



# ‘Smart’ water kiosks improve access to drinking water in rural Mongolia

## SUMMARY

In Mongolia, access to safely managed drinking water has increased nationally, but access in rural, peri-urban, and low-income locations remains low. Climate change, limited and declining freshwater sources, deforestation, and pollution are degrading water quantity and quality. To address the situation, UNICEF is supporting WASH facilities that are sustainable for local communities under the KOICA-funded project “Community-Based Climate Resilient Water, Sanitation, and Hygiene Interventions” among others, targeting three provinces (Bayankhongor, Gobi-Altai, and Zavkhan). UNICEF supported two smart water kiosks in two sub-provinces (Yesunbulag and Khukhmorit) in Gobi-Altai province, improving services from a **Basic** level to ‘Basic +2’<sup>1</sup>, meaning a Basic service level with 2 of the 3 elements of Safely managed drinking water service (improved source that is free from contamination and available when needed). As a result of UNICEF’s work, the local government allocated its own funds to upgrade an additional 20 water kiosks to provide ‘basic +2’ services for the rural communities in Mongolia.

## Introduction

National context - Located in the heart of Central Asia, between the People’s Republic of China and the Russian Federation, Mongolia has 3.3 million citizens living over a territory of 1,566,500 km<sup>2</sup>, making it the least densely populated country in the world. Mongolia faces unique challenges related to its vast territory, dispersed population, and extreme weather conditions. It is the second largest land-locked country in the world and is exposed to winter temperatures as low as -40° Celsius. A third of its population leads a semi-

nomadic lifestyle, constantly on the move in search of better pastureland for their herds.

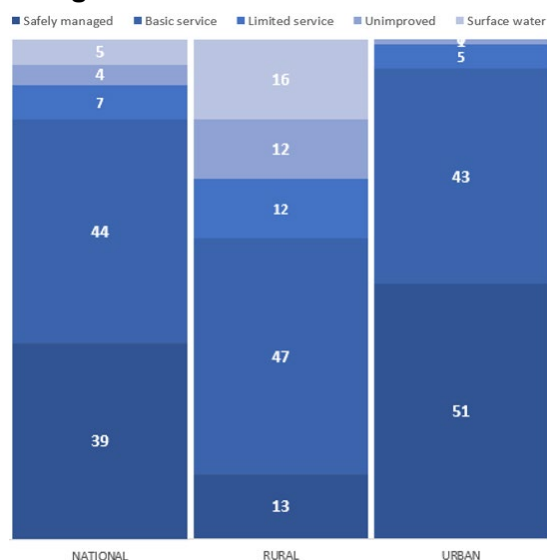
Within this context, UNICEF Mongolia worked with the Government of Mongolia to implement the Korea International Cooperation Agency (KOICA)-funded “Community-Based Climate Resilient Water, Sanitation, and Hygiene Interventions in Mongolia (2019-2022)” project, targeting three of Mongolia’s 21 provinces: Bayankhongor, Gobi-Altai, and Zavkhan. The project aimed at strengthening the resilience of children and their communities to climate change

<sup>1</sup> “Basic+2” is a service level introduced by UNICEF in its Water Game Plan, as the minimum service level to sharpen the focus of the organization on the path to 2030, by identifying an intermediate service level between ‘basic’ and ‘safely managed’ service level ambition of the SDG. This intermediate service level is ‘Basic+2’; and is defined as a service that:

1. Meets the JMP basic service levels of: • An improved water source, • Collection time not exceeding 30 minutes (round trip including collection).
2. Also has +2 of the three components of a safely managed service: • Free from fecal and priority chemical contamination • Available when needed but need not be necessarily located on premises

through enhanced access to quality and reliable WASH services.

**Figure 1: Drinking water situation in Mongolia**



Source: WHO/UNICEF JMP (2023)

Rural provinces in Mongolia have persistently low coverage of safely-managed drinking water at 11 per cent. The three rural provinces were the focus of UNICEF Mongolia’s Country Programme (2017-2022) because of their low access to safe drinking water services. Out of 21 total provinces, Bayankhongor was ranked 16, Zavkhan 20, and Gobi-Altai 21 in access to safe drinking water services<sup>2</sup>. Gobi-Altai province in particular suffers from both water scarcity and poor water quality.

Due to the low population density in rural areas, piped water on premises is often not possible. Building pipelines and setting up water treatment facilities require significant investment and resources. In areas with low population density, it might not be economically viable for the

<sup>2</sup> Economic Policy and Competitiveness Research Center, 2017, Mongolia Provincial Competitiveness Report

<sup>3</sup> NSO. 2019. Social Indicator Sample Survey-2018, Survey Findings Report

<sup>4</sup> WHO/UNICEF, JMP, 2020, <https://washdata.org/data/downloads#MNG>

government or local authorities to establish and maintain such infrastructure. For example, in Gobi-Altai, chemical water quality is poor due to high mineralization and requires costly water filters and water-softening equipment. In addition, households may not use safe water treatment and storage practices compromising microbiological water quality. A recent survey found that 16 per cent of sources and 19.7 per cent of households were contaminated with *E. coli*, an indicator of potential fecal contamination and linked to diarrhoea.<sup>3</sup>

In schools and kindergartens, limited water access and overcrowded WASH facilities are common problems. An estimated 74 per cent of schools have access to basic drinking water.<sup>4</sup>

### Drinking water services in Gobi-Altai Province

Situated in the western part of Mongolia, Gobi-Altai province is the second largest province with a population of 58,343 and its center is Yesunbulag with 18,720 residents. It has 18 sub-provinces and two villages.<sup>5</sup>

The 2018 survey indicates only 12.5 per cent of the population of Gobi-Altai has Safely Managed drinking water services compared to a national average of 30 per cent.<sup>6</sup>

**Table 1: Drinking Water Coverage in Gobi-Altai<sup>7</sup>**

Place	Safely managed	Basic	Limited
Gobi-Altai	12.5	65	5.5

<sup>5</sup> ADB, 2020, Overview of Mongolia’s water resources system and management

<sup>6</sup> National statistics office of Mongolia and UNICEF, 2018, Social Indicator Sample Survey/MICS

<sup>7</sup> NSO, 2022, Access to drinking water supply status in the three target aimags

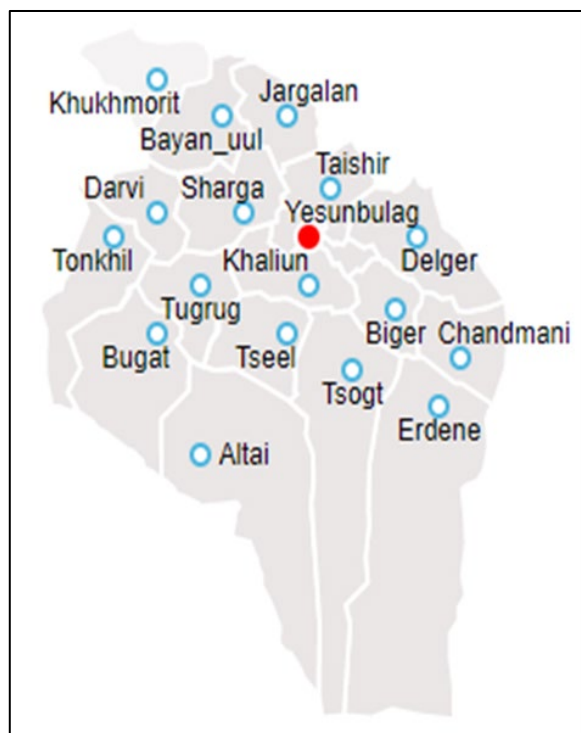
Gobi-Altai province and particularly rural soums<sup>8</sup> (sub-provinces) are historically dependent on groundwater with levels of magnesium and calcium that exceeded international standards.

**Figure 2: Map of Mongolia**



Source: [https://sco.wikipedia.org/wiki/File:Map\\_mn\\_gobi-altai\\_aimag.png](https://sco.wikipedia.org/wiki/File:Map_mn_gobi-altai_aimag.png)

**Figure 3: Location of Gobi-Altai Province**



Source: [https://commons.wikimedia.org/wiki/File:Mongolia\\_Govi-Altai\\_sum\\_map.png](https://commons.wikimedia.org/wiki/File:Mongolia_Govi-Altai_sum_map.png)

<sup>8</sup> Mongolia is divided administratively into 21 aimags (provinces), and each aimag is divided into soums (sub-provinces) and baghs (smallest unit).

Place	Unimproved	Surface
Gobi-Altai	12	5

Khukhmorit sub-province in Gobi-Altai province is home to more than 2,700 people. This sub-province is 275 km away from the center of the province and connects three provinces, Gobi-Altai, Zavkhan, and Khovd.

From 2017 to 2019, annual water quality analyses were carried out on samples from 77 drinking water kiosks and ground wells in 18 sub-provinces and 2 villages of Gobi-Altai province. The testing is funded by local development funds, the World Bank, and UNICEF. Detailed laboratory tests were carried out for 62 parameters for 3 consecutive years.

The water quality analyses showed that traditional water kiosks in 7 sub-provinces (Khaliun, Sharga, Tonkhil, Dariv, Bayan-Uul, Khukhmorit, and Tugrug) did not meet the standard requirements (MNS:0900-2018) and high concentration of heavy metals were detected in Khukhmorit's water kiosk. For example, transition metals such as cobalt, scandium, nickel, molybdenum, zinc, etc., and semi-metals (arsenic, rubidium etc.) and other metals (europium and uranium) were found.

There were additional challenges associated with traditional water kiosks, beyond poor water quality. The kiosks were only open during the daytime given they relied on an attendant to operate the kiosk and collect fees. Since many adults were working during the day, water would often be collected by children. Additionally, the kiosks did not have a sustainable model for operation and maintenance. Therefore, these traditional water kiosks – though meeting the definition of basic water services – were often not providing water that was free from contamination or available when needed.

Recommendations to improve the level of service included:

- Installation of purification and desalination equipment
- Insulation and maintenance of water kiosk facilities
- Establishment of a protected zone around the water points and putting up fences and signboards to restrict activities and so protect the source water quality
- Solving issues related to ensuring regular operation during winter and heating it in a way that meets the hygiene requirements, and
- Solving issues related to installing automatic (so-called 'smart') devices and raising funds to improve access to and continuous supply of safe drinking water to families and children.

## Description of UNICEF Interventions

### Introduction of Smart Water Kiosk in Yesunbulag, Gobi-Altai

In Yesunbulag (Gobi-Altai province center), UNICEF aimed to demonstrate how all of these recommended improvements could be made to provide people with basic drinking water services that are free from contamination and available when needed (referred to as 'basic +2', since it fulfills two of the three additional criteria for a safely managed service level). This intervention was aimed at demonstrating a sustainable model and then advocating for the local government to replicate it with their own funds.

In 2020, UNICEF supported the conversion of two existing water kiosks into automated, 24-hour kiosks, representing an improvement in service level from basic to 'basic +2' for 5,000 households. To do this, UNICEF provided financial and technical support for the demonstration of the smart water kiosk system,

including a server equipment package, monitoring software, and 3,000 copies of smart cards for customers. Key improvements included:

- **24-hour/7-days operational.** Previous water kiosks required a caretaker who looked after the facility from 9 am to 5 pm, and local residents could only collect water during the scheduled time. After the installation of the smart water kiosk systems, the community can access safe drinking water at any time.
- **User-friendly equipment.** Each smart water kiosk has a description displaying how it functions and how to use it. Users can easily fetch water by simply tagging their pre-paid card and pressing the green button to fetch water and the red button to stop.
- **24-hour lighting** that enables residents to access the facility at night and has improved the safety of the water source and the surrounding area.

**Figure 4: Smart water kiosk in Bayanshand, Yesunbukag**



Source: UNICEF/Mongolia/JunghwaKim

As a result, after UNICEF's demonstration, the provincial government allocated funding (estimated USD 60,000) and installed 21 water kiosks with automatization equipment together with water purifying and/or disinfection equipment in the province center, allowing all of them to become operational 24 hours, 7 days per week. As a result, an estimated 18,720 people have

moved from a basic service level to ‘basic +2’ service level.

At the province center level (Yesunbulag), a local government-owned publicwater utility company, Undarga-Altai is responsible for supplying clean water to the population. They check water usage with a real-time monitoring system to deliver safely managed water. The system displays a dashboard that shows the status of 22 smart water kiosks with different indexes: temperature, consumption, time, number of users, etc. The water samples are taken and analysed by the province inspection agency every month. Since then no contamination has been identified. The company is also in charge of sewage collection and removal and ensures the continuous and reliable operation of clean water supply and sewerage for residences, institutions, and industries. Engineers from the Undarga-Altai monitor smart water kiosks and provide technical support to ensure good water quality. Their advice helps local governments to install and operate appropriate water purification filters and equipment according to the bacteria, mineral, or chemical level of the water.

**Figure 5: Real-time monitoring dashboard for smart water kiosk**



Source: UNICEF/Mongolia/JunghwaKim

The tariff for water ranges from MNT 1.7 to MNT 3 per liter (0.49-0.86 USD/m<sup>3</sup>), and the average consumption has increased from 4-5 liters to 7.5 liters per person per day. As a result, the income of the service provider in Undarga-Altai (established in 1992) has increased by a factor of ten, from 30,000 MNT (9 USD) to 300,000 MNT (93 USD) per month per kiosk after installing the smart system. Now, the caretaker cost of the kiosk facility is no longer needed due to this automatic system that monitors the whole process. Bayalag-Gobi company based in Ulaanbaatar provides technical support to the Undarga-Altai for the operation and maintenance of these 22 smart water kiosks (real-time monitoring server) with an annual service fee of 6 million MNT (1,862 USD), such as checking errors of the smart equipment, servers, and other technical issues.

**Figure 6: Water purification filter at the smart water kiosk in Jargalan sub-province, Gobi-Altai**



Source: UNICEF/Mongolia/JunghwaKim

### Improving drinking water quality in Khukhmorit, Gobi-Altai

In Khukhmorit, a rural sub-province in Gobi-Altai province 275 km away from the center, UNICEF partnered with the local government of Gobi-Altai province to build one new smart water kiosk. Prior to the water kiosk, people were relying on a traditional water kiosks. The new kiosk improved the reliability and availability of the water supply while providing better quality water.

The smart water kiosk was designed using a shipping container which makes it durable and portable. Outside the kiosk, protection fences, security cameras, waste bins, chairs, and information boards were installed to ensure a safe and clean environment.

As a result, 684 households (2,367 people) and more than 1,370 children in Khukhmorit now have an improvement in service level from basic to 'basic +2', meaning that the water is now free from contamination and available when needed.

The upgrades cost a total of MNT 120 million (USD 37,300), meaning the cost of the upgrade was less than USD 16 per capita. This demonstrates that new, high-quality services can be affordably provided in rural areas with low population density. UNICEF contributed around two-thirds of the cost, or MNT 77 million (USD 23,900), while the provincial government contributed MNT 43 million (USD 13,400) from their Environmental Conservation and Rehabilitation Measures funds.

**Figure 7: Smart water kiosk in Khukhmorit sub-province and water purification filters installed inside the kiosk.**



Source: UNICEF/Mongolia/ErdenebilegMunkh

## Conclusions and lessons learned

In rural areas of Mongolia, provincial governments and UNICEF worked together to scale up access to 'basic +2' water services through smart water kiosks. By demonstrating new models for automated facilities, UNICEF was able to advocate for and leverage government financial investment into these improved facilities.

The lessons learned from this experience were:

- Locally organized public events helped raise awareness on ownership of the facility as well as the importance of reducing water loss, such as the knowledge and understanding about the importance of safe and quality water. The Water Safety Volunteer Team set up by a Water Safety Council is also promoting hygiene around the water kiosks
- The smart water kiosk has shown that people in low-income communities are willing to pay for clean and safe drinking water. By providing affordable access to safe water, the kiosk has helped reduce the incidence of waterborne disease in the communities.
- The smart water kiosk uses technology to provide safe and affordable drinking water to people in low-income communities. The kiosk is equipped with sensors that monitor water quality and level, and a mobile payment system that makes it easy for people to pay for the water they use.
- Community engagement is critical for the success of the smart water kiosk initiative. UNICEF has worked with local communities to ensure that the kiosk is located in a convenient and accessible location and that the pricing of the water is affordable for everyone.

- Replication to the sub-province (soum) level required the soum governor's office commitment to maintaining the operation and maintenance of the system. Income increased as the customers paid through bank cards, and the O&M costs and service provider charges were covered.

## Next steps

For securing the sustainability of drinking water quality, the Gobi-Altai province government has committed to invest more in the following areas:

- Scaling up of smart water kiosks in all settlements of the province (sub-province centers and villages).
- In the urban areas, gradually replace the old water transfer pipelines to ensure the quality of drinking water.
- Introduce household-level smart water meters to reduce water loss and increase the operation and management efficiency of water supply services.

UNICEF is planning to support other provinces in Mongolia to replicate the best practices and lessons learnt from the Gobi-Altai, through horizontal learning and exposure visits to get the first hand information about costs, technology, operation and maintenance etc.

## Photo Credits

Cover photo and others: Junghwa Kim (WASH Officer, UNICEF) and Erdenebileg Munkh (WASH Project Consultant, Gobi-Altai Governor's Office)

## Acknowledgements

Reviewed by Batnasan Nyamsuren and Ihsan Khan (UNICEF Pakistan), Brooke Yamakoshi (UNICEF East Asia and Pacific Regional Office), Anu Paudyal Gautam (UNICEF HQ) and Aidan Cronin (UNICEF HQ).

## About the Authors

Junghwa Kim is a WASH Officer with UNICEF Mongolia based in Ulaanbaatar. Erdenebileg Munkh is a WASH Project Consultant in the Gobi-Altai Governor's Office in Yesunbulag.

## About the Series

UNICEF's water, sanitation and hygiene (WASH) country teams work inclusively with governments, civil society partners and donors, to improve WASH services for children and adolescents, and the families and caregivers who support them. UNICEF works in over 100 countries worldwide to improve water and sanitation services, as well as basic hygiene practices. This publication is part of the UNICEF WASH Learning Series, designed to contribute to knowledge of good practice across UNICEF's WASH programming. In this series:

*Discussion Papers* explore the significance of new and emerging topics with limited evidence or understanding, and the options for action and further exploration.

*Fact Sheets* summarize the most important knowledge on a topic in few pages in the form of graphics, tables and bullet points, serving as a briefing for staff on a topical issue.

*Field Notes* share innovations in UNICEF's WASH programming, detailing its experiences implementing these innovations in the field.

*Guidelines* describe a specific methodology for WASH programming, research or evaluation, drawing on substantive evidence, and based on UNICEF's and partners' experiences in the field.

*Reference Guides* present systematic reviews on topics with a developed evidence base or they compile different case studies to indicate the range of experience associated with a specific topic.

*Technical Papers* present the result of more in-depth research and evaluations, advancing WASH knowledge and theory of change on a key topic.

*WASH Diaries* explore the personal dimensions of users of WASH services, and remind us why a good standard of water, sanitation and hygiene is important for all to enjoy. Through personal reflections, this series also offers an opportunity for tapping into the rich reservoir of tacit knowledge of UNICEF's WASH staff in bringing results for children.

*WASH Results* show with solid evidence how UNICEF is achieving the goals outlined in Country Programme Documents, Regional Organizational Management Plans, and the Global Strategic Plan or WASH Strategy, and contributes to our understanding of the WASH theory of change or theory of action.

*COVID-19 WASH Responses* compile lessons learned on UNICEF's COVID-19 response and how to ensure continuity of WASH services and supplies during and after the pandemic.

Readers are encouraged to quote from this publication but UNICEF requests due acknowledgement. You can learn more about UNICEF's work on WASH here: <https://www.unicef.org/wash/>

[www.unicef.org/wash](https://www.unicef.org/wash)

© United Nations Children's Fund (UNICEF)

The statements in this publication are the views of the authors and do not necessarily reflect the policies or the views of UNICEF.

United Nations Children's Fund  
3 United Nations Plaza, New York, NY 10017, USA

For more information, please contact: [WASH@unicef.org](mailto:WASH@unicef.org)