

# Integrated Rural Development for IDP Communities in Azerbaijan through Revitalization of Kahriz Water Supply System



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## IOM Azerbaijan



In Azerbaijan, which is located in an arid zone, water shortage is one of the main problems that rural populations face. Compared to other countries in South Caucasus, Azerbaijan's water resources are much more limited. The problem of water shortage in Azerbaijan negatively affects agricultural development as well as the hygiene and sanitation conditions of local communities. In addition to strengthening the access of rural communities to potable water supply, the current economic conditions in the country necessitate initiatives supporting vulnerable groups, such as internally displaced persons (IDPs) and refugees.

An approach to genuinely address the water shortage problem, already successfully tested and proven to be effective, is the rehabilitation of eco-friendly hydraulic structures known as “kahriz”, traditionally used as the main water source in arid zones of Azerbaijan. The main advantage of this approach is that, once rehabilitated, kahriz systems provide water all year round with no electricity. It is estimated that at least 1,400 such kahrizes exist in 20 regions of Azerbaijan, if all kahrizes are rehabilitated, it can meet 30% of water demand in the country.

Kahriz has the following advantages:

- It doesn't need any external energy (fuel, electricity)
- It doesn't overexploit underground water
- It provides water of excellent quality
- It requires low maintenance costs
- If properly maintained, it functions for centuries

Renovating kahriz systems has been among IOM's most successful inputs in Azerbaijan for the past two decades. IOM views its participation in community development programs as a means to address key drivers of irregular and economically-induced rural-to-urban migration and its impacts on individuals and society. Since 1999, IOM Azerbaijan restored over 180 kahrizes that directly benefited close to 25,000 households in rural areas.

## Description of the Initiative



Kahriz is a system fed through subterranean water. Some volume of surface water and precipitation water are drained through less water-resistant soil structures and gather on more water-resistant layers and through this cycle subterranean water volume is accumulated to create an aquifer. Kahriz is constructed as a gently sloping subterranean canal, which taps a water-bearing zone at elevation higher than where the agricultural lands of communities lay. Kahrizes have played a vital role in underground water extraction since very ancient times.

Traditionally, all the work regarding the construction and repair of kahrizes is carried out by a specialized group of traditional artisans called “kankans” through manual labor. This is the main factor that has a negative impact on the economic efficiency of a kahriz. To increase the economic efficiency of these systems, IOM decided to develop an innovative technological method, which is designed to carry out a full cycle of restoration work using machines and mechanisms adapted for work in kahriz systems. In recognition of this, Kahriz Project received the International Energy Globe Award in 2021.

## Product Innovation



Vertical and horizontal directional drilling equipment have been successfully tested and prototyped. Currently, it is being piloted during kahriz restoration in the framework of the above-mentioned project.

Similar technology exists and is applied for water and oil well drilling. Existing machines have been adapted for kahriz restoration and its drill heads have been changed to fit the purpose. Hence, it is an improvement of an already existing invention.

The project is implemented in cooperation with the State Committee for Affairs of Refugees and IDPs of the Republic of Azerbaijan and funded by the Korea International Cooperation Agency (KOICA). What is more, IOM Regional Office in Vienna, as well as IOM HQ provides support during project implementation. For procurement of equipment with technical specifications adapted to restoration of kahrizes, IOM Azerbaijan has partnered with a number of local vendors. Vertical drilling equipment was provided by the Gidromashservice CJSC while horizontal directional drilling equipment by AK Piping Materials CJSC.

## Results



As mentioned above, the technology improves effectiveness, work speed and safety. For example, with manual labor – traditional method, vertical digging of kahriz took 15 days while with drilling machine, it takes 2 hours. Horizontal drilling similarly increases the efficiency, work speed and effectiveness. In contrast to traditional method, drilling equipment is also very safe as kankans control machines outside kahriz tunnels.

Within this project, 18 kahrizes in Aghdam, Granboy, Fuzuli, and Gazakh districts of Azerbaijan have been restored, including via innovative technology, providing 3521 households with safe water for drinking and agriculture. Utilization of vertical and horizontal drilling machines have increased speed of kahriz restoration. Previously these household were getting water from artisan wells or distribution by truck water cisterns, and in both cases beneficiaries were paying for the water. Currently Kahriz water is free of charge and savings can be used for improving their livelihood or in the long run, making investments.

Drilling equipment is considered for restoration of all kahrizes. The decision whether to use innovative technology or not is made by technical experts according to kahriz conditions. Restoration of some kahrizes with drilling equipment is not possible due to technical reasons. There is huge potential for scaling because kahrizes have been used for centuries not only in Azerbaijan but also in other countries located in arid and semi-arid zones.

## Scaling and Sustainability



Currently, practice of rehabilitation of kahrizes with the help of drilling equipment is only known in Azerbaijan. However, as mentioned above, there is big potential for its application in other countries that have kahrizes. It should be highlighted that this technology was presented during the International Conference titled “Kahriz as an architectural monument, sustainable source of water and factor of social and economic development” that took place on 26-27 May 2022. IOM Azerbaijan’s innovative practice caught interest of more than 80 conference participants, including kahriz engineers from Tunis, Iran, Oman, etc.

Skills of kankans were normally transferred from “father to son” and have eroded over time due to lack of market demand. Hence, in the framework of the project, 50 kankans were trained in order to restore forgotten skills, as well as gain new insights of rehabilitation of kahrizes with drilling technology. What is more, Kahriz Research and Information Center has been launched within Azerbaijan Technical University, which is located in Ganja city. The Center aims at increasing awareness and promoting scientific studies on kahriz engineering, including via new practices among academic circles. These factors contribute to sustainability of the current innovation.

For more information, please contact IOM Azerbaijan office.

