] , the system water use plan and the protocol decision of 10 April 1980 on the inter-republican distribution of small rivers of the Fergana Valley approved by the Deputy Minister of Land Reclamation and Water Management of the USSR, Borodavchenko I.I.

To conclude this chapter, the following points can be listed:

- A review of the legislative framework for the water resources management in the Republic of Uzbekistan shows that the above-mentioned laws and regulations promote and provide the opportunity to implement the basin planning in Uzbekistan.

- The country's legislation has elements of IWRM and basin planning, but there are no specific rules and regulations for the preparation of basin planning.

- In Uzbekistan, water resources management at the regional level is carried out on the basis of the hydrographic principle and is regulated by basin irrigation systems (Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 320 of July 21, 2003, "On Improving the Organization of Water Management"). However, it is important to note that at the district level water resources management is carried out based on the administrative-territorial principle (Resolution of the Republic of Uzbekistan No. PP-3172 of August 4, 2017, "On measures for further improvement of the organization of activities of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan").

[3] Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 82 of March 19, 2013. More information: https://www.norma.uz/deyatelnost_otdelnyh_otrasley/ob_utverjdenii_polojeniya_o_poryadke_vodopolzovaniya_i_vodopotrebleniya_v_respublike_uzbekistan

NATIONAL PROGRAMS AND DEVELOPMENT STRATEGIES RELEVANT TO THE TERRITORY OF THE SHAKHRIKHANSAY BASIN

a. On agricultural development (including the provision of subsidies for agricultural development)

A number of documents that improve the financial and economic conditions, increase profitability and encourage farmers to increase productivity were adopted in 2018. In accordance with the Decree of the President of the Republic of Uzbekistan No. PP-3574 of February 28, 2018 “On measures to fundamentally improve the system of financing the production of raw cotton and cereals” it was established that the final payments for raw cotton and cereals will be carried out fully by the end of harvest year. It has been established that the cost of electricity consumed by pumping units of farmer households and water users associations shall be covered by subsidies from the State budget.

The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 149 of February 28, 2018 «On measures for the widespread introduction of market mechanisms in agriculture» defines:

- State-guaranteed prices for the purchase of raw cotton and cereals in the context of varieties and classes;

- Approved guaranteed volume of distribution of credit resources by regions, months and types of costs allocated for financing the costs of raw cotton and cereal crops growing in 2018 for public procurement;

- Newly approved “Regulation on the procedure for crediting the costs of growing and carrying out final settlements for raw cotton and cereals”.

In accordance with the above-mentioned resolution, credit lines are provided by regional branches of commercial banks based on applications of lenders, contracts and guaranteed volume of credit resources, approved by Khokim (governors) of the relevant district together with the heads of agricultural producers and the district farmer councils, dekhkan farms and owners of land plots in Uzbekistan. The raw cotton and cereal crops production on the basis of agro-technical measures (cards) are considered taking into account the cost of seeds, supplied by the procurement organization in advance of up to 60 percent (projected) value of the future yields. Payments from loan accounts for the purposes specified above shall be made in non-cash form (except for wages) based on payment orders of the lenders.

LLC “Tomorka Khizmati” was established in all rural areas of the republic in accordance with the Resolution of the President of the Republic of Uzbekistan No. PP-3680 of April 26, 2018. The main tasks are to provide practical assistance to farmers, dekhkan farms and owners of household lands in growing and selling crops by:

- Delivery of the necessary material resources, including seeds, seedlings, containers, equipment and other means to farmers, dekhkan farms and owners of household lands on a contractual basis;

- Land reclamation and crop sowing;

- Creation and improvement of the water irrigation system, installation of water pumps, drilling of artesian wells and organization of drip irrigation;

- Marketing of manufactured products and crops in the domestic and foreign markets, including their harvesting, storage, processing, and export

The Fund to support farmers, dekhkan farms and owners of homestead lands under the Council of homestead lands, dekhkan farms and owners of homestead lands of Uzbekistan with the status of a legal entity was established. Fund funds are used for:

- allocation of resources to the Microcredit bank, the Agro bank and the People's Bank of the Republic of Uzbekistan for the provision of loans for farmers, dekhkan farms and owners of homestead lands for a period of 3 years, including a grace period of up to 1 year, with an interest rate of 7 percent per annum, taking into account the margin of the bank in the amount of 2 percent;

- provision of loans through commercial banks at the refinancing rate of the Central Bank of the Republic of Uzbekistan, taking into account the bank's margin of 2 percent, to LLC "Tomorka Khizmati" and other manufacturing, processing, procurement, delivery, trade organizations in the field of agricultural production, as well as leasing organizations to strengthen their financially - technical base, to purchase agricultural machinery and vehicles, materials and components for the installation of greenhouses for farmer households, dekhkan farms and owners of homestead lands;

- maintenance and logistical support of the Fund's activities;

- formation of authorized funds of LLC «Tomorka Khizmati», which need a working capital, in the amount of not less than 25 percent of the authorized Fund;

- other areas related to the attraction of investments for farmer households, dekhkan farms and the development of homestead land, as well as the implementation of innovative projects

In 2018, the volume of additional supplies of agricultural equipment in Andijan region reached 278 units, and the volume of deliveries of agricultural machinery on a leasing basis - 197 units within the measures to further improve the technical capacity in agricultural sector due to the renewal and modernization of the agricultural machinery fleet, ensuring the timely and high-quality execution of agricultural works defined by the Decree of the President of the Republic of Uzbekistan No. PP-3712 of May 10, 2018.

b. On industrial development

The Resolution of the Cabinet of Ministers No. 53 of January 25, 2018 provides for the establishment of cotton-textile productions of "Khantex Group" LLC and "Khantex Agro Servis" LLC in the territory of the Kurgantepa district and "Digital Prime Textile" LLC in the territory of the Balikchin district, and organization of cotton-textile production on the basis of the direct contracting for the cultivation and supply of raw cotton between the enterprises of the textile industry and farms.

c. Strategies and plans for the development of water resources management (state and local levels)

Based on the forecast parameters for the construction and reconstruction of irrigation facilities financed by centralized investments from the State Budget of the Republic of Uzbekistan for the period 2018–2019, approved by the Decree of the President of the Republic of Uzbekistan № PP-3405 of November 27, 2017, the following facilities in the Shakhrikhansay zone were included into the State Program:

- reconstruction of 1.8 km of chute irrigation networks ("Tukhtasin mevasi" and "Zamirabonu sakhovati") on the territory of "S. Kosimov chashmasi" WCA in the Bulakbashi district;

- reconstruction of 2.0 km of chute irrigation networks ("Fayziobod", "Navoi", "Navruz" and "P-4-2" on the territory of "Madamin polvon davomchilari" and "Lutfullo Bakhromov" WCAs, Askin district.

In accordance with a set of measures to ensure the growth and reassessment of fresh groundwater reserves and their rational use, aimed at improving the drinking water supply system for the population of the Fergana Valley for 2017-2022 and approved by the Cabinet of Ministers' Resolution №779 of September 30, 2017, the following activities are envisaged in the Shakhrikhansay basin:

- assessment work on groundwater in the quaternary sediments in selected areas of the Osh-Aravan and Andijan-Shakhrikhan fields to substantiate the drinking water supply in Yorkishlak, Oyim and Urta-Shakhrikhan urban villages of Andijan region - groundwater reserves are expected to increase up to 11.3 thousand m^3 / day;

- reassessment of operational reserves at the existing group water intakes (Kuyganyar, Pakhtaabad, Ulugnar, Boz, Okhchi, Khodjaabad and Karasuv), as well as the assessment of groundwater operational reserves in the areas of the existing group water intakes (Chinabad, Bulakbashi and Jalalkuduk) within Osh-Aravan, Andijan-Shakhrikhan, Maylisuysk and Karaungursk fields to justify the sources of drinking water for settlements - it is expected to increase groundwater reserves up to 30.0 thousand m^3 / day;

- hydrogeological studies in order to justify the possibility of using various types of drainage for water reduction in the territories of Boz, Altynkul, Izbaskan, Djalalkuduk district centers and the western part of Andijan city, Andijan region;

- elimination of abandoned, uncontrolled wells and wells drilled with violations of technology requirements in Andijan region.

In accordance with the summary parameters for the construction and reconstruction of production and observation wells in Fergana Valley in 2017-2022, approved by the Cabinet of Ministers' Resolution No. 779 of September 30, 2017, the following works are planned to be carried out in the Shakhrikhansay basin (see Table 2) .

Name of districts	Operational wells, pcs.						Observation wells (2018-2022)	
	Totally	2017	2018	2019	2020	2021	quantity (piece)	linear m / million soums
Asaka	10	4	1	-	4	1	5	400 / 128,0
Bulakbashi	12	3	3	3	2	1	-	-
Jalalkuduk	15	3	4	5	1	2	-	-
Markhamat	5	1	1	-	2	1	-	-
Khodjabad	12	5	2	3	2	-	2	160 / 51,2
Shakhrikhan	46	32	3	3	8	-	-	-
Kurgantepa	14	2	6	3	2	1	-	-

Table 2. Parameters for construction sites and reconstruction of operational and observation wells in Fergana Valley

In accordance with the targeted program on construction and reconstruction of the drinking water supply system of Andijan region for 2017-2021, approved by Presidential Decree No. PP-2910 of April 20, 2017, the following works are planned to be carried out in the Shakhrikhansay basin (see Table 3).

Name of districts	Water supply network, km	Wells, pieces	Water towers, pcs.	Reservoirs, pieces	Chlorinators, pcs.	Fence, linear m
Asaka	34,3	10	3	1		400
Bulakbasha	51,0	12	10			
Jalalkuduk	71,0	15	11			950
Markhamat	34,7	5	2			
Khodjabad	38,0	12	7	1	2,0	680
Shakhrikhan	177,0	46	46			
Kurgantepa	47,0	14	11			100

Table 3. Program of construction and reconstruction of drinking water supply system of Andijan region for 2017-2021

The second line of the main water pipeline "Khanabad-Andijan" (in Kurgantepa, Jalalkuduk, Andijan, Asaka, Altynkul, Balykchy, Shakhrikhan and Boz districts) of Andijan region, with a capacity of 286.0 thousand m^3 / day will be constructed with the participation of the World Bank (2020-2023).

In accordance with the Environmental Monitoring Program in the Republic of Uzbekistan for 2016-2020, approved by the Resolution of the Cabinet of Ministers No. 273 of August 23, 2016, the following ctivities will be conducted in the Shakhrikhansay basin:

- monitoring the water quality of the Karadarya River and the Shakhrikhansay Canal, Asaka discharge point, Markhamat discharge point, and Kashkardak, Markhamat and Abdusamat collectors;

- monitoring of soil pollution sources in the areas of Zaurak landfill for the disposal of pesticides in Zaurak village of Khodzhaabad district;

- monitoring of sources of soil contamination in areas of storage of solid domestic waste (Asaka and Markhamat garbage dumps).

According to the forecasted parameters for the production of organic fertilizers at solid domestic waste landfills for 2017-2021, approved by the Decree of the President of the Republic of Uzbekistan No. PP-2916 of April 21, 2017, the "Toza Khudud" State Unitary Enterprise (SUE) produces organic fertilizers in the Aksu basin in Kashkadarya region (see Table 4).

Name of districts (location of landfiilds)	Year of est-ablishment	Area (ha)	Volume of accumulated waste, (t)	Production of organic fertilizers* (t), including by year:				
				2017	2018	2019	2020	2021
Asaka	1989 r.	6,0	86520	865	1038	1125	211	1298
Kurgantepa	1982 r.	3,5	1080	11	13	14	15	16
Khodjabad	1986 r.	3,0	58520	585	702	761	819	878
Bulakbasha	1996 r.	2,0	42320	423	508	550	592	635
Jalalkuduk	1986 r.	2,0	1160	12	14	15	16	17
Markhamat	1976 r.	2,0	171320	1713	2056	2227	2398	2570
Shakhrikhan	1990 r.	3,0	62640	626	752	814	877	940

Table 4. Forecast parameters for the production of organic fertilizers in solid waste landfills for 2017-2021

It is planned to build 97 wells in Andijan region in accordance with the parameters for expanding the network of observation points for groundwater monitoring for 2018–2021, approved by the Presidential Decree No. PP-2954 of May 4, 2017.

Name of the object of observation	Number of observation wells on 01/01/2018 (assessment)	2018		2019		2020		2021	
		number of wells (units)	drilling (l. m)	number of wells (units)	drilling (l. m)	number of wells (units)	drilling (l. m)	number of wells (units)	drilling (l. m)
Totally	53	4	1200	40	1230	25	975	28	780
Groundwater deposits	43	4	1200	30	1130	20	815	26	740
Sources of pollution	8	-	-	-	-	4	100	1	20
Waterworks, rivers, canals	2			10	100	1	60	1	20

Table 5. Parameters for expanding the network of observation points for monitoring groundwater for 2018–2021

In accordance with the list of investment projects for the construction of new and modernization of existing hydroelectric power stations of "Uzbekgidroenergo" JSC on the natural watercourses and water management facilities of the republic, approved by the Decree of the President of the Republic of Uzbekistan No. PP-2947 of May 2, 2017, the following activity will be carried out:

- Modernization of "Kaskad Shakhrikhan" Hydro Power Plant (SFC-1) branch in Asaka district of Andijan region - increase of hydro power plant capacity up to 2.2 MW;

- Modernization of «Kaskad of Shakhrikhan" HPP (SFC-2) branch (Phase 2) in Asaka district of Andijan region – increase of HPP capacity up to 7.0 MW;

- Modernization of "Andijan" HPP-1 at the Andijan Reservoir Basin in Khanabad city, Andijan region - capacity is 140 MW

In accordance with the Decree of the President of the Republic of Uzbekistan No. PP-2947 of May 2, 2017, "On the program of measures for the further development of hydropower production for 2017–2021", the list of promising investment projects of "Uzbekgidroenergo" JSC for the construction of new and modernization of existing hydroelectric power plants on natural waterways and water facilities of the republic includes the following activities:

- Modernization of "Kaskad Shakhrikhan" Hydro Power Plant (HPP-5A) branch in Asaka district of the Andijan region - increase of HPP capacity up to 12.0 MW

- Modernization of "Kaskad Shakhrikhan" Hydro Power Plant (HPP-6A) branch in Asaka district, Andijan region —increase of HPP capacity up to 8.2 MW

In conclusion of this session, there are the list of the following points that are relevant to the territory of the Shakhrihansay basin:

- In 2018, a number of documents were adopted and organizational structures were created that improve the financial and economic condition, increase profitability and stimulate farmers to increase productivity;

- The State has adopted a number of programs in the basin area of the Shahrikhansay Irrigation System aimed at the construction and reconstruction of irrigation facilities, construction and reconstruction of drinking water supply facilities, modernization of existing hydroelectric power plants of “Uzbekgidroenergo” JSC on natural watercourses and water facilities, as well as the adoption of promising programs for the further development of hydropower for 2017-2021, financed by centralized investments from the State budget of the Republic of Uzbekistan.

WATER RESOURCES IN THE SHAKHRIKHANSAY IRRIGATION SYSTEM

a. Hydrology

The «Shakhrihansay» Irrigation System is located in Andijan region. The length of the canal is 120 km. The main source of water for the "Shakhrihansay" Basin Irrigation System is the glacial- snow-fed Karadarya River. Minimum costs are observed from December to March, more often in February. During the flood period, up to 70-75% of the annual flow for the low-flow period (November-February) is 25-30% of the annual flow.

The maximum observed flow rate in May is 1110 m3/s, the minimum observed in January is 25 m^3/s. The average annual flow of the Karadarya River is 3.783 million m3. The average annual flow of the Karadarya River is 3.783 million m^3. Estimated consumption:

- 0,01% water supply – 2194 m3/s;
- 0,1% - 1664 m3/s;
- 1% - 1307 m3/s;
- 5 % water supply – 1030 m^3/s.

The Karadarya River flow is regulated by the Andijan Reservoir of long-term regulation with a volume of 1.9 million m3. The Akbrasay and Aravansay Rivers flow into the Shakhrikhansay, the largest annual flow is in July - September period (40-60% of the annual flow). At this time, the rivers are fed mainly as a result of melting snow and glaciers. From March to June, these rivers receive a minimum flow – 20-30% of the annual flow, but not more than 40%.

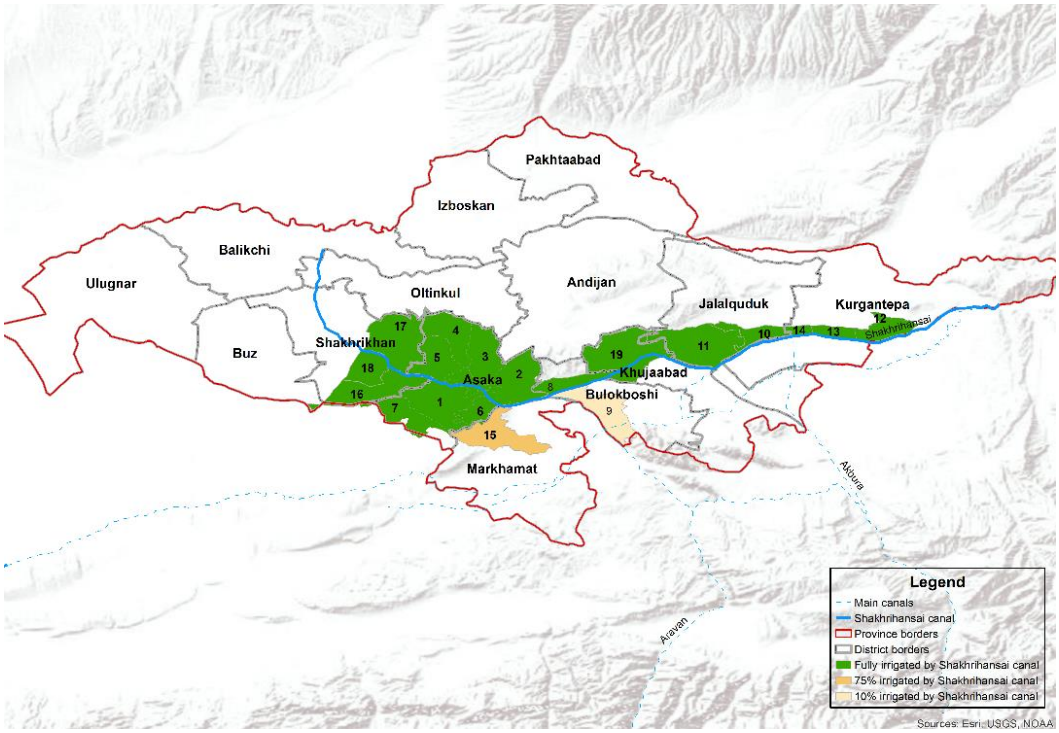

Figure 2. Map of WCAs operating in the Shakhrikhansay Irrigation System basin in Andijan region (province)

The average water consumption at the head part of the Shakhrikhansay canal is 190.0 m^3/s, in the spring period the maximum water consumption reaches 240.0 m^3/s, and during the low-water seasons the minimum water consumption in canal is up to 40.0 m^3/s. Taking into account the fact that the

Shakhrikhansay canal is very long, it is managed by two organizations: 1)the South Fergana Main Canal (SFC) starting from the upper part of the river (Andijan Reservoir), namely from CP (station) 0 to CP 374 + 10; 2) in the area from CP 374 + 10 to CP 1082 + 85, it is managed by the Basin Administration of the Naryn-Karadarya irrigation systems..

b. Groundwater Analysis

Groundwater can be traced everywhere and lies at a depth of 0.5 to 25 m. They are fed by water loss from irrigation and water infiltration from inter-farm irrigation systems. Aquiferous rocks are mainly pebbles. Waters - fresh with mineralization up to 1 g/l, non-aggressive to concrete and reinforced concrete structures.
Distribution of areas with groundwater salinity is shown in Figure 3.

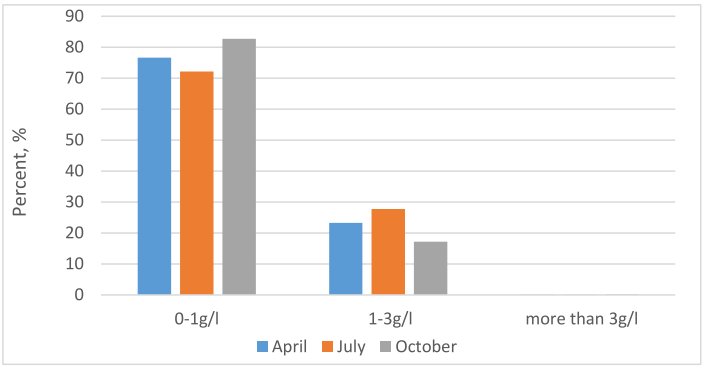

Figure 3. Distribution of areas by groundwater salinity in the Shakhrikhansay Basin for 2017, %

Groundwater is formed in sediments of all ages and is ubiquitous.
Groundwater quality in Andijan region is suitable for use in agriculture and for drinking purposes. Groundwater is mainly used for domestic drinking water supply and industrial water supply. Osh-Aravan, Andijan-Shakhrikhan underground water deposits are the most intensively exploited. The value of the coefficient of use of approved operating reserves of groundwater is 0.35-0.43. The results of the analysis of water samples, performed by the central analytical laboratory of the SUE “Suvokrva” of Andijan region, show that groundwater in all indicators and components meet the standards of Uzbekistan, № 950: 2011: «Drinking water». The results of water analyzes are given in Table 6.

c. Water quality

The main source of water in Shakhrikhan district is the Karadarya River. The salinity of the Shakhrikhansay Canal water ranges from 0.20 g/l to 0.68 g/l. In 2017, a decrease in water mineralization of Shakhrikhansay Canal was detected (Figure 4).

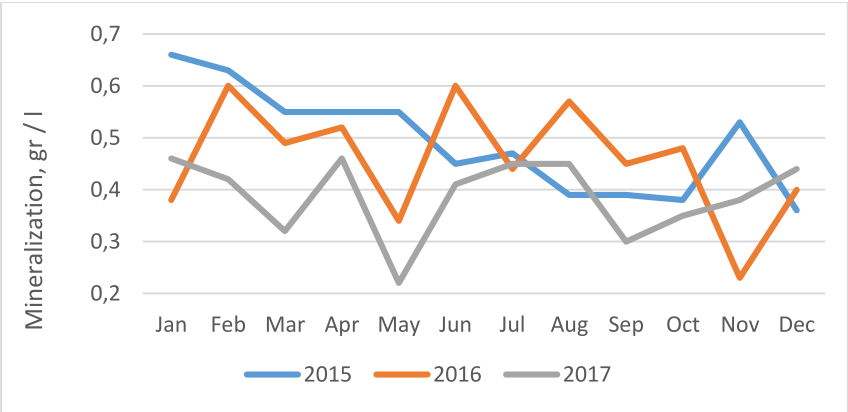

Figure 4. Dynamics of changes in water mineralization in the Shakhrikhansay Canal

Table 6. Indicators of drinking water quality in Andijan region

Monitoring the quality of drinking water in water intake areas, before entering the network and in the distribution network of settlements																			
№	Sampling point	Temperature ^0C	Taste in points	Smell in points	Color in degrees	Oxidizability	Muddiness	Alkalinity mg / dm^3	Overall hardness of water, mg / lm^3	Nitrites mg / dm^3	Nitrates mg / dm^3	pH	Dry residue mg / dm^3	Dry residue mg / dm^3	Ions Ca mg/dm^3	Ions Mg mg/dm^3	Sulphates mg/dm^3	Coliform index	Total microbial count
1	Khartum causeway	19	0	0	0	0,56	absent	2,6	3,3	absent	4,1	8,0	234	19,6	2,1	1,05	56,1	<3	22
2	Pakhtakor -Kharabek	20	0	0	0	0,72	absent	2,5	3,25	absent	4,12	7,9	237	23,5	2,15	1,1	54,1	<3	21
3	Kharabek Reservoir	18	0	0	0	0,56	absent	2,5	3,15	absent	4,3	7,93	231	21,6	2,1	1,1	52,4	<3	21
4	Khanabad - Kharabek	19	0	0	0	0,64	absent	2,6	3,2	absent	4,2	7,95	239	19,6	2,0	1,1	56,7	<3	24
5	Kharabek - Khartum	19	0	0	0	0,56	absent	2,6	3,1	absent	4,5	7,98	235	21,5	2,05	1,1	51,7	<3	23
6	Distribution network	19	0	0	0	0,56	absent	2,5	3,2	absent	4,3	7,95	232	19,6	2,2	1,1	50,9	<3	25
7	Ulugnar district, "Turttol" Citizens' Self-Government	20	0	0	0	1,6	absent	2,1	6,8	absent	8,4	7,7	240	49,0	3,8	1,9	44,2	<3	21
8	Shakhrikhan district, "Yangi zamon" Citizens' self-government body	22	0	0	0	0,72	absent	4,0	8,9	absent	9,3	7,85	320	29,4	3,2	0,8	88	<3	22
9	Markhamat district, "Oiydamozor" Citizens' self-government body	20	0	0	0	0,64	absent	1,6	2,08	absent	2,1	7,98	90	33,2	3,2	1,3	34,3	<3	27
10	Markhamat district, "Toshyuli" Citizens' self-government body	19	0	0	0	0,72	absent	4,5	17,4	absent	6,5	7,95	342	41,6	3,6	1,5	71,9	<3	24
11	Balikchinsky district, “Urmonbek” Citizens' self-	19	0	0	0	0,61	absent	2,0	2,3	absent	3,1	8,02	190	17,64	13,5	4,0	127	<3	25
12	Andijan district, “Dustlik” Citizens' self-government body	19	0	0	0	0,8	absent	2,8	9,6	absent	12,4	7,9	390	23,52	7,1	2,0	98	<3	26
13	Shakhrikhan district, “Bobochek” Citizens' self-	18	0	0	0	0,96	absent	2,4	7,1	absent	8,4	7,81	280	35,5	10,3	3,0	71,4	<3	21
14	Asaka district, J. Manguberdi st.	17	0	0	0	1,04	absent	2,0	5,4	absent	5,2	7,75	185	35,5	1,7	0,9	51,7	<3	29

NATURAL CONDITIONS IN THE SHAKHRIKHANSAY BASIN

a. Geology and morphology

The Shakhrikhansay Canal is located within the eastern part in the low mountain zone of the eastern Fergana Valley. Geology of the site is represented by boulder-pebble deposits with gravel-sand aggregate and conglomerates on calcareous cement.

The canal runs along a flat, slightly inclined alluvial-pluvial plain, complicated by the canals of the sai of temporary streams. Beginning of the formation relates to Golodnostep cycle of denudation, which continues to the present time. The second terrace rises above the floodplain by 2-6 m and has a mark of 700-800 m.

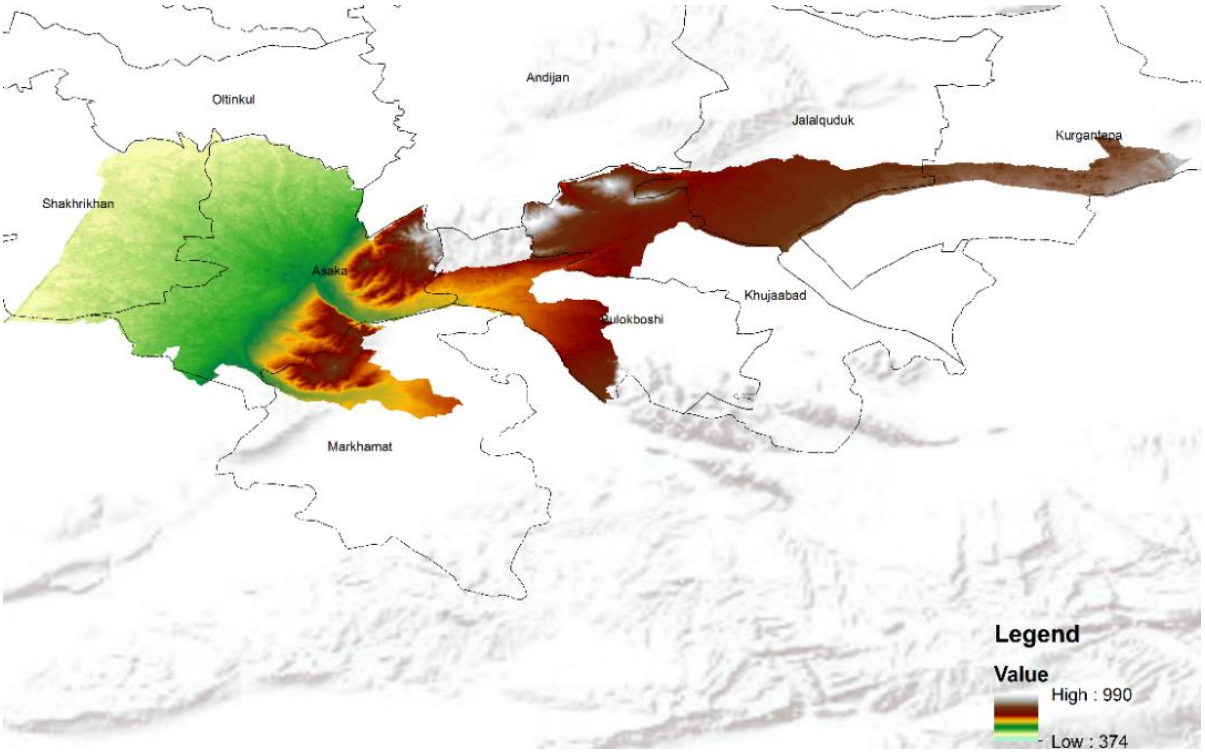

Figure 5. Map of the landscape of the "Shakhrihansay" Irrigation System

The terrace from the surface to a depth of 2.0-25.0 m is composed of sandy loams and loams, which are underlain by pebbles, whose thickness reaches 25 meters or more.

At the head part of the canal at a distance of 12 km, the canal route passes through Utizadir area, which is one of the beds of the Karadarya River. In pebbles there are interlayers and lenses of loams, sandy loams and sand of various thicknesses from 0.5 to 10 meters or more.

The physico-mechanical properties of pebbles were studied by engineering geological surveys conducted in 1963 and during the expansion and reconstruction of the canal (1983). The characteristics of the physico-mechanical properties of pebbles, the degree of their salinity and aggressiveness are based on the survey data of 1983. After 1983 geological surveys were not carried out, there is no geo-supervision data on the quality of the construction of embankment embankments in the process of its expansion and acts of stripping work during its concrete lining.

b. Climatic conditions including risk analysis of natural disasters and possible preventive measures

Climatic conditions of the territory under consideration are given by the Andijan meteorological station, located at an altitude of 477.0 m. The characteristic features of the climate of this territory are aridity, continental conditions with quite cold winters and hot, long summers with high sun position.

According to the Andijan weather station, the average annual air temperature is +13.5°C, with an average minimum in January of -1.9°C, and a maximum in July of +27.2°C. The average annual precipitation is 238 mm. Precipitation mainly falls during the cold season (October-March, Figure 6). Wind regime depends on the location of the territory, on the flat territory dominated by the winds of the northern half of the horizon. In the cold season, winds of the North-Eastern direction are most often observed, associated with the presence of a spur of the Siberian anticyclone. In the warm season winds of the Northern and North-Western directions prevail. In the flat part of the territory, average wind speeds vary in the range of 0.6-1.8 m/s, averaging 1.1 m/s.

Maximum wind speeds range from 14 m/s to 20 m/s. Some separate gusts of winds reach 34 m/s. The maximum wind speeds are observed in winter and early spring, and in the fall the lowest wind speeds are observed. «Winds of intrusion» lead to wind erosion of the soil. These include dry winds and dust storms. Comparison of current and mean annual meteorological parameters is shown in Figure 6.

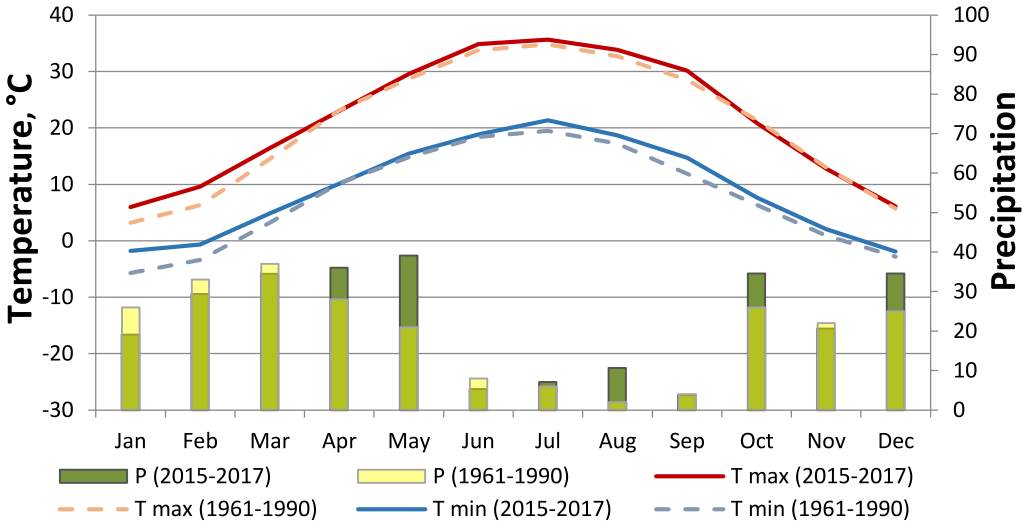

Figure 6. Monthly precipitation and average maximum and minimum air temperatures in 2015-2017, Andijan station, compared with the average multi-year observational data

Disaster risk analysis and possible preventive measures

The Shakhrikhansay Canal at this current site (37.41 km) does not cross a single river, neither permanently nor periodically operating sais (small rivers). There are storm water inlets within the organized discharges of surplus water from adjacent irrigated lands on the left side along the canal.

In canal area the landslides and slope detritus are not recorded and not predictable based on soil conditions, the depth of excavation, concrete lining around the perimeter and the passage along the canal on the left side of the collector-aggregators.

The main canal of SFC – the largest branch of Shakhrikhansay – is located on the territory of Andijan and Fergana regions of Uzbekistan. It is used for irrigation of the area of 94022 hectares in Andijan and Fergana regions. The building belongs to the Class II.

Starting from CP 630+32 and almost to the end, the canal runs through the side-hill fill and partly on the side-hill. During the flood period, the canal almost along its entire length is the water intake of the mudflows entering the canal through the mudflow releases.

Despite this, the canal for 70 km from the Aravansay CP 255+00 to the Beshalishsay CP 950+00 has no discharges. Therefore, there is a mudflow hazard.

In the zone of the South Fergana canal, landslides and landslide processes were not recorded and are not being predicted.

Maximum flow mode

Problems associated with managing and organizing water use in the Shakhrikhansay Canal Basin are not revealed, but there are technical difficulties, such as the need to equip with automated technology, given the fact that the used basin management technology is in a worn out state. Mudflows, coming from the tributaries of the Aravansay and Akburasay were observed in the Sharikhansay River Basin in 1998 and 2010. The maximum water consumption during floods reached 180 m^3/s, causing damage to agriculture and settlements. It should be noted that mudslides are mainly created by tributaries of the Aravansay and Akburasay, characterized by low concentration of solid runoff and short duration. Floods occur in the spring, from March to the end of April.

c. Land reserves

The land fund of the Shakhrikhansay Basin within the Andijan region is 97715 ha, of which 11.4% is household land, 29.4% is non-agricultural land and 59.2% is agricultural land, including arable land - 42.7%, perennial plantings - 8.2%, diggings - 0.9% and pastures - 7.4%. The area of irrigated land is 59487 ha.

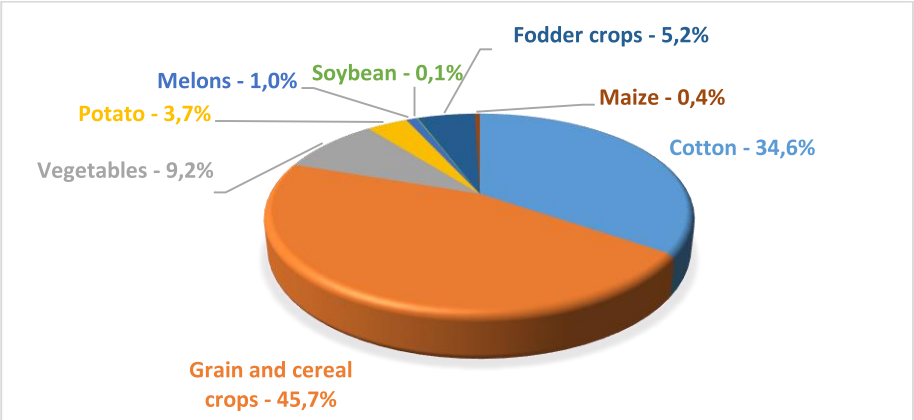

Figure 7. Production of crops in Andijan region

Despite the decisions made on not placing the state order for raw cotton and grain on lands with low soil fertility, the area under cotton and winter cereal crops still occupies the main part of irrigated arable land: 80.3% in the Shakhrikhansay Basin (Figure 7).

Soils are typical and light gray soils. The mechanical composition: 36% – heavy loam, 44% – medium loam, 15% – light loam and 5% – sandy loam. The area of irrigated land with a depth of groundwater level up to 2 meters from the surface of the earth is 29%

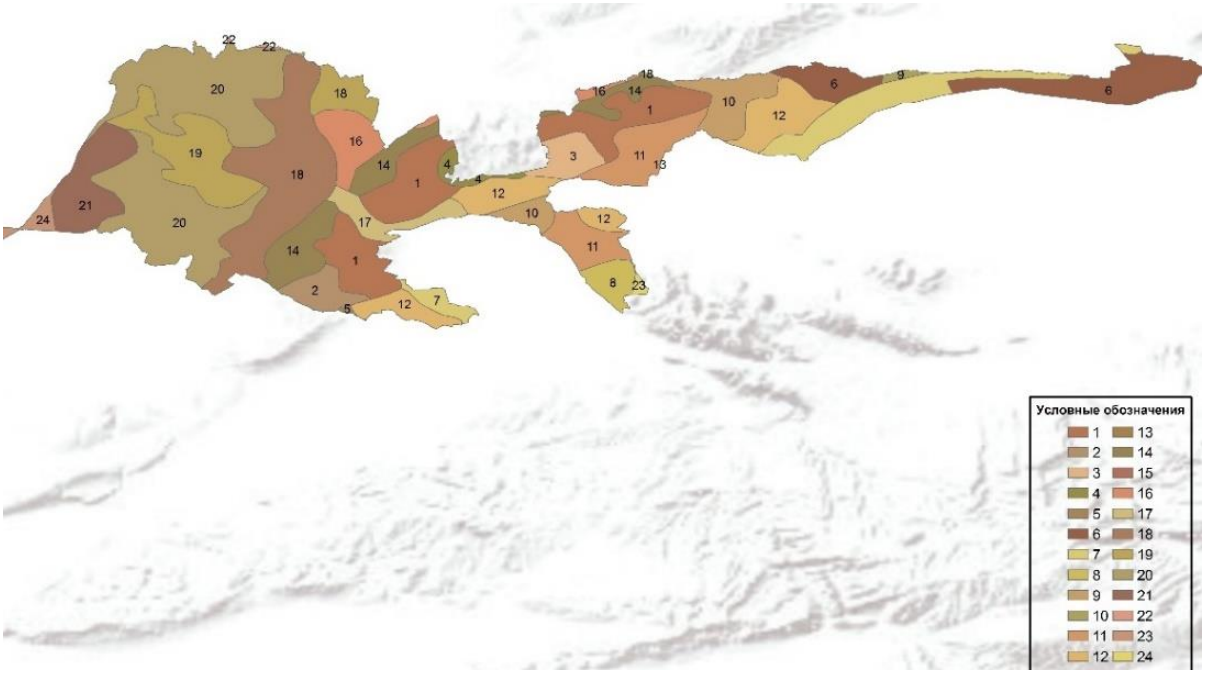

Figure 8. Soil types in the Shakhrikhansay Basin

№	Soil types
1	Old-irrigated gray soils typical medium loam, sometimes underlain by gravel (0.5-1 m)
2	Old-irrigated light gray soils, light loamy, often underlain by gravel (0.5-1 m)
3	New-irrigated meadow sasa soils are heavy-loamy, medium-and strongly saline, in places arzyk
4	New- irrigated gray soils typical medium loam, slightly eroded, slightly saline places, sometimes underlain by gravel (0.5-1 m)
5	Old-irrigated gray-meadow and meadow-gray soils medium-loamy
6	New- irrigated gray-meadow and meadow-gray soils are medium-loamy, slightly saline, sometimes slightly washed, sometimes underlain by pebble (0.5-1 m)
7	New- irrigated gray soils are typical medium-loamy, sometimes weakly skeletal and weakly washed, sometimes underlain by pebble (0.5-1 m)
8	New gray soils are light medium loamy, slightly saline, in places weakly washed, gypsum-bearing, sometimes underlain by gravel (0.5-1 m)
9	New- irrigated gray soils are light medium loamy, uninhabited, in places weakly washed, often underlain by pebble (0.5-1 m)
10	Old-irrigated meadow sasa soils are heavy loamy, sometimes weakly skeletal, not populated, in places slightly saline
11	New- irrigated meadow sasa soils are heavy loamy, medium to high saline, in some places arzyk
12	Old-irrigated meadow sasa soils are medium loamy, slightly saline, washed in places, sometimes with 0.3–0.5 m pebble
13	New- irrigated meadow sasa soils are medium loamy, sometimes light loamy, weakly, sometimes saline and gypsum-bearing
14	Serozems typical (virgin-fallow) skeletal-fine-grained and coarse skeletal, in places with primary rocks, medium to high washed
15	Old-irrigated meadow sasa soils, heavy loamy, slightly saline, sometimes washed
16	Pebbles, sand and pebble deposits
17	New- irrigated meadow sasa soils are heavy loamy, medium to high saline, in some places arzyk
18	Gray soils typical (virgin-fallow with small areas of rainfed and conditionally irrigated) medium loamy, with heavy loamy and clay soils
19	New- irrigated meadow sasa soils are medium loamy, poor- and in places moderately saline
20	Old-irrigated meadow sasa soils, heavy loamy, slightly saline, sometimes washed

21	New-irrigated meadow sasa soils are heavy loamy, in places slightly saline
22	New-irrigated gray soils are typical medium loamy, sometimes weakly skeletal and slightly washed away, in some places underlain by gravel (0.5 m)
23	Old-irrigated gray -meadow soils and meadow-sierozem soils are medium loamy, in some places underlain by pebble (0.5m)
24	New gray soils are light medium loamy, slightly saline, in places weakly washed, gypsum-bearing, sometimes underlain by pebble (0.5m)

However, this is not dangerous, since groundwater salinity on 81% of the irrigated area is less than 1 g/l and is an additional source of nutrition for agricultural crops. There are no saline soils. 1880 hectares of deposits can be entered into agricultural use through agricultural activities.

d. Natural Ecosystems and Biodiversity

Landscape of the Shakhrikhansay Canal Basin is characterized by a variety of cultural and natural forms. Relief consists of plains, hills and adyrs. The highest point of the river basin is 600-800 meters, which is located in the eastern part of Andijan region. Surface of the plain consists of alluvial deposits. Vegetation cover of the basin is defined by climatic features of different heights, location of mountain ranges, exposure of slopes and soil nature. Soil of the basin is very diverse: gray, brown, meadow, meadow-marsh soils, sandstone, small stone. Territory of the basin is one of the oldest agricultural centers in the republic (photo 2). Its landscape has almost completely changed as a result of cultural development and the creation of a favorable environment for development. As a result of human economic activity and its impact on nature, vegetation cover is significantly disturbed, which leads to soil erosion in some areas. The soil cover on the site is represented by sandy-loamy sediments.

Photo 1. Shakhrikhansay Canal
Source: Andijan Regional Department of the State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection

Photo 2. Landscape of Andijan
Source: State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection

Photo 3. Beekeeping farm in Asaka district (photo: Lauren Kana Chan, 2018)

Photo 4. Apple tree in the territory of the Shakhrikhansay basin
(Photo: Shovkat Khojaev / IWMI)

Diversity of flora and fauna

A characteristic feature of the vegetation is the dominance or substantial participation of ephemera and ephemeroids, adapted to the contrast mode, which is common to this area. Among the ephemeral elements, viviparous bluegrass, sedge, bulbous barley prevails. Wide areas of poplar, elm, flat tree, ash, maple are very typical for these conditions. Of the foreign species there are gleditschia, ailanthus, sophora, mimosa, cedar. In spring, the hills are covered with ephemeral plants. On the plains, which are not used in agriculture, wormwood grows, and in the foothills - pistachio and almonds. On the territory there are wild plants: reeds, nightshade family plants, mint, wormwood and other herbs. Fauna of the basin is mainly represented by birds and animals peculiar to the territory. This, in particular, sparrows, blue pigeons, turtle doves, Indian starlings. There are grasshoppers, lizards, snakes from insects and reptiles' families. From the rodent's families there are mice, jerboas in the basin. There are very small numbers of fox and rabbit.

SOCIO-ECONOMIC SITUATION IN THE SHAKHRIKHANSAY BASIN

a. Employment and income

Demographic assessment in the Shakhrikhansay Basin Irrigation System was carried out in all seven districts located along the basin: Kurgantepa, Jalalkuduk, Khodjaabad, Bulakbashi, Asaka, Shakhrikhan and Markhamat. Population in the Shakhrikhansay Basin is 1393.2 thousand people and the population density is 639.7 people per square kilometer, which makes it the most populated part of the Fergana Valley.

Today, about 47% of the population of whole Andijan region lives in the territory of the Shakhrikhansay Basin. Population increased significantly from 2010 to 2018, from 1111.7 to 1393.2 thousand people. Area with the highest population density is Asaka district, where the population density is more than 1106.1 people per square kilometer. In 2010, about 59% of the basin population lived in rural areas, whereas in 2018 this figure was 57.1%, which indicates a decrease in the rural population in the basin during this period (Figure 9).

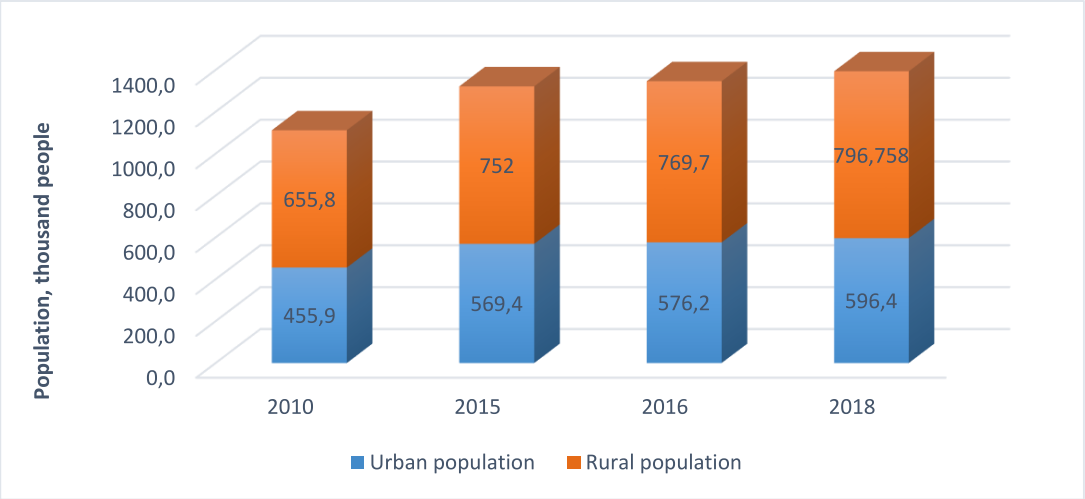

Figure 9. Dynamics of the urban and rural population along the "Shakhrikhansay" Basin according to the Department of Statistics of Andijan Region

According to the Statistics Department of Andijan region, in 2017, the economically active population in the basin was 615.9 thousand people, or 44.2% of the total basin population (Kurgantepa, Jalalkuduk, Khodjabad, Bulakbashi, Asaka, Shakhrikhan and Markhamat districts).

Number of employed people amounted to 579 thousand people, of which 180.9 thousand people are employed in agriculture, or 31% of the population employed in the economy (Figure 10).

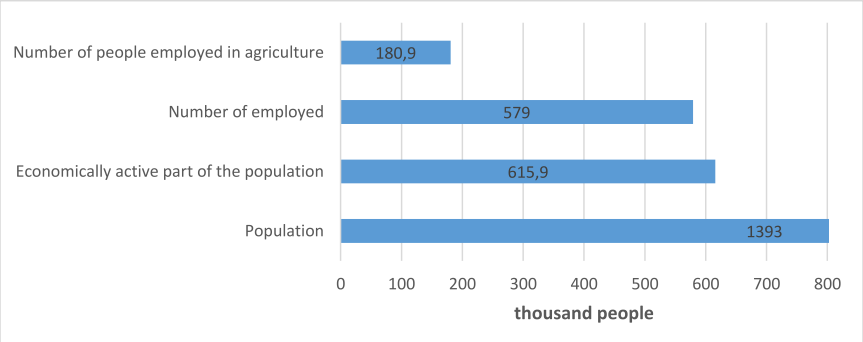

Figure 10. Employment indicators in Shakhrikhansay Basin

b. Social Development Indicators

There are 213 pre-school educational institutions and 358 schools in the Shakhrikhansay Basin, where 537,000 children and adolescents under the age of 19 are trained and educate. Statistics show that there are no problems related to gender imbalance, as the number of men and women is almost equal. Population is fully supplied with electricity, but in different parts of the basin people use imported water for drinking purposes and part of the population is not provided with natural gas (Table 7).

Children and adolescents under 19	thousand people	537
Men	thousand people	588,7
Women	thousand people	578,6
Schools	units	358
Kindergarten	units	213
College	units	53
Hospitals	units	257/14
Water supply		Available (partially) (69, 5%)
Electricity		Available (100%)
Gas supply		Available (partially) (50, 5%)

Table 7. Social indicators for the Shakhrikhansay Basin (the table is compiled according to the Regional Statistical Departments, 2017)

c. Macroeconomic indicators

According to the State Statistics Committee of the Republic of Uzbekistan, the Gross Regional Product (GRP) of Andijan region in current prices amounted to 14479.0 billion UZS and grew by 6.7% compared with 2016[4]. Economic growth is due to positive growth rates in agriculture, forestry and fisheries - 101.1% (share in the GRP structure - 33.4%), in industry - 123.5% (20.8%), in construction - 101.9 % (5.6%), in the service sector - 105.1% (40.2%). The GRP per capita amounted to 4847.2 thousand UZS and grew by 4.9% compared to 2016.

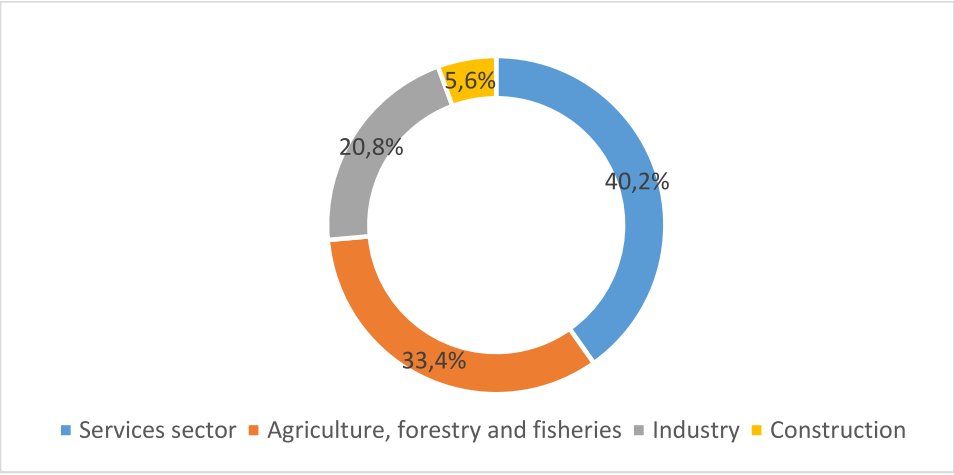

Figure 11. Composition of the Gross Regional Product (GRP) in Andijan region in 2017

[4] There is no data on GRP by areas of the Andijan region. Macroeconomic indicators are indicated for the entire area.

d. Stakeholders of the Shakhrikhansay Irrigation Basin

The main stakeholders of the basin include the following organizations:

1. Naryn-Karadarya BISA
2. Local unit of the State Committee on Ecology and Environmental Protection
3. Management unit on operation of the Andijan Reservoir
4. State Unitary Enterprise «Andijonsuvokova»
5. Management unit on the main canals of the Fergana Valley
6. District Irrigation Departments in Asaka, Jalalkuduk, Kurgantepa, Bulakbashi, Markhamat, Khodjaabad and Shakhrikhan districts
7. Representatives of hydrological stations (on groundwater issues)
8. District Departments on Agriculture
9. Representatives of energy organizations (HPP)
10. Local Division of the Hydrometeorological Center of Uzbekistan
11. Representatives of business and industry (factories)
12. Representatives of the State Water Inspection (for technical condition of structures)
13. Representatives of the MOE
14. Representatives of Sanitary-Epidemiological Service (SES)
15. Regional and district hokimiyats
16. Representatives of housing and communal services (housing and communal services) (on issues of drinking water supply)
17. Representatives of the Border Guard Service of the Republic of Uzbekistan
18. Farm Council
19. Elders / Aksakals
20. Chairs of makhallas
21. Fishery farms' representatives
22. District offices of the Land Cadaster
23. Young professionals in water management and irrigation systems
24. Water Users Association (WCA)

25. Representatives of medical institutions

26. Forestry representatives

27. Non-governmental organizations

28. Representatives of reservoir operating organizations

29. Representatives of the Reclamation Expedition

30. Representatives of the State Committee for the Development of Tourism (local departments)

31. Design institutes (invite as needed)

The roles and tasks of the main stakeholders are presented in Annex 3.

In conclusion, we can list the following points relevant to the territory of the basin of the Shakhrikhansay Irrigation System:

- Population along the basin increases dramatically;
- The rural population prevails over the urban population;
- The main role in the employment is played by dekhkan, farms, small businesses and private entrepreneurship;
- There is no problem with gender imbalance as the number of men and women is almost equal;
- Population is fully supplied with electricity, but in some areas people use imported water for drinking purposes and part of the population is not provided with natural gas;
- GRP growth is driven by growth rates in the main sectors of the region's economy: agriculture, forestry, fisheries, industry, construction and services. In 2017, GRP per capita amounted to 4847.2 thousand UZS.
- There are enough stakeholders in the basin

CURRENT STATE OF WATER MANAGEMENT

a. Institutional analysis on water management

The organizational structure of water management in the Fergana Irrigation System is shown in Figure 12.

The Ministry of Water Resources oversees water management facilities of the republican subordination (large canals and reservoirs, including the SFC, the Andijan Reservoir). The Basin Irrigation System Administrations (BISA) supervise water management facilities of regional subordination (canals and reservoirs for inter-district use). District Irrigation Departments (DIDs) control water management facilities of district purpose and directly supply water to WCAs and other water users. BISA and DIDs plan, distribute, record and control the use of water resources.

The water uses management and the development of water-saving technologies of the Ministry of Water Resources (MWR), water resources departments, hydrometry departments and the dispatching service of BISA and the main hydraulic engineers of DIDs are directly involved in the planning and distribution of water resources. Also, within the new structure of the Ministry of Agriculture it is planned to establish departments on determination and planning of water consumption in agriculture under the central office and regional departments on agriculture, including appointment of chief specialist on the determination and planning of water consumption in agriculture for district departments.

Prior to the restructuration of the Ministry of Water Resources, the operation of inter-district and inter-farm (inter-community) canals and the distribution of water between administrative districts and WCAs were carried out by the Irrigation System Departments (ISDs). Now inter-farm (inter-community) canals and water distribution between WCAs will be performed by DIDs. It remains unclear who will operate and maintain inter-district canals and distribute water between administrative districts. Currently, no provision has been adopted for operational organizations (BISA, Main canal administration (MCA), PSM, Reclamation Expedition (RE) and DID) of the Ministry of Water Resources.

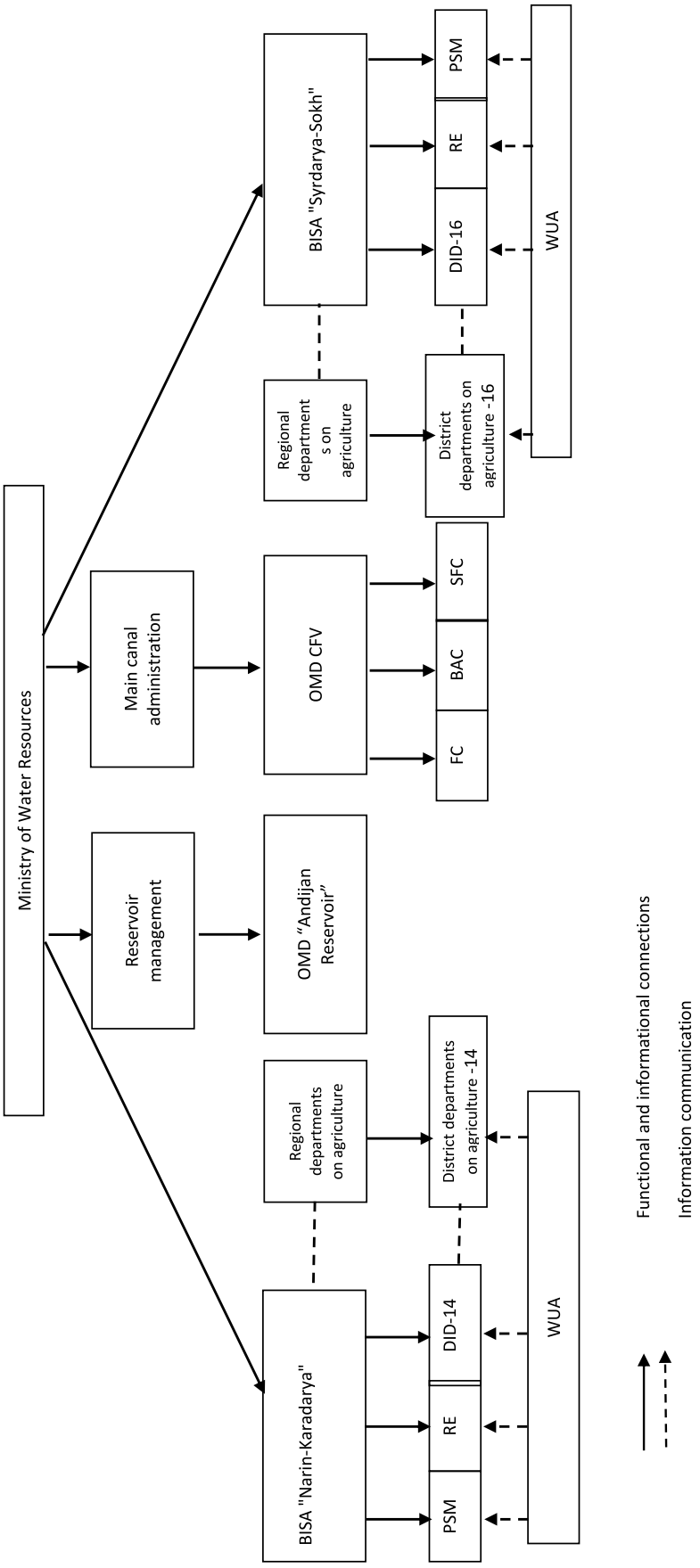

Figure 12. Organizational structure of water management in the Fergana Irrigation System

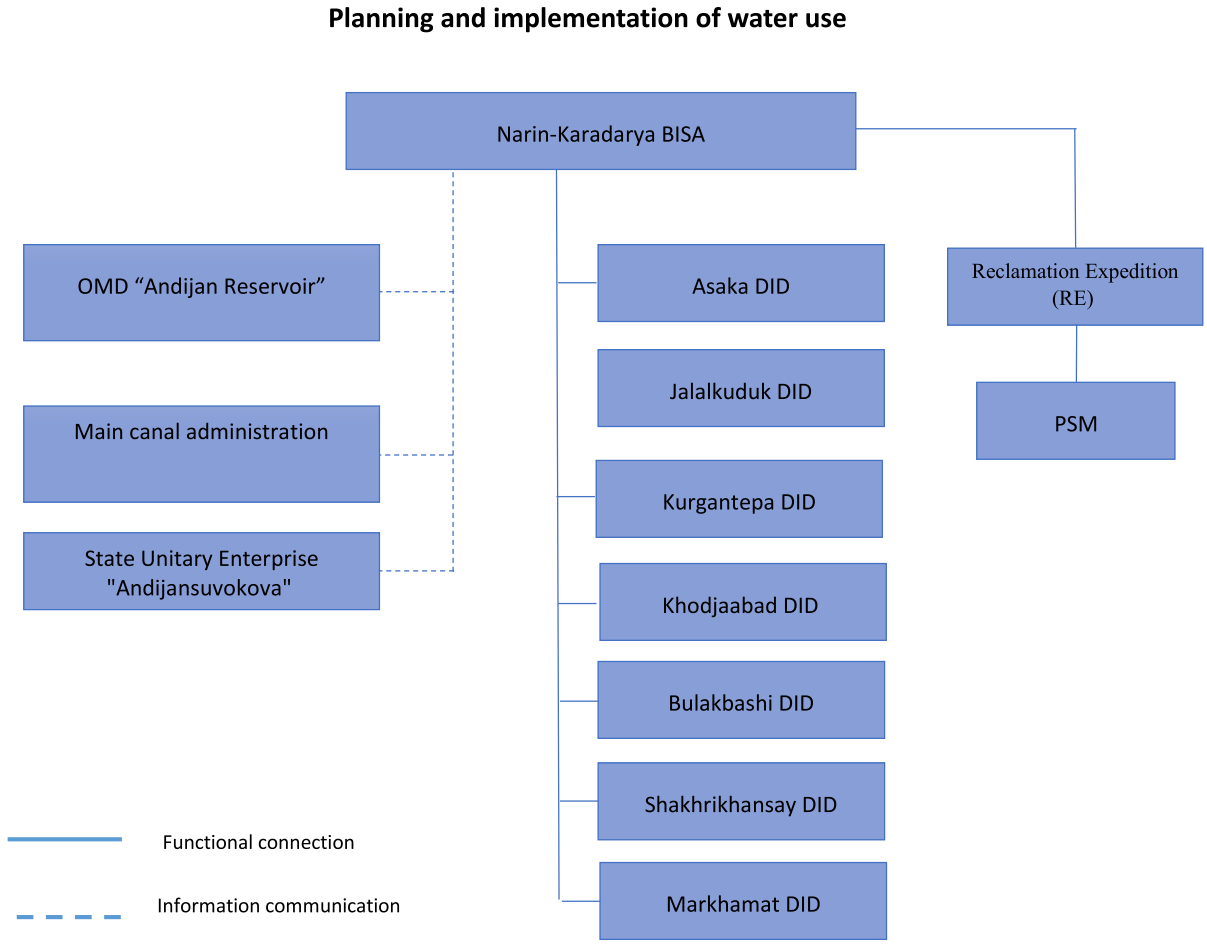

Figure 13. Organizational structure of water management in the “Shakhrihansay” Irrigation System Authority

In accordance with the «Regulation on water use and water consumption in the Republic of Uzbekistan» before the start of the next irrigation season (vegetation and non-vegetation), WCAs should develop the water consumption plans for farmers and dekhkan farms, self-government bodies of citizens and other water consumers and on the basis of their generalization to draw up water use plans of the Association.

Based on water use plans, WCAs, DIDs and BISA should develop a water use plan. The water use plan should establish the average decadal consumption in the context of available water consumers, WCAs and districts, as well as the average decadal head consumption for all points of water allocation in WCAs, on economic, distribution, inter-district and main canals. The water use plan should also establish ten-year irrigation tasks, i.e. irrigation areas with planned water consumption in the context of available water consumers, WCAs and districts, as well as on the suspended area of economic, distribution, inter-district and main canals. WCAs’ water consumption and water use plan and system water use plan - a tool for water resources management and the basis for irrigation systems operation (operation mode of hydraulic structures (HS), PS, canals, control of canals gates of different levels, etc.).

In fact, currently most WCAs do not have specialists in hydraulic engineering. Therefore, in practice, WCAs’ water consumption and water use plans are not developed.

Further, water use plans of water consumer associations, as well as other water users, are summarized by the DIDs. The system plans of the districts are summarized by the BISAs.

Developed and generalized plans of water use, and water consumption are approved as follows:

- *for water consumer associations by DIDs;*

- *for districts by the basin management of irrigation systems in coordination with the relevant territorial bodies of the Ministry of Agriculture of the Republic of Uzbekistan;*

- *for the basin irrigation system, large and especially important waterworks by the Ministry of Water Resources of the Republic of Uzbekistan*

Water withdrawal limits. In accordance with Article 30 of the Law "On water and water use," water intake limits are set for all water users and consumers. Water withdrawal limits are set in the following order of priority:

1. Drinking, medical and household;
2. Industry;
3. Agriculture;
4. Sanitary and environmental needs

Water distribution. WCAs release water based on requests from farmers. Not all WCAs receive written requests for water intake from water users. Requests are received by phone mainly. WCAs do not register requests. It is highly recommended to keep a special logbook. It is necessary to document the date of request, of water user and the actual water supply date (Figure 13). Registration of requests is necessary for the assessment of WCA's performance in water management. Registration of requests helps to assess the timeliness of water supply. This is also helpful in case of disputes with water consumers in order to prove that the water was delivered on time.

Accounting and reporting in water use and water consumption. Water use agreements stipulate that water intake facilities should be equipped with means for regulating and metering water resources by water users and water consumers according to their affiliation, i.e. water intake points for water users should be equipped by WCAs, WCAs' water intake points should be equipped by DIDs, and DIDs' intake points should be equipped by the main Canal Operation Department.

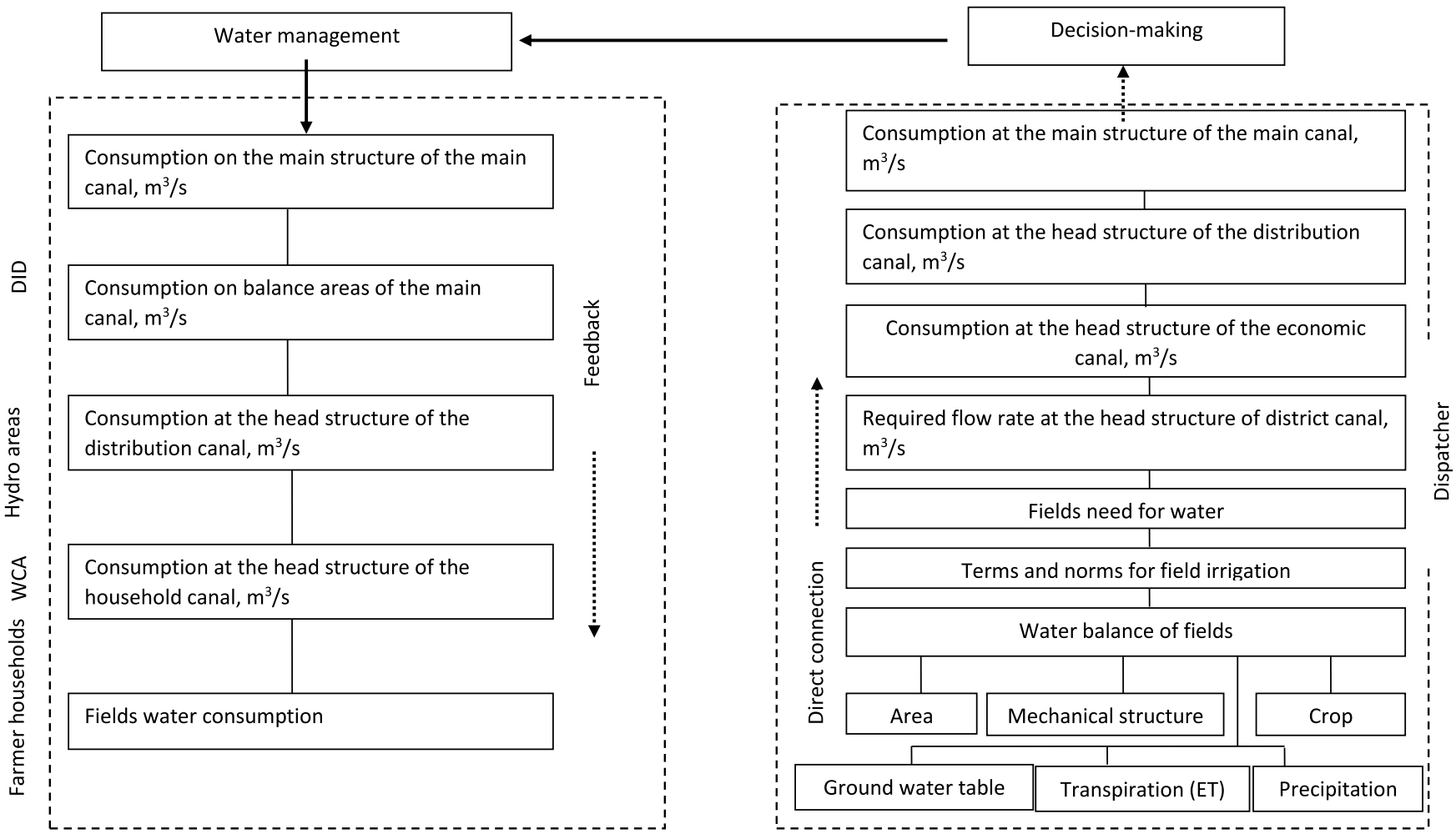

Figure 14. Recommended Water Planning and Distribution Scheme

b. Water infrastructure

The Shakhrikhansay Canal is the oldest major canal on left bank of the Karadarya River System. It is located on the territory of Andijan region, Fergana valley. Initially, it was built to transfer part of the water flow from the Karadarya River to Aravansay River.

Construction of the canal was carried out in the period from 1882 to 1888. Operation was started in 1888. Initially, the canal was located in the earthen engineering canal. In the process of operation, the costs increased, the canal became wandering (meandering), and canal moved to the canyon (old flood riverbed) due to the subsidence of loess soils. In some places it reaches up to 600 m wide and up to 20 m deep.

In 1978-1983, the head regulator was built under the project of the "Ferganagiprovodkhoz" Institute, which was part of the Kampyrravat water hub, and the canal was reconstructed in the section from CP 0 to CP 374 + 10, as a result of which the canal was given an engineering look, it was lined with concrete along the entire perimeter of the cross section and the entire length of the reconstruction. Currently, the Shakhrikhansay Canal has a length of 108.3 km. Normal consumption in the head of the canal is 190.0 m^3/s, the maximum is 240.0 m^3/s, and the minimum is 40.0 m^3/s.

The largest withdrawal of SFC is on CP 374 + 10. The water intake at SFC is carried out at the hydroelectric complex located on CP 374 + 10 of the Shakhrikhansay Main Canal. Length - 119.37 km, the entire length of the canal is lined with concrete. Maximum consumption was 110 m^3/s, normal - 90 m^3/s, minimum - 5.0 m^3/s. The canal was built on the basis of the Kuva branch, which was built in 1935-1936. The Kuva branch, as well as SFC, had a head intake at the Shakhrikhansay, slightly above its confluence with the Akburasay River, and ended with water discharge to the Kuvasay River. The main purpose of the branch was to increase the water availability of the Isfayramsay River System and feed the Aravansay River System in its lower part. In 1940, the branch was continued to the Margilansay with simultaneous reconstruction of the canal and structures on it in the area from the Aravansay to Kuvasay, after which it was named as the South Fergana Canal named after A.Andreev. The canal was built after the BFC through common voluntary work.

There are 115 water facilities at the Shakhrikhansay, including by types:

- head regulator - 1
- control structure- 9
- flood gate- 2
- water outlets - 50
- water supporting structure - 1
- intersection with BFC - 1
- spillway channel- 1
- drop structure- 4
- underwater pipeline - 1
- railway bridge - 4
- road bridge - 32
- footbridge – 9

Water distribution is carried out by 553.67 km of distribution canals, of which 306.28 km are lined with concrete, and 2007 km of on-farm irrigation canals, of which 390 km are lined with concrete and consist of a tray-type network. There are 1,194 waterworks on distribution canals, including 438 water outlets, 380 hydro-posts and 376 bridges.

c. Analysis of water resources use by economic sectors (water needs by types of water use in the basin)

There is no problem with water supply in agriculture. There is an increase in specific water intake and water supply in WCAs (Figure 15).

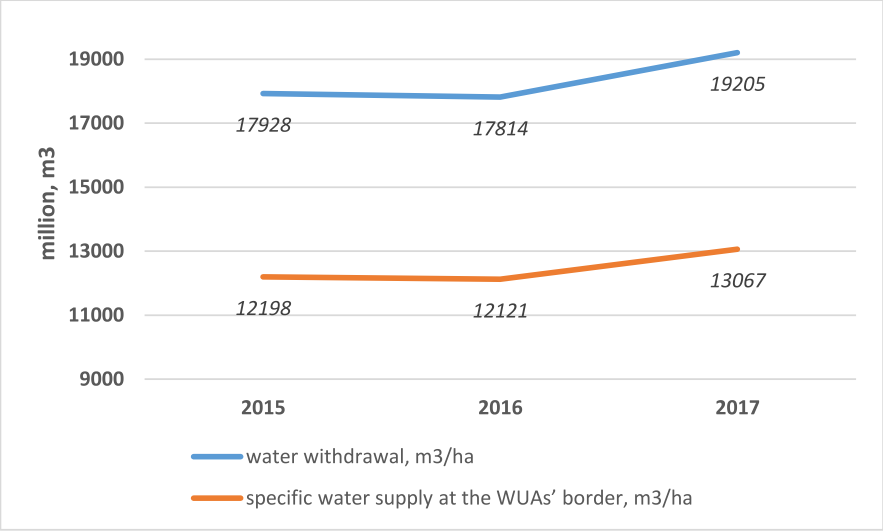

Figure 15. Specific water withdrawal and water supply

But the population of the districts in the Shakhrikhansay Basin is partially provided with centralized water supply: 55.1% in Markhamat district and 88.3% in Khodjabad district. The main sources of drinking water supply of the population are Andijan and the Karkidon Reservoirs and groundwater. The annual water withdrawal from the Andijan Reservoir is 45 127-55 271 thousand m3, which is 75% of the total water intake for drinking and household needs. Groundwater is withdrawn from 1 468 artesian wells.

In the Andijan region, there are a total of 16 branches of "Suvokava", 30 water-collecting facilities and one water treatment plant. The total length of drinking water is 7344, 8 km. There are 1 468 drinking wells. About 35% of drinking water infrastructure requires construction and repair works (Figure 16).

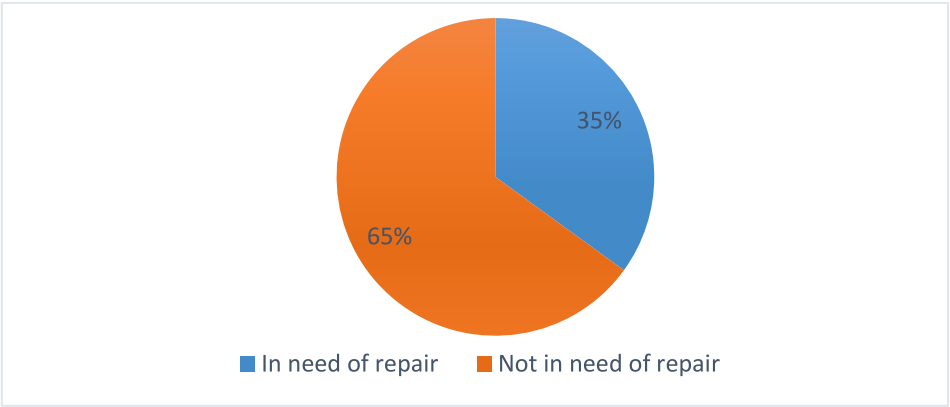

Figure 16. Technical condition of drinking water infrastructure

There are 6 main sources of drinking water supply in the region, replenished from water from sewage treatment plants, such as "Kampirravot" and "Karkidon", as well as from underground water sources "Pakhtakor", "Munduz", "Kambarota" and "Okchiy".

The main source of water supply in Asaka and Markhamat districts is “Ukchi” station (capacity 2.4 thousand m^3).

In accordance with the sanitary rules and regulations in Uzbekistan No. 2.04.02-1997 on water supply, the external networks and facilities, at a rate of total water consumption of 100 l/day per person, for household water intake conditions without sewage, the total population’s need for water per year in the pilot zone is as following:

1370000 people x 100 l/day x 365 days = 50005000000 l, *или* 50005 thousand m^3

We estimate water availability for 2017. The annual water intake of the population of the districts in the Shakhrikhansay Basin amounted to 21946 thousand m3 per year.

Water availability amounted to (21946/50005) *100 = 44%.

Water in the Shakhrikhansay Basin are mainly used for irrigation (89.14%), agricultural water supply (9.85%) and public utilities (0.92%). A small amount of water is used in fisheries (Figure 17). There are 2 industrial enterprises in the Shakhrikhansay Basin: the oil and fat factory and GM Uzbekistan. Both enterprises have local water supply and artesian wells.

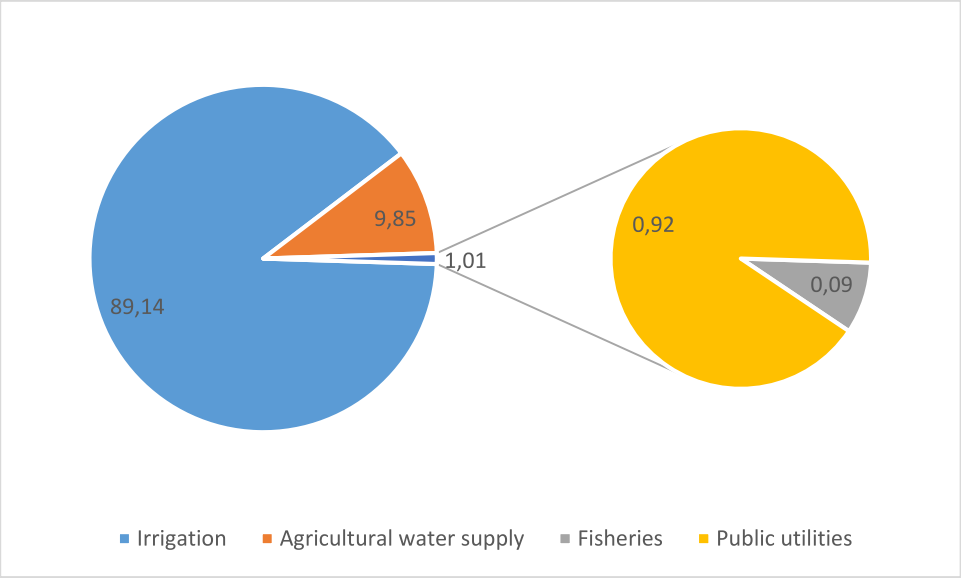

Figure 17. Water use by industry, % in Shakhrikhansay basin

Since the main volume of water is used for irrigation, respectively, most of the water loss occurs in agriculture. The efficiency of main and inter-district canals is 0.90, distribution networks - 0.84 and on-farm networks - 0.76, that is, the system efficiency is only 0.52. In addition, according to expert estimates, organizational losses occurring on the irrigation network of WCAs, and equal to 15% of water intake in WCAs, i.e. 58% of the water taken from the source does not reach the field.

Opportunities and limits in the basin (SWOT Analysis)

SWOT Analysis	
STRENGTHS	**OPPORTUNITIES**
• Soil fertility makes it possible to get the maximum yield. In addition, there are no saline lands in the basin. • High quality and availability of drinking water to local residents (freshwater salinity does not exceed 0.68 g/l). • Most of the irrigation network (54.3 km) is lined with concrete, which reduces the loss of water in the basin. • About 20% of the organizational structure of water use in the Shakhrikhansay Basin is represented by experienced specialists. • Water resources management at the regional level is based on the hydrographic principle and is regulated by basin irrigation systems.	• The legislation of the Republic of Uzbekistan has elements of IWRM and basin planning and gives the opportunity to conduct a basin planning. • In 2018, a number of documents were adopted and organizational structures were developed to improve the financial and economic situation, increase profitability and encourage farmers to increase labor productivity. • The government is adopting a number of programs in the Shakhrikhansay Basin Irrigation System aimed at building and reconstructing irrigation facilities, constructing and reconstructing drinking water supply facilities, modernizing existing hydroelectric power stations of “Uzbekgidroenergo” at natural water courses and water management facilities, and adopting promising programs for further development of hydropower for 2017-2021, funded by centralized investment from the State budget of Uzbekistan. • There is a good possibility of increasing yields due to the good fertility of the land, favorable climatic conditions and development of intensive gardens with the introduction of water- and energy-saving technologies. • The Shakhrikhasay Basin has potential to attract international donor organizations to develop and implement cross-border projects. • Development of the tourism industry based on cultural and historical heritage

WEAKNESS	THREATS
• The complex hydrographic location of the basin. The Shakhrikhansay Basin crosses the borders of two states: Uzbekistan and Kyrgyzstan, and also provides water to two regions. • Weak organizational structure of water use. The low capacity in WCAs and DIDs due to the lack of experienced water specialists, including the dispatch service. • Lack of description and scheme for accurate distribution of irrigation networks of WCAs and DIDs. The river basin is characterized by developed irrigation networks that are suitable for use, but due to the fact that they are not on the balance of WCAs and ROIs, no funds are allocated to maintain them. • Irrigation canals require repair work, as a result there are significant water losses in the canal. • Deterioration of the irrigation network and water measuring facilities. • At the district level, water resources are managed according to the administrative-territorial principle. • The absence of other stakeholders in water resources management at district level - representatives of organizations in such sectors as ecology, water supply, energy, etc. There is no representative public governing body responsible for implementing common technical and economic policies ensuring the effective functioning of irrigation systems. • There is no system for assessing and encouraging the activities of water management organizations. • Low level of water use organization in WCA. • Low technical level of irrigation systems in pilot basins, especially at WCA level. • WCAs' water consumption and water use plans are not developed; water resources planning is carried out based on "vertical down" principle. • Population of the Shakhrihansay Basin does not efficiently use the available water reserves. • Population of the river basin is indifferent to water resources, in turn, this leads to pollution and irrational use of water resources.	• Probability of partial flooding and waterlogging during flood peaks. The Akburasay and Aravansay Rivers flow into the Shakhrikhansay Basin and pass through the territory of Kyrgyzstan. Water discharge from Kyrgyzstan is carried out without notice, which is another cause of flooding of adjacent territories. • The lack of an operational data exchange system between Uzbekistan and Kyrgyzstan on the transboundary rivers (Akburasay and Aravansay) leads to the risk of emergency situations. • The occurrence of diseases among the population is due to the lack of a centralized sewage system in the districts. Spontaneous waste landfills located less than 1000 meters from open water bodies and settlements that do not meet the requirements of sanitary rules and regulations № 0350-17, and are another cause of diseases of the local population. • Changes in the canal stream and destruction of the banks due to illegal extraction of construction materials (gravel and sand).

CONCLUSION

Commitment of the research team of the International water management institute (IWMI) under the 1st Component: “National framework concept for water management and integrated water resources management” of the project “Sustainable water management in rural areas of Uzbekistan”, funded by the European Union, was conducting a situational analysis of the Shakhrikhansay Irrigation System Basin in Uzbekistan to provide basic information and research results to develop a management plan for a river basin.

1. Research included a study of the legislative framework for water resources management; national development programs and strategies relevant to the territory of the Shakhrikhansay Basin; water resources; natural conditions, including information on natural ecosystems and biodiversity; socio-economic situation, including demography; current state of water management and SWOT Analysis.

2. Main water consumption in the Shakhrikhansay Basin comes from irrigation (89.14%).

3. There are no significant social and environmental problems related to water management and organization of water use. There are mudflows on the Akburasay and Aravansay Rivers, which in some years cause damages to agriculture. The largest annual flow of the Akburasay and Aravansay Rivers falls on the period from July to September (40-60% of the annual flow). At this time, the power of the rivers occurs mainly as a result of the melting of snow and glaciers.

4. Level of centralized water supply in the Shakhrikhansay Basin: 55% in Markhamat district and 88.3% in Khojabad district. The main sources of drinking water supply in the Shakhrikhansay Basin are the Andijan and Karkidon Reservoirs and groundwater. The population’s water availability in 2017 was 69.5% regarding the sanitary standards.

5. There are no problems with the water availability for agriculture in the Shakhrikhansay Basin.

6. Main problem in the basin is large specific water intakes from sources, due to the low technical level of irrigation systems and water consumption management, which requires improvement of water management, system reconstruction with maximum efficiency and the introduction of water-saving technologies.

7. Below is the register of problems on water management and water consumption management in pilot basins, which was compiled during a study of the current state of the basin and at seminars in September 2018 with the participation of members of the working group. The list of problems also includes the problems considered in the reports on “Economic mechanisms/instruments to encourage water-saving” and “Full reimbursement of the costs of operation and maintenance of irrigation systems in pilot river basins”, prepared by the IWMI team under component 1, implemented by GIZ.

Analysis of the SWOT-matrix provides the identification of specific strategies for further action based on the methodology described in Annex 2.

Further strategies for planning the management of the Shakhrikhansay Basin based on the SWOT Analysis:

- Maintain the technical condition of the irrigation and drainage networks in the basin, in such a way as to preserve the fertility of the soil;

- Provide water resources management based on the hydrographic principle. Although the ISDs were

eliminated, it is necessary to leave the former border of the basin management at the BISAs hydro site;

- Retain a low level of mineralization of water resources and avoid soil salinization;
- Prevent a reduction in the number of employees of operational water management organizations and improve the skills of staff at WCA, DID, BISA and prevent loss of personnel;
- Install water-metering structures and devices within on-farm network of WCAs, in particular, request Component 1 of the EU Program in Uzbekistan to equip a pilot WCA with water-measuring devices;
- Develop programs aimed at the elimination of water losses and the timely repair of inter-and on-farm networks;
- Ensure timely preparation of water use plans;
- Involve representatives of rural communities, makhalla and representatives from other sectors, such as drinking water supply, ecology, tourism, energy, etc., to the management of water resources at the basin level;
- Attract state programs on the Shakhrikhansay Basin Irrigation System aimed at building and reconstructing irrigation facilities, constructing and reconstructing drinking water supply facilities, modernizing existing hydroelectric stations of “Uzbekgidroenergo” located in natural watercourses and water management facilities, and also adopting promising programs for further hydropower development for 2017–2021, financed by centralized investments from the state budget of Uzbekistan;
- Work on the introduction of water- and energy-saving innovative technologies, in particular by creating intensive gardens and fields for vegetable growing and introducing drip irrigation technologies, sprinkling and flexible hoses;
- Developt tourism industry (the presence of historic buildings and recreational areas) in order to generate additional income and finance the O & M basin, as well as provide employment for the population living along the basin;
- Involve intersectoral stakeholders, including representatives of Fergana region and the main canal administrations of the Fergana Valley in the basin’s management;
- Determine the balance sheet values of the on-farm networks and transfer them to the WCA balance sheet;
- Involve other interested parties - representatives of organizations in such sectors as ecology, water supply, energy, etc. in the management of water resources at the district level;
- Consider the possibility of creating a representative public governing body responsible for the implementation of a common technical and economic policy ensuring the effective functioning of irrigation systems at the district level;
- Consider the option of introducing a system of assessment and incentives for water management organizations;
- Work on the implementation of the procedure for developing of water use and water consumption plans for WCAs; water resources management planning should be carried out based on the “bottom up” rule;

- Develop measures to combat land degradation, in particular against wind and water erosion, to combat of forest area and biodiversity decrease;

- Develop an action plan to combat floods and water-logging during flood peaks along the Akburasay and Aravansay Rivers together with Kyrgyz colleagues;

- Develop an early warning information system for natural disaster reduction between Kyrgyzstan and Uzbekistan;

- Coordinate and develop an operational data exchange system between the states of Uzbekistan and Kyrgyzstan on the transboundary rivers (Akburasay and Aravansay), which will reduce the occurrence of emergency situations;

- Include into state programs the introduction of a centralized sewage system in the districts, which should reduce the incidence of disease among the population.

- Combat spontaneous landfills, located less than 1000 meters from open water bodies and settlements and other violations of sanitary rules and norms (No. 0350-17);

- Prevent changes in the canal stream and destruction of the river banks due to illegal extraction of construction materials (gravel and sand);

- Prevent the deterioration of the quality of drinking water, the outbreak of infectious diseases among the population;

- Attract more donor projects to solve problems in the basin;

- Encourage population of the Shakhrikhansay River Basin towards rational use of water resources with the help of mass media.

REFERENCES

1. Agenzia Regionale Per La Protezione Dell'Ambiente (ARPA). (2011). SWOT Analysis and Strategic Water Management Plan for Irminio River Basin. The report was compiled in the framework of the project 1G-MED08-515 WATERinCORE for "Sustainable water resources management through increased overall responsibility in the basins of Mediterranean rivers". Project is co-financed by the European Regional Development Fund.

2. National Encyclopedia of Uzbekistan, 2008. State Scientific Publishing House. Tashkent.

3. Department of Statistics of Kurgantepa district (2018). Passport of Kurgantepa district.

4. Department of Statistics of Jalalkuduk district (2018). Passport of Jalalkuduk district.

5. Department of Statistics of Khodjaabad district (2018). Passport of Khodjaabad district.

6. Department of Statistics of Bulakbashi district (2018). Passport of Bulakbashi district.

7. Department of Statistics of Asaka district (2018). Passport of Asaka district.

8. Department of Statistics of Shakhrikhan district (2018). Passport of Shakhrikhan district.

9. Department of statistics of Markhamat district (2018). Passport of Markhamat district.

10. Central Analytical Laboratory of the State Unitary Enterprise «Suvokov», Andijan Region.

Annex 1. Structure of the situational analysis of the “Shakhrikhansay” Irrigation System

Preamble
Introduction

1. Legal framework for water resources management (basin planning)

a. Legislation of the Republic of Uzbekistan on water management issues (with a focus on the application of the basin planning approach)
b. National water allocation obligations in the “Shakhrikhansay” Basin Irrigation System

2. National programs and development strategies relevant to the territory of the “Shakhrikhansay” Basin Irrigation System

a. On issues of agricultural development (including the provision of subsidies for agricultural development)
b. Strategies and plans for the development of water management (state and local level)

3. Water resources in the “Shakhrikhansay” Basin Irrigation System

a. Hydrology
b. Groundwater analysis
c. Water quality

4. Natural conditions in the “Shakhrikhansay” Basin Irrigation System

a. Geology and morphology
b. Climatic conditions (risk analysis of natural disasters and possible preventive measures)
c. Land fund
d. Natural ecosystems and biodiversity

5. Socio-economic situation in the basin

a. Employment and incomes
b. Social development indicators
c. Macroeconomic indicators
d. Basin stakeholders

6. The current state of the organization of water use

a. Institutional analysis of water management
b. Water infrastructure
c. Analysis of water use by sectors of the economy (water demand by type of basin water-use)

7. Opportunities and limitations in the basin (SWOT analysis)

Conclusion

Annex 2. SWOT Analysis definition

SWOT analysis was developed to identify strengths and weaknesses (as internal factors), as well as opportunities and threats (as external factors) in the "Shakhrikhansay" Basin Irrigation System (ARPA, 2011). In particular, the strengths and weaknesses are identified based on data and information that were previously assessed in the process of analyzing the situation and a comprehensive study of the situation in the field of water management in the basin. Opportunities and threats are determined on the basis of an analysis of water management, which includes a review of the national legal framework (directives, regulations and laws), national strategic frameworks, development plans and water management principles. SWOT analysis for the basin and the conclusions from the application of the SWOT matrix will provide general recommendations that will serve as an initial response to the problems and improvement opportunities observed in the basin.

Accordingly, based on the results of SWOT analysis, appropriate water resource management strategies for the river basin can be developed. These strategies are divided into four types: offensive, reactive, defensive and adaptive (ARPA, 2011). Offensive strategies that focus on the strengths of seizing opportunities and lead to policies that accelerate development, and can be implemented in the short term. Reactive strategies aimed at overcoming weaknesses through the use of opportunities lead to structural policies and can be implemented in the medium term. Defensive strategies try to use strengths to prevent threats lead to stabilization policies and can also be implemented in the medium term. Adaptive strategies aim to reduce gaps and avoid threats lead to preventive policies and are expected to take effect in the long term. A visual representation of the SWOT matrix and the resulting strategies is presented in Table 8.

	STRENGTHS	**WEAKNESS**
OPPORTUNITIES	Offensive strategies (policies leading to accelerated development) *Elements of a short-term strategy*	Reactive Strategies (Structural Policies) *Elements of the strategy for the medium term*
THREATS	Defensive strategies (stabilization policy) *Elements of the strategy for the medium term*	Adaptive strategies (preventive policy) *Elements of a long-term strategy*

Table 8. SWOT-Matrix

Annex 3. Roles and responsibilities of key stakeholders in the "Shakhrikhansay" Basin[5]

Stakeholders	Roles and responsibilities
Ministry of Water Resources of Uzbekistan	• Implementation of a unified state policy in the field of water resources management, 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 the harmful effects of water; • Sustainable and rational delivery of water resources to the territories and sectors of the economy, taking measures to ensure the improvement and sustainability of the land reclamation conditions; • Ensuring reliable operation of the irrigation and land reclamation systems, reservoirs, pumping stations and other water management and hydraulic structures, organization of protection of large and critical water facilities; • Increasing the responsibility of water users and water consumers regarding the careful and rational use of water resources; • Introduction of the achievements of science and technology, modern water-saving technologies and advanced experience in the field of water management, innovative methods of water management system and water use; • Organization of advanced training of specialists in the field of water management; • Development of interstate relations on the management and use of trans-boundary water resources, attraction of foreign investments and technical assistance (grants), as well as active participation in the activities of international organizations in the field of water management.
Naryn-Karadarya BISA	• Ensuring the implementation of a unified water management policy aimed at comprehensive modernization of the industry, the introduction of science and technology, modern water-saving technologies, advanced domestic and foreign experience relevant to the activities of water facilities in the region; • Implementation of measures to attract foreign investments, grants and technical assistance of international financial organizations and foreign countries in the water sector, ensuring their effectiveness in accordance with the principles of project management; • Taking measures to improve the principles and system of water resources management, ensure their careful and rational use, improve the ameliorative status of irrigated land, conduct reconstruction and modernization of water facilities, hydraulic structures; • Improving the work with personnel, ensuring, constant capacity building trainings.
«Shakhrikhansay» BISA[6]	• Organization of water supply planning for water users, including WCAs, on the basis of contracts; • Ensuring targeted and rational use of water resources, compliance with the established procedure for water use in the whole irrigation system; • Organization of management of the irrigation system, increasing its efficiency and productivity; • Ensuring the technical reliability of the irrigation system and water facilities; • Preparation of the irrigation system for reliable operation and keeping it in working condition; • Maintain accurate records and reports on water intake and water supply; • Introduction of water-saving technologies increase of efficiency and targeted use of allocated funds, material and technical resources, machinery and equipment.

[5]Data from Resolution of the Cabinet of Ministers of the Republic of Uzbekistan of July 3, 2018, No. 500

[6] The Irrigation Systems Departments (ISD) were disbanded throughout the republic in 2018.

District Irrigation Departments (Kurgantepa, Jalalkuduk, Khodjaabad, Bulakbashi, Asaka, Shakhrikhan and Markhamat districts)	• Ensuring the effective implementation of sectorial and regional programs for the development of water management; • Coordination of work on the introduction of water-saving technologies in different sectors of the economy, including agriculture; • Ensuring the integrated management and rational use of water resources, increasing their efficiency, introducing innovative technologies and mechanisms for water use and water consumption, organizing a¬¬nd improving their record keeping; • Conducting methodological and practical assistance in organizing and developing links and other associations of water consumers, coordinating work on technical operation, reconstruction and repair of water management facilities of water consumer associations; • Assistance in the implementation of scientifically based irrigation regimes, drip irrigation systems and other water-saving irrigation technologies; • Maintenance of General coordination of works on repair of on-farm irrigation and drainage systems and their development, as well as the introduction of water-saving technologies; • Analysis of the use of water resources and making proposals for the establishment of water supply limits for administrative areas, promotion of the economical use of water resources amongst the water users and water consumers; • Facilitation and coordination of work by associations of water consumers on drawing up contracts for water consumption, equipping the irrigation network with water management and metering tools; • Participation in the implementation of concepts, strategies and integrated measures, as well as regulatory and legal acts on the development of water facilities of the production infrastructure, strengthening their material and technical base; • Participation in the implementation of a set of measures to improve economic relations between water consumers and water consumer associations based on the in-depth analysis of the mechanism of mutual settlements and the causes of debts, proposals for improving the quality and expansion of services; • Monitoring the enforcement of contracts concluded between water consumers and serving associations;
Reclamation Expedition	• Maintenance and modernization of the main and inter-farm collector network and closed drainage network, as well as equipment on the balance sheet; • Establishment of operation mode of reclamation pumping stations, vertical drainage wells and control of their performance; • Monitoring of the reclamation state of irrigated lands, the quality of collector, irrigation and groundwater, as well as the maintenance of relevant reports; information about water and land users, ameliorative condition and necessary measures on their part to achieve ameliorative well-being; • Maintain an inventory of ameliorative status; • Development of measures to improve the land reclamation condition, technical improvement and modernization of the land reclamation network; • Development of recommendations for water users and subsequent monitoring of the use of saline collector-drainage water.

Local unit of the State committee on ecology and environmental protection	• State administration in the field of ecology, environmental protection, rational use and reproduction of natural resources; • Provision of favorable ecological state of the environment, protection of ecological systems, natural complexes and separate objects, improvement of ecological situation; • State environmental control over compliance with legislation in the field of protection and use of land, subsoil, water, forests, protected natural areas, flora and fauna, protection of atmospheric air; • Maintenance of the state cadaster in the field of ecology and environmental protection, as well as state registration of nurseries for breeding and keeping wild animals, wild plants, Zoological and Botanical collections; • Organization of environmental education, propaganda and education; • Prevention of violations in the field of environmental protection, rational use of natural resources and waste management; • Ensuring close interaction with the public and civil society institutions on ecological issues and environment protection.
Gosvodkhoznadzor	• Ensuring the reliability of the technical condition of operation and safety of large and particularly important water facilities; • Design, construction, commissioning, operation, reconstruction, repair, conservation and liquidation of large and particularly important water facilities, including the organization of project expertise, quality control of construction, reconstruction, commissioning, conservation and liquidation; • Organization of reliable protection of large and especially important water facilities.
WCA (29)	• Development of the water use plan of the serviced area in the context of WCA member farms and its coordination with the state water management organization with which WCA is in contractual relations for the purpose of water supply; • Maintenance and operation of the on-farm irrigation and drainage network managed by WCAs in a technically sound condition; • Repair and restoration work on on-farm irrigation and drainage network; • Provision of land reclamation services, water disposal; • Monitoring the correct operation of water-measuring devices on both irrigation and collector-drainage networks; • Keeping records of water supply on irrigation networks and channels, and metering of the drainage system of a collector-drainage network under the authority of the WCA; • Representation of interests and protection of the rights of its members in relations with state, economic, public organizations; • Economic and operational relationships between the WCA and the water management organization and between WCAs and water consumers - members and non-members of WCAs

Farmers	• Ensure targeted, effective and efficient use of land; • Comply with environmental requirements and other environmental regulations; • Carry out measures to improve the reclamation condition of the land plot, preserve and increase fertility, provide funds for these purposes (within the business plan); • Ensure the supply of agricultural products for state needs in accordance with the concluded agreements within the limits of the provided volumes; • Use water resources in accordance with the water use agreement, take measures for water saving, targeted and rational use of water resources; • In accordance with the established procedure, take part in the cleaning and repair of irrigation and collector-drainage networks that are on the balance of the water users association, of which this farm is a member, and also keep them in good technical condition, follow the established operating rules
Khokimiyats (Kurgantepa, Jalalkuduk, Khodjaabad, Bulakbashi, Asaka, Shakhrikhan and Markhamat districts)	• Executive agency

Annex 4. Register of problems in the Shakhrikhansay Basin Irrigation System, which was developed during workshop in Andijan on September 7, 2018

Priority	Problem identified	Negative consequences and risks	Reasons	Elements of activity	Indicator	Score
A,1	**Institutional aspects of water management. Rating (11)**					
1.1	Lack of legal and institutional arrangements for the distribution of property and responsibility for the O & M of irrigation networks	• Degradation of irrigation networks; • Lack of guaranteed water consumption	There is no clear inventory and certification of irrigation facilities.	Agriculture	Technical passports of irrigation objects with indication of their belonging	14,6
1.2	Unjustified interference in the activities of district and regional water management organizations by higher authorities and their involvement in the performance of duties of WCAs and water consumers	• Reduced sense of responsibility for functional obligations; • Increase of staff turnover and lack of staffing of organizations by experienced specialists	Administrative, managerial intervention in the activities of water specialists	Water manage-ment system	• employee turnover rate; • percentage of performance	11,3
1.3	Unsustainable financial condition of WCA, district eater management units	• Unsustainable WCA activity; • Lack of material and technical resources	Low collection of payments for water delivery services from farmers and other water users	Agriculture	Level of payments collection	8,6
B,2	**Issues on exchange of information. Rating (10)**					
2.1	Inadequate connection between Hydrometcenter, Hokimiyat, MES, BISA, Canal, DID and WCA	Disagreements in water management	Lack of cooperation	Agriculture	Development of mutual obligations between organizations	12,6
2.2	No information on water resources from side tributaries	• Inefficient allocation of water resources; •Unpreparedness for mudflows or insufficient amount of water resources; •Possible destruction of infrastructure or incorrect design of irrigation systems for the future	Lack of agreements (both between agencies and between countries)	Agriculture	• installation of water meters; • data sharing agreements; • open access to data	11
2.3	Lack of dispatching services in district irrigation departments, as well as in WCA	• no water measuring system; • higher-level water organizations do not receive full information	• Not allocated staff units; • Financial constraints	Agriculture	Provided the required number of positions	10,6

2.4	There is no exchange of drainage data due to their transboundary nature.	Unwillingness to mudflows and/or water shortage	No agreements	Agriculture	Agreements with neighboring republics	10,4
C,3	**Technical condition of the irrigation and melioration system. Rating (9)**					
3.1	Many HTSs (about 75%) are in poor condition.	Emergency and deterioration of water management	Lack of funding for timely repair work on canals	Agriculture and Water Manage-ment	Water-carrying capacity	13
3.2	Lack of hydrological posts at Aravansay, unsatisfactory condition of hydrological posts at the Akburasay	• Incorrect water accounting; • Impossibility of planning	Lack of funding for timely repair work on the canals	Agriculture and Water Manage-ment	Level of equipment with hydro-gauging posts	11,2
3.3	Low technical level of irrigation systems (in the basin), especially at WCA level	• loss of water in large volumes and low utilization of water; • increase in salt load on water sources	Lack of funding for timely repair work on the canals	Agriculture and Water Manage-ment	• Canal efficiency; • % water loss	10,4
3.4	Many channels (55%) are in poor condition	• destructive effects on dams, coastal areas and canal protection zones; • channel siltation	Lack of funding for timely repair work on the canals	Agriculture and Water Manage-ment	Canal efficiency;	10,2
D,4	**Socio-economic issues. Rating (9)**					
4.1	Illegal ownership of protected areas of the basin	Inability to use equipment/ machinery in emergency situations	Inaccurate designation of protected areas in regulatory documents and lack of cadastral documents	Water Manage-ment sector	• improving the processes of irrigation activities in the basin; • return of land to the exclusion zone	11,3
4.2	Illegal extraction of building materials (rubble) from the bed of the Shakhrikhansay River	• destruction of the river bed; • erosion risks during floods; • emergency situations	There are no resources and powers at water management organizations to prevent this	Industrial sector	• iIncreased water-carrying capacity; • river bank protection	10,3
E,5	**Natural and ecological conditions**					
5.1	Garbage dumping into the Shakhrikhansay River Basin (ecology)	• outbreaks of various diseases due to water pollution; • environmental degradation	Low level of environmental culture of legal entities and individuals	Industrial sector	Improvement of the ecological situation in the basin	11,8