Annex 6

GIZ Regional Program "Climate-sensitive water resources management in Central Asia"

Studies on priority issues in the field of water, energy and environment in the Amu Darya and Syr Darya basins

Priority topic "Infrastructure issues, resilience to climate change (Nexus approach) in the Syr Darya basin"

REPORT

on the results of field expedition to water infrastructure in the Syr Darya River Basin within the boundaries of the Republic of Uzbekistan

(Tashkent and Syrdarya provinces, Republic of Uzbekistan)
27-28 October 2025

Project coordinator — **D.R. Ziganshina, Ph.D. in law**

Project manager — **A.G. Galustyan, Cand. tech.science**

Lead of priority topic — **A.I. Dolidudko, PhD**

Tashkent 2025

Contents

List of expedition team

Dinara R. Ziganshina	SIC ICWC, project coordinator
Aurika G. Galustyan	SIC ICWC, project manager
Alexander I. Dolidudko	SIC ICWC, responsible for priority topic
Alexander S. Gazaryan	National expert from Uzbekistan
Natalya V. Shulepina	Journalist

Acknowledgement

Members of the expedition acknowledge the assistance and comprehensive support provided by the relevant authorities and organizations throughout the research process.

BWO Syr Darya:	
Odil A. Kholkhujaev	Head of BWO Syr Daya
Avazjon R. Uktamov	Head of Water Distribution and Water Balance Department
Davronjon A. Norboev	Chief of Techical Development and Innovation Technology Division
Islamjon M. Muminov	Chief of Construction and Repair Division
Upper Chirchik Hydroscheme (UCHS):	
Ulugbek T. Baratov	Head of Upper Chirchik Hydroscheme
Javokhir K. Faizibaev	Chief of operational site 3 (Zakh-Khanym)
Gulistan Authority of Hydroschemes and Dustlik Canal:	
Bakhtiyar D. Kadyrov	Head of the Gulistan Authority of Hydroschemes and Dustlik Canal
Abdukarim A. Azimov	Chief engineer
Shukrillo A. Parmaniv	Head of Bekabad branch
Abdusalom A. Gaibullaev	Head of Hunger steppe branch (DP-145)
Territorial branches of the Uzbekistan Ministry of Water Management:	
Bakhtiyar D. Kurbanov	Head of the Chirchik-Akhangaran Basin Irrigation Systems Authority
Nurkamol U. Atakulov	Head of the Lower Syr Darya Basin Irrigation Systems Authority
Tashkent reservoir at the Tashkent Main Canal Authority	
Dadajon B. Dusmatov	Head of Tashkent Main Canal Authority
Sunnatillo Karimberdiev	Chief expert of Tashkent Main Canal Authority
Jakhongir Ashirboev	Head of Tashkent reservoir site

Introduction

The Syr Darya River Basin is a critical transboundary basin in Central Asia, essential to the food, energy, and environmental security of Kazakhstan, Kyrgyzstan, Tajikistan, and Uzbekistan. The impacts of climate change are increasingly evident in the region: rising temperatures, receding glaciers, and erratic precipitation are shifting the seasonal availability of water. These changes are straining existing infrastructure - including reservoirs, canals, hydroschemes - and threatening the reliability of the regional water supply. Consequently, building climate resilience has become a shared priority, necessitating modernized management and a unified approach across all basin nations.

Modernizing large-scale hydraulic infrastructure in the Syr Darya River Basin is a vital step toward water security, but it is not a silver bullet. This was the key finding from experts at the Scientific Information Center of the Interstate Commission for Water Coordination (SIC ICWC) following a two-day inspection of facilities along the river's middle reaches in Uzbekistan. The visit underscored a critical reality: without coordinated management and close transboundary cooperation and the widespread adoption of water-saving technologies in irrigation, the impact of multi-million dollar infrastructure investments will remain limited.

The field visit took place on October 27–28, 2025, as part of the **“Infrastructure issues, resilience to climate change (Nexus approach)”** component of the GIZ **Green Central Asia** initiative, Regional Program “**Climate-sensitive water resources management in Central Asia**.” The mission was conducted with the support of Uzbekistan’s Ministry of Water Management, the BWO Syr Darya and its territorial branches in Tashkent and Syrdarya provinces.

This report summarizes a field assessment of key hydraulic infrastructure located along the middle Syr Darya River in Uzbekistan’s Tashkent and Syrdarya provinces.

I. Aim, objectives and methodology of the field study

The **aim** was to assess the current status of water infrastructure in the Syr Darya River Basin in terms of its climate resilience and its role in transboundary water management. Particular attention was paid to the assessment of technical condition of key structures and their adaptation capacity.

To achieve the above aim, the following **tasks** were completed**:**

- experts performed a **visual inspection** of key water infrastructure in the Syr Darya Basin. Assets assessed included the Upper Chirchik Hydroscheme, the Tashkent reservoir, and the Dustlik Canal, the South Hunger Steppe Canal (SHSC), Zakh, and Khanym canals;
- experts analyzed the operation of key hydraulic facilities and gathered data on the results of recent **reconstruction and modernization** efforts to provide a preliminary technical assessment of their current condition;
- on-site **water-saving** measures were evaluated, including the concrete lining of irrigation canals, the application of innovative anti-seepage materials, and the deployment of drip and sprinkler irrigation systems;
- **primary data** was collected through a series of consultations with water management officials and local field staff;
- extensive **photo and video documentation** was captured, including interviews for a documentary film that will highlight the current state of infrastructure and the climate challenges facing the Syr Darya River Basin.

Methodology of the field study

The field study was conducted as a technical assessment mission across the Tashkent and Syrdarya provinces. The itinerary featured on-site inspections of several critical facilities, including the Upper Chirchik Hydroscheme (UCHS), the transboundary Zakh and Khanym canals, the Tashkent reservoir, and the interstate Dustlik (Dostyk) and South Hunger Steppe (SHSC) canals. Furthermore, the team evaluated canal lining projects and the adoption of advanced water-saving technologies for crop irrigation.

The field study consisted of on-site inspections and a preliminary technical evaluation of water management infrastructure along the middle reaches of the Syr Darya River in Uzbekistan. This assessment integrated direct observations with technical briefings provided by facility operators, as well as supplemental data from SIC ICWC (CAWATERinfo) platform and existing reports from national project experts.

The following sections provide a detailed overview of the surveyed facilities, presented in chronological order according to the mission's itinerary.

II. Expedition route and studied infrastructure

DAY 1 (27.10.2025 г.): Tashkent province

Upper Chirchik Hydroscheme

The first site visited during the trip to study the current status of water infrastructure was the Upper Chirchik Hydroscheme (UCHS) located in the Upper Chirchik district of Tashkent province. The UCHS is a strategic hydraulic facility located along the Chirchik River, which is both a transboundary river and the main artery providing drinking and irrigation water to the city of Tashkent and surrounding districts in Tashkent province.

Headwater of Upper Chirchik Hydroscheme (Chirchik River)

Commissioned in 1957, the Upper Chirchik Hydroscheme operates with a design flow of 1,600 m³/s. The facility diverts water into the 87-km Left-bank Karasu Canal at a rate of 180 m³/s, supporting 161,000 ha of farmland in the Tashkent province.

Tailwater of the Left-bank Karasu Canal

Mr. U.T. Baratov, Head of the Upper Chirchik Hydroscheme, briefed the group on the facility's operations and water distribution between the Chirchik River and the Left-bank Karasu Canal. He also highlighted recent modernization efforts and the successful integration of an automated control system.

Head of the Upper Chirchik Hydroscheme U.T. Baratov and Director of SIC ICWC D.R. Ziganshina

During the briefing, Mr. Baratov noted that the hydroscheme underwent extensive reconstruction and modernization in 2015–2016, following a Presidential Resolution. Key improvements included:

- full replacement of all 14 gates and lifting mechanisms at the hydroscheme, along with 10 gates and lifting mechanisms at the Left-bank Karasu Canal intake;
- concrete reinforcement of the intake's downstream slopes over a 140-meter stretch and the replacement of all perimeter fencing.
- modernization of the automated gate control and dispatch systems, including a complete replacement of electrical equipment and the fabrication of new stop logs for future maintenance.

The modernization concluded with the integration of an automated control system by OOO "Sigma Avtomatika". This system ensures the reliable and safe management of water resources by enabling automated level regulation and real-time equipment monitoring, optimizing water distribution. These guarantee the hydroscheme's efficient and secure operation.

Demonstrating hydroscheme's ACS

Gauging station in headwater of UCHS

It was emphasized that these modernization efforts have secured the long-term reliability of the hydroscheme. The upgrades provide enhanced resilience to fluctuating flow levels (particularly during flood events) and guarantee a stable water supply for more than 160,000 ha of irrigated land across Tashkent province.

Zakh and Khanym Canals

Following the inspection of the main intake, participants visited Site No. 3, a territorial branch of the Upper Chirchik Hydroscheme Authority. This site houses the headworks for the Zakh and Khanym interstate canals.

There, Ulugbek Baratov provided an in-depth briefing on the facilities' operations and the transboundary water distribution protocols between the Republics of Uzbekistan and Kazakhstan.

The team at the site of the Headworks of the Zakh and Khanym canals

Constructed in 1949, the **Zakh Canal** has a maximum capacity of 65 m³/s and a total length of 62 km. Within Uzbekistan, the canal spans 38 km; this includes a 500-meter reach from the headworks to the gauging station, which is managed by BWO Syr Darya. The final 24 km section runs along the border, where the canal's right bank falls under Kazakh jurisdiction and the left bank remains within Uzbekistan.

The canal supports a total irrigated area of 45.7 thousand ha, distributed between Tashkent province, Uzbekistan (17.1 thousand ha), and Turkistan province, Kazakhstan (28.6 thousand ha).

Also constructed in 1949, the **Khanym Canal** has a maximum capacity of 15 m³/s and spans a total length of 136 km. Within Uzbekistan, the canal covers 22.2 km, including a 180-meter reach from the headworks to the gauging station managed by BWO Syr Darya. The canal irrigates a total of 8,300 ha, supporting 700 ha in Tashkent province of Uzbekistan and 7,600 ha in Turkistan province of Kazakhstan.

Headworks of Zakh Canal

Headworks of Khanym Canal

Tashkent Reservoir (Tashkent Sea)

Tashkent Reservoir (formerly the Tuyabuguz Reservoir) is a strategic hydraulic facility located along the middle reaches of the Ahangaran River. It serves as a water source for both the Tuyabuguz Left-bank Canal and the Left-bank Karasu. The reservoir features a surface area of

19.8 km², with a total capacity of 250 million m³ and a useful storage volume of 224 million m³. It reaches a maximum depth of 34.0 m, with an average depth of 12.5 m.

Tashkent reservoir (left bank)

Dadajon Dusmatov, Head of the Tashkent Main Canal Authority, provided participants with an overview of the reservoir's operations and the recent rehabilitation work performed at the dam's headwater. Specifically, the application of modern anti-seepage materials to the joints of the concrete slabs has significantly reduced water losses through the body of the dam.

D.B. Dusmatov, Head of the Tashkent Main Canal Authority; employees of the Tashkent Reservoir; and D.R. Ziganshina, Director of the SIC ICWC, inside the administration building of the Tashkent Reservoir.

The reservoir was commissioned in 1963, following a construction period that spanned from 1953 to 1963. The project was built based on designs developed by the "Sredazgiprovodkhlopok" Institute.The Tashkent Reservoir consists of an earth-fill dam with a crest length of 2,815 meters, flanked by embankment levees with a combined length of 1.9 km. The central section of the dam, which spans the Angren (Akhangaran) River floodplain, is constructed with a loam core. This core is reinforced at the top and bottom with gravel packing that gradually tapers toward the edges. The dam face is protected by precast reinforced concrete slabs of 2×2×0.2 m and cast-in-place (monolithic) concrete. The flanking levees are constructed entirely of loam.

The reservoir was constructed for seasonal regulation of the Akhangaran and Chirchik rivers to meet irrigation demands. A portion of the Chirchik's water is diverted via the Tashkent Canal and enters the Akhangaran at the first siphon.

The facility is equipped with a 440-meter-long chute spillway featuring a 34-meter drop. The maximum discharge capacity of the spillway is 950 m^3/s. The reservoir operates two tower-type outlets: one delivers water to the Left-bank Karasu via a dedicated right-bank canal (q_{max}=55 m^3/s), while the second one serves as the head regulator for the Tuyabuguz Left-bank Canal (q_{max}=25 m^3/s). In 2019, the 12-MW Tuyabuguz HPP was commissioned on the right-bank canal.

The team and the staff of Tashkent Reservoir

The reservoir provides water to 122,000 ha of irrigated land across four districts of Tashkent province. A dedicated recreation zone has been established in the area surrounding the "Tashkent Sea," and the reservoir itself is a popular destination for recreational fishing.

DAY 2 (28.10.2025): Syrdarya province

Dustlik (Dostyk) Canal

The second day of the study visit for assessment of the current status of water infrastructure began with a visit to the Dustlik Canal Headworks.

Headworks of the Dustlik Canal

The Dustlik (Dostyk) Canal is an interstate irrigation canal crossing Syrdarya province of Uzbekistan and Turkistan province of Kazakhstan. The canal's headworks are located on a diversion channel downstream of Farkhad HPP in Tashkent province, Uzbekistan.

During the visit, Mr. Sh. A. Parmanov, head of the Bekabad branch, briefed the participants on the operation of hydroscheme, as well as the results of the reconstruction and modernization of the Dustlik Canal headworks.

Presentation of the completed reconstruction and modernization of the Dustlik Canal's headworks

The total length of the Dustlik Canal is 117 km, with 68 km running through the Republic of Uzbekistan and 49 km through the Republic of Kazakhstan. Commissioned in 1948, the canal has a design discharge capacity of 230 m^3/s. The total command area covers 236,000 ha,

including 100,000 ha in Syrdarya province of Uzbekistan and 136,000 ha in Turkistan province of Kazakhstan. The infrastructure includes the Dustlik Canal headworks and specialized structures for water discharge into the Syr Darya River.

During the presentation Mr. Parmanov highlighted that the Dustlik Canal headworks underwent a comprehensive reconstruction and modernization between 2021 and 2023, mandated by a Presidential Resolution of the Republic of Uzbekistan. Key upgrades were as follows:

- all ten gates and lifting mechanisms of the headworks and spillway were replaced, and the 16-ton gantry crane was fully refurbished;
- protective barriers and the onsite aqueduct were replaced;
- a 200-m section of the spillway's tailrace (bottom and side slopes) was concrete-lined, and a new concrete gauging station was installed;
- the automated gate control system was modernized, the dispatching system was implemented, and electrical components were replaced.

Tailrace of the Dustlik Canal's spillway structure

The modernization concluded in 2024 with the installation of an automated control system. These comprehensive upgrades at the Dustlik Canal Headworks have secured the facility's long-term, fail-safe operation, guaranteeing a reliable water supply for 236,000 ha of irrigated land across both Uzbekistan and Kazakhstan.

Additionally, the team visited a section of the canal within the Gulistan city. Between 2016 and 2019, this 4,750-meter stretch underwent extensive concrete lining of both the bed and the side slopes. Bakhtiyor Kadyrov, head of the Gulistan Authority of Hydroschemes and Dustlik Canal, briefed on the milestones achieved during this period.

Head of the Gulistan Authority of Hydroschemes and Dustlik Canal Mr. Kadyrov

Mr. Kadyrov noted that under Presidential Resolution P-4421 (March 9, 2015), a Republican Commission led by Prime Minister Shavkat Mirziyoyev was established. This commission was tasked with developing a comprehensive 2015–2019 program to improve Gulistan's drainage systems, reclaim land, lower groundwater levels, and modernize the city's social and engineering infrastructure.

He further emphasized that these efforts were solidified by Presidential Resolution PP-2401 (September 4, 2015), which approved and launched the formal program for Gulistan's urban renewal and land reclamation.

Islamjon Muminov, Head of the Repair and construction division, added that the reconstruction involved: grading and concrete lining of both slopes, the refurbishment of canal-side inspection roads, the installation of safety railings and barriers, and the addition of lighting systems.

Concreting of the Dustlik Canal from DP482 to DP529+50 within the Gulistan city

The Dustlik Canal was reconstructed using concrete lining and stone reinforcement on the slopes. The process began with mechanized desilting to clear sediment from the bed and slopes, alongside the removal and off-site disposal of overgrown vegetation.

On sections where old concrete slabs were present, they were dismantled and cleared. For areas requiring backfilling, earth was deposited for embankments and subjected to rigorous compaction. In confined or narrow stretches, the soil was compacted manually.

Dustlik Canal within the Gulistan city

The reconstruction of the Dustlik Canal in the territory of Uzbekistan has successfully mitigated seepage in central Gulistan, leading to a significant reduction in both water losses and groundwater levels. Furthermore, these improvements have boosted the canal's flow capacity, ensuring a more reliable water supply to irrigated land in Syrdarya province of Uzbekistan and Turkistan province of Kazakhstan.

South Hunger Steppe Canal (SHSC)

The South Hunger Steppe Canal (SHSC) is an irrigation canal that originates from the headwater of Farhad HPP on the Syr Darya River. The total length of the canal is 123 km. It serves a total command area of 370,000 ha, which includes 131,000 ha in the Syrdarya province and 239,000 ha in Jizzakh province. The canal was constructed and commissioned in 1961.

Tailwater of South Hunger Steppe Canal

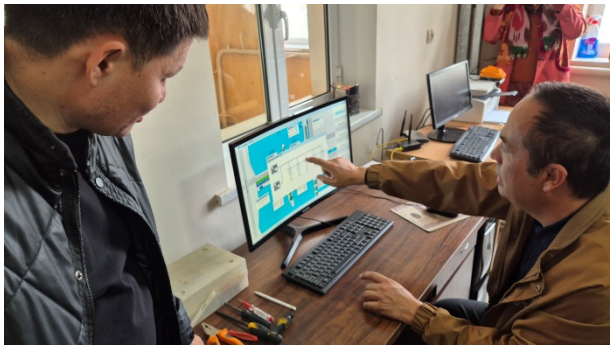
Mr. I.M. Muminov, Head of the Repair and construction division of BWO Syr Darya, briefed participants on the facility's operations and the outcomes of reconstruction of the SHSC Headworks located at DP145-00. The modernization efforts were carried out between 2020 and 2021.

Head of the Repair and construction division I.M. Muminov

Mr. Muminov highlighted that, pursuant to a Presidential Resolution, the Canal at DP145 underwent extensive reconstruction and modernization between 2020 and 2021. The project included the following key upgrades:

- replacement of all ten gates and their lifting mechanisms, along with the installation of new protective barriers;
- concrete lining of the structure's tailrace;
- construction of four gauging stations at headwater and tailwater;
- modernization of automated gate controls and dispatching systems, complete overhaul of the electrical systems, including the installation of two new transformer substations.

The reconstruction was concluded with the installation of an automated control system (ACS), mirroring the modernization strategy used at other key facilities. Developed and implemented by OOO "Sigma Avtomatika", the system ensures the reliable and safe management of water resources. It enables automated water level regulation, real-time equipment monitoring, and the optimization of water distribution, ensuring the hydroscheme operates efficiently and safely.



Introduction to hydroscheme's ACS

Gauging station at SHSC tailwater

The reconstruction and modernization of SHSC at DP145 have secured the facility's reliable operation. These improvements guarantee a stable water supply for 370,000 ha of irrigated land across Syrdarya and Jizzakh provinces of Uzbekistan.

Team along the Central branck of SHSC

Water Saving Technologies

The visit to these major waterworks facilities provided participants with a firsthand look at the massive scale of ongoing reconstruction and technical renewal. However, infrastructure modernization is only one side of the coin; water conservation at the field level is equally critical. Without efficient agricultural water use, even the most advanced hydraulic structures cannot guarantee sustainable water management.

To explore efforts for reducing seepage losses in irrigation network, participants reviewed the results of canal lining projects and the application of innovative anti-seepage materials. In Syrdarya province, this includes the use of bentonite mats - a rolled geosynthetic waterproofing material. These mats are installed as anti-seepage barriers to prevent water losses during transport, significantly increasing the system's overall efficiency coefficient.


Laying of bentonite mat on the on-farm irrigation network

Modernizing water infrastructure is a critical step toward improving water security; however, the impact of such investments remains limited without the adoption of water-saving technologies directly in the fields. To address this, the expedition concluded with a field visit, where participants observed the practical application of drip and sprinkler irrigation systems firsthand.


Drip and sprinkler irrigation system

III. Key conclusions

Modernization works: Reconstruction and automation of key waterworks facilities - Upper Chirchik Hydroscheme, Dustlik and South Hunger Steppe Canals - have already improved the regional water management system. Upgraded equipment, coupled with the installation of modern sensors and remote monitoring systems, has significantly enhanced the precision and efficiency of water regulation. These advancements ensure a more equitable distribution of water across different sections while substantially minimizing conveyance losses. Collectively, these measures establish a robust foundation for more rational water use and a resilient supply system in the context of changing climate and rising water demands.

Seepage issues can be solved. Integration of modern engineering solutions is already yielding tangible results. Thus, the application of innovative anti-seepage materials at the Tashkent Reservoir, coupled with the phased concreting of critical canal sections have significantly

curtailed seepage losses and improved reliability of hydraulic facilities. The benefits of these measures extend beyond simple resource management. These measures contribute to a more rational use of every cubic meter of water but also prevent waterlogging of adjacent territories, improving conditions for land use and increasing resilience of the entire water management system in the region.

The transboundary dimension matters. The Zakh, Khanym, and Dustlik Canals are not only pieces of infrastructure but also vital arteries of cooperation between Uzbekistan and Kazakhstan. The efficient operation of these facilities directly impacts the sustainability of water supplies, agricultural growth, and the environmental equilibrium in the border regions. Furthermore, the joint management and coordination of water use along these canals serve a diplomatic purpose: they strengthen trust between nations, foster mutual understanding, and help refine the mechanisms for sustainable water partnerships across Central Asia.

The main challenge lies in the field. The field serves as the ultimate proving ground for the system's overall efficiency. The visit to a field with drip irrigation demonstrated that the future of water sector depends on an integrated approach combining large-scale infrastructure modernization with technologies adopted at the end-user level. The fate of the entire water management system is decided in the fields, where water is ultimately transformed into crops. It is here that precision in delivery, the optimization of irrigation rates, and the stewardship of every drop become paramount. This approach does more than just conserve water; it drives agricultural productivity and builds resilience against the growing pressures of climate change and resource scarcity.

Next steps. Based on the results of the visit, SIC ICWC is preparing a detailed analytical report with recommendations for national and international partners. Photo and video materials collected during the visit will be used to produce a documentary film to raise awareness of the status and importance of water infrastructure in the Syr Darya River basin.