6.4.2 Measure the reuse of water across the university

At Alexandria university, water and wastewater treatment are central to improving water quality, protecting water resources, and ensuring a reliable water supply for drinking water, irrigation, and research areas across campuses. This study presents an analysis of waste water, groundwater, and treated effluent using method approaches such as adsorption, membrane filtration, activated sludge systems, and desalination. The evaluation examines pollutant removal, heavy metal contamination, concentration changes, and system performance to develop a model for sustainable water management, environmental protection, pollution control, and water conservation, supporting ecosystem sustainability and reliable water supply for future applications.

- Water Recycling represents a fundamental component of Alexandria University's sustainability strategy. More than 50% of wastewater is treated and reused for non-potable applications, including landscape Irrigation, agricultural production, and campus cleaning. Reclaimed water supports green spaces, research farms, rooftop gardens, and aquaculture facilities. Key initiatives include greywater recovery systems, air-conditioning condensate collection, wastewater treatment units, a 100 m^3 Desalination plant, and renewable energy-powered desalination technologies that promote integrated Water Resources Management.
- To protect water resources, the University implements water pollution control measures, including wastewater treatment, regulated discharge systems, accredited laboratory testing, and continuous water quality monitoring. The Central Laboratory and specialized research facilities conduct physical and chemical analyses according to internationally recognized standards, supporting environmental protection and aquatic ecosystem conservation. Coastal cleanup campaigns, marine conservation activities, and environmental awareness programs further contribute to reducing pollution and protecting aquatic environments.
- The Water Recycling Program demonstrates significant progress in non-potable water reuse and resource recovery. Treated sewage effluent (TSE) from the Campus, totaling approximately 1.12 million m^3 annually, is utilized for landscape irrigation. At the Faculty of Pharmacy, a greywater pilot system treats hand-wash wastewater for toilet flushing, while air-conditioning condensate recovery systems in select buildings supply irrigation and flushing operations. Rainwater is harvested into a central retention lake, providing an additional source for green-area irrigation. The Faculty of Agriculture's aquaculture facility recycles nutrient-rich effluent from its eight-pond fish farm to irrigate adjacent crops, enhancing soil fertility and yield. The University also operates a 100 m^3/day solar-powered desalination unit at Wadi El-Natroun. It has developed an innovative renewable energy–driven multi-stage flash desalination system (RE-NF-MSF) with nanofiltration pre-treatment, demonstrating leadership in sustainable water technologies.
- In relation to Treated Water Consumption, Alexandria University channels the entirety of its wastewater 1,116,625.26 m^3 annually, through the Alexandria Sanitation Company for secondary and tertiary treatment. A substantial portion of this treated water supports Egypt's

New Delta agricultural reclamation project, thereby contributing to the country's national food security objectives. Treated water is reused for irrigation, aquaculture, and experimental research, establishing a closed-loop water management model that exemplifies the University's commitment to sustainable resource utilization.

- The irrigated water supplied to the fish farm at the Agriculture Experimental Research Station of the Faculty of Agriculture is recycled to irrigate the crops, vegetables, and fruits of the land farm. The recycled water is rich withnatural fertilizers and enhances the crops production.
- In addition, the water recycling in Fish Aquaculture of the Faculty of Agriculture, Alexandria University: The watersewage of the Aquaculture of the Faculty of Agriculture, Alexandria University which consist of eight ponds (one acre and quarter/each) in Abis region. Alexandria University used the recycled water for crops culturing in the adjacent agriculture research center in Abis.



The water sewage of the Aquaculture of the Faculty of Agriculture (Alexandria University, Egypt) The irrigated water supplied to the fish farm at the Agriculture Experimental Research Station of the Faculty of Agriculture is recycled to irrigate the crops, vegetables, and fruits of the land farm.



Wastewater treatment unit at Faculty of Engineering




100 m^3 Desalination Unit, Wadi El-Natroom - Faculty of Agriculture



Innovative Renewable Energy (RE) Driven - Multi Stage Flash (MSF) System with Salts Precipitator and Nano Filtration (NF) Feed Water pre Treatment (RE-NF-MSF) - Faculty of Agriculture

Green Cycle

ALEXANDRIA UNIVERSITY

Rooftop Cultivation




Grey water recycling system organized by Faculty of Pharmacy (Alexandria University, Egypt), and reused in rooftop cultivation.



Air conditioning water collection and reuse unit - Faculty of Engineering



The sewage water will be treated and reused in the irrigation of green areas in the project (Alexandria University)



Reclaiming 800 thousand acres in the new delta using treated water from sewage

- Across the past three years, Alexandria University has minimized and redesigned parking lots, transforming selected parking spaces into green zones, pedestrian walkways, and sustainable mobility infrastructure. These actions enhance biodiversity, lessen land sealing, and reinforce the institution's commitment to sustainable campus development.
- Research and innovation are fostered through the Alexandria University Water Resilience Center of Excellence (AWR-CoE), which acts as a national platform for applied research, capacity development, professional training, and global collaboration. The Center promotes sustainable water technologies by researching wastewater treatment, desalination, water reuse, circular economy concepts, and climate adaptation while providing specialized academic courses, workshops, scholarships, and alliances with premier national and international institutions.