Water Treatment Facility at Taboshar

Mitigating Environmental and Public-Health Risks from Contaminated Mine Water in Istiklol, Tajikistan

Background

The Istiklol area (former name – Taboshar) is one of Tajikistan's most challenging uranium legacy sites. For decades, contaminated mine water from Adit No. 6 has moved through fractured geological layers into surface channels and, at times, toward residential areas, creating persistent environmental and public-health risks.

Earlier plans for a conventional treatment facility proved unworkable due to high operational and maintenance demands. This led the European Union, together with ISTC, G.E.O.S. Ingenieurgesellschaft mbH and Tajik authorities, to reassess the strategy and adopt a more resilient, low-maintenance, and locally manageable solution.

Redesigned solution

A prefeasibility study evaluated several options to manage contaminated mine water and secure safe drinking water for Istiklol. Stakeholders selected a dual-pipeline solution using natural hydrological conditions instead of complex treatment systems.

The approach combines a protected diversion line directing contaminated mine water to a controlled infiltration zone, with a gravity-fed pipeline bringing clean spring water from Chat-Souf and Urta-Souf to the city's reservoirs. Endorsed by the **European Union**, ISTC, G.E.O.S. and Tajik authorities, this solution reduces technical risks, eases long-term operation, and ensures a reliable water supply.

Project	Water Treatment Facility at Taboshar (INSC 2018/402-647)
Project Duration	2018 - 2026
Funding	EUR 3.7M fully funded by the European Union
Location	Istiklol (Taboshar), Sughd Region, Tajikistan
Nature of Works	Construction of two pipeline systems: diversion of contaminated mine water; delivery of clean spring water to Istiklol
Infrastructure Elements	- 4.975 m contaminated-water diversion pipeline + infiltration well; - 15.412 m fresh-water pipeline – 2 sand traps (Chat Souf & Urta Souf) – Water-intake structure at Adit No. 6
Implementing Agencies	International Science and Technology Center (ISTC); G.E.O.S. Ingenieurgesellschaft mbH
Beneficiaries	Government of Tajikistan City of Istiklol (Taboshar)
Primary Objective	Reduce environmental and public-health risks from contaminated mine water and improve long-term water security
Key Impacts	Safe diversion of contaminated mine water; reliable supply of clean drinking water for ~15,000 residents; reduced radiological exposure; long-term environmental protection

Implemented Works and Engineering Approach

Photo 1: *Rebar and formwork for infiltration structure construction*

Construction methods were adapted to steep slopes, loose debris and highly variable ground stability across the corridor. Works included rock excavation, slope cutting, trenching in mixed geological layers and the installation of protective anchoring systems to stabilise pipes in sections exposed to erosion or seasonal runoff. All components were designed for gravity-fed operation and low-maintenance durability in remote locations.

Photo 2: *Pipe alignment reinforcement near Adit No. 6*

Contaminated-Water Diversion System

The diversion line consists of HDPE pipes installed along a reinforced alignment near Adit No. 6. Excavation teams prepared narrow trenches in rocky terrain, followed by placement of compacted bedding layers to prevent pipe deformation. Reinforcement cages and concrete footings were used at transition points, junctions and steep inclines.

A concrete infiltration structure was constructed downstream to distribute inflow evenly and reduce hydraulic pressure. Waterproofing membranes, steel rebar and formwork assemblies were used to ensure structural stability.

Photo 3: Pipeline installation using elevated supports across a steep mountain section

Freshwater Transmission System

The 15-km fresh-water pipeline uses large-diameter HDPE sections welded with thermofusion units. Field teams carried out welding, pressure testing and on-site visual inspections before installation. Pipeline segments running across unstable ground are supported by steel frames or anchored on concrete pedestals to prevent displacement.

Inspection chambers and valve units were installed at several access points to allow flow control, system draining and periodic maintenance. Pipeline crossings over ravines were achieved using suspended support structures fixed to reinforced anchors.

Spring-Water Intake and Flow Control Components

At the Chat-Souf and Urta-Souf springs, the existing outlets were upgraded with reinforced chambers, protective concrete rings and large-diameter valve mechanisms to regulate flow. Flow tests were performed to verify discharge stability, identify potential air pockets and calibrate flow-control elements.

Inspection & Control Infrastructure

Routine control structures were integrated along the pipeline to ensure long-term operability in remote terrain. Inspection chambers were installed at hydraulic transition points and at areas where natural runoff may accumulate. These units allow scheduled access for flow measurements, junction checks, pressure control and periodic maintenance.

Protective housings were added to valves and junction units to shield sensitive elements from temperature variations, vandalism, and debris generated by seasonal flows. Clearance zones were stabilised with rock bedding and compacted layers to minimise erosion risks during heavy rain or thaw periods.

Photo 5: Testing of flow rate at fresh-water pipeline discharge point

Photo 4: Field pressure-testing of HDPE pipeline segments

Operational Sustainability and Future Integration

The new system provides a durable, low-maintenance solution that reduces radiological and environmental risks at the Istiklol/Taboshar legacy site while securing a stable supply of clean spring water for the local population.

It also creates the technical basis for upcoming remediation steps, including strengthened monitoring, regulatory control, and long-term site management. As the first EU-funded pilot of its kind in Central Asia, it will support future actions in the region.

Final commissioning and handover to Tajik authorities will ensure sustained, locally operated benefits.

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