2025 / ANNUAL SUSTAINABILITY REPORT

SDG 6 | Clean Water and Sanitation

Khazar University · Baku, Azerbaijan

REPORTING PERIOD JANUARY–DECEMBER 2025

Institutional Approach

Khazar University supports clean water and responsible resource use through campus environmental policies, water-related teaching, scientific research and international cooperation. In 2025, the University established a specialist water research centre, contributed to studies of river water quality and aquatic pollution, and hosted or joined discussions on water security. Existing campus facilities and policies provide a foundation for these activities.

1	**6**	**3**
Water research centre established in 2025	Sampling locations in the Kura River study	Water-focused events and exchanges in 2025

6.1 Research on water

In 2025, Khazar University continued to advance research addressing water quality, freshwater ecosystems, water resource management, and sustainable water technologies. University-affiliated researchers contributed to **46 Scopus-indexed publications associated with SDG 6 (Clean Water and Sanitation), comprising 39 research articles and seven review papers**. These publications reflect interdisciplinary research in water treatment, pollution monitoring, hydrological modelling, sustainable irrigation, and aquatic ecosystem protection.

Water quality and aquatic ecosystem health represented important areas of scientific investigation. Yolchuyeva, Hajiyeva, and Huseynli (2025) examined the physicochemical characteristics of drinking water from six sampling locations along Azerbaijan's Kura River, assessing indicators relevant to water quality monitoring. Research involving Khazar University academic Rovshan Abbasov also investigated the chronic toxicity of diflubenzuron in *Daphnia magna*, a freshwater organism used in aquatic ecotoxicology. Additionally, Mamedova and Karanis (2025) published a comprehensive review of coccidian parasites in freshwater fish, contributing knowledge relevant to aquatic biodiversity, fish health, and freshwater ecosystem monitoring.

Research on **water pollution and sustainable treatment technologies** examined innovative methods for improving water purification and wastewater management. Vatanpour et al. (2025) investigated advanced reverse-osmosis membranes designed to improve water permeability, resistance to fouling, and treatment performance. Hassan et al. (2025) reviewed electrochemical and microbial approaches to the degradation of persistent per- and polyfluoroalkyl substances (PFAS), while Castellanos et al. (2025) examined the potential of nanocellulose-based materials for removing heavy metals and other contaminants from wastewater.

Water security and data-driven resource management also featured prominently in the University's research. Morchid et al. (2025) investigated smart irrigation systems integrating embedded technologies and machine learning to support more efficient agricultural water use. Abdi et al. (2025) applied hybrid quantum neural networks to hydrological forecasting at Mile Mughan Dam on the Aras River, contributing to research on reservoir inflow prediction and water resource planning.

A significant institutional development was the establishment of the Water Sciences and Hydroinformatics Research Center on **3 November 2025**. The Center provides a dedicated framework for interdisciplinary research in hydrology, hydroinformatics, water security, irrigation, water quality, drought and flood analysis, and data-driven water resource management.

Together, these research contributions demonstrate Khazar University's engagement in addressing water-related environmental and technological challenges. Through international scientific collaboration, locally relevant research, and institutional capacity development, the University contributes knowledge supporting sustainable water management, freshwater ecosystem protection, and improved water security.

Selected Research Publications (2025)

Scopus-indexed research

1. **Mamedova, S., & Karanis, P. (2025).** *Coccidia (Apicomplexa: Eucoccidiorida) of Freshwater Fish*. Microorganisms, 13(2), 347. DOI

2. **Vatanpour, V., Al-Shaeli, M., & Behroozi, A. H. (2025).** *Enhancing the antifouling properties and permeability of polyamide TFC RO membranes via Ag_3PO_4 nanoparticle incorporation.* Desalination, 615, 119272. DOI
3. **Hassan, M., et al. (2025).** *Electro-microbial destruction of 'forever chemicals': Recent advances and imminent challenges.* Chemical Engineering Journal, 521, 166499. DOI
4. **Castellanos, H. G., et al. (2025).** *The efficacy of nano-cellulose-based composites in heavy metal removal from wastewater: A comprehensive review.* Journal of Chemical Technology and Biotechnology, 100(2), 291–312. DOI
5. **Morchid, A., et al. (2025).** *An Innovative Smart Irrigation Using Embedded and Regression-Based Machine Learning Technologies for Improving Water Security and Sustainability.* IEEE Access, 13, 100731–100751. DOI
6. **Abdi, E., Sattari, M. T., Samadianfard, S., & Ahmad, S. (2025).** *Advancing Hydrological Prediction with Hybrid Quantum Neural Networks: A Comparative Study for Mile Mughan Dam.* Water, 17(24), 3592. DOI

Additional water-related research

7. **Yolchuyeva, F., Hajiyeva, S., & Huseynli, A. (2025).** *Analysis of Physico-Chemical Parameters of Drinking Water from Kur River, Azerbaijan.* Khazar Journal of Science and Technology, 9(1), 5–14. DOI
8. **Karimova, G., et al. (2025).** *Cellular and individual toxicity of diflubenzuron for the chronic exposure in Daphnia magna: Focus on oxidative stress, chitin content, and reproductive outcomes.* Ecotoxicology. DOI

6.2 Water consumption per person

Khazar University's Environmental Policy encourages more efficient water use in toilets, cafés and gardens. At the Narimanov campus, the University has reported installing water-saving taps and toilet fittings. According to its published facilities description, these fixtures can use up to 60% less water than conventional equipment. The comparison describes equipment performance rather than the University's measured water consumption during 2025.

6.3 Water usage and care



Responsible water management includes infrastructure, sanitation and pollution prevention. The University has documented the connection of its Buzovna campus to a centralised wastewater network, replacing an earlier on-site discharge arrangement. Together with efficient sanitary fittings and environmental policies, this forms part of Khazar's approach to water stewardship on campus.

Teaching also supports awareness of water quality and protection. The Fall 2025 Water Resources Management syllabus covered integrated management, pollution sources, water quality, wastewater treatment and Azerbaijani water legislation. These topics connect sustainable water use with practical and regulatory knowledge.

6.4 Water reuse

The University's published climate-planning materials identify the use of treated greywater for irrigation, drip irrigation and other measures to reduce water demand as longer-term priorities. These proposals reflect an interest in using water resources more efficiently across campus landscapes and services.

6.5 Water in the community

In March 2025, Khazar researchers participated in the SORG4NOBAL international project's final meeting, which discussed nature-based solutions and strategies to reduce pesticide pollution and eutrophication in agricultural environments. On 25 March, Khazar academics contributed to a water-security workshop at Erasmus University Rotterdam addressing Azerbaijan and the Caspian Sea.



On 21 October 2025, the University hosted Finland's Ambassador Kirsti Narinen for a public academic talk on water diplomacy. The discussion addressed water-resource governance, international cooperation, climate-related pressures and fair access to natural resources.



These activities brought water security into educational and international dialogue.

Selected Activities in 2025

2025	ACTIVITY

11–12 Mar	SORG4NOBAL final project event
25 Mar	Erasmus Rotterdam water-security workshop
Fall 2025	Water Resources Management course syllabus
21 Oct	Finland's Water Diplomacy lecture
3 Nov	Water Sciences and Hydroinformatics Research Center

2025 Overview

In 2025, Khazar University strengthened its work on water research, water-related teaching and international knowledge exchange. A new research centre, published studies of water quality and aquatic ecosystems, and discussions with European partners added to the University's water-focused activities. Environmental policies and existing infrastructure continued to guide campus water conservation and sanitation.