جامعة الإسكندرية
ALEXANDRIA UNIVERSITY

SDG6



Clean water and Sanitation

2025-2026

Total volume of water used in the university

Alexandria University is committed to sustainable water management through monitoring water consumption, promoting water conservation, and reducing freshwater waste. Pilot initiatives include recycling air-conditioning wastewater for suitable non-potable uses and evaluating water quality for safe reuse. The Center of Excellence for Water is also conducting desalination studies using locally produced membranes in cooperation with the industrial sector. These efforts focus on improving treatment efficiency, reducing environmental impacts and operational costs, and developing innovative solutions to ensure sustainable water resources for the university and the surrounding community.

Water consumption per faculty/ institution

water consumption by Faculties and institutes	
Faculty or institute	Water in cubic meters
University Administration Building	3600
Faculty of Arts	25009
Faculty of Business	15536
Faculty of Education	4183
Faculty of Medicine	41974
Faculty of Dentistry	17211
Faculty of Engineering	32322
Faculty of Agriculture	60.271
Faculty of Pharmacy	11735
Faculty of Science	44122
Faculty of Nursing	21140
Faculty of Veterinary Medicine	68218
Higher Institute of Public Health	1819
Medical Research Institute	27056
Institute of Graduate Studies and Research	8480
Faculty of Physical Education for girls	10044
Faculty of Physical Education for boys	141747
Faculty of Specific Education	4380
Saba Pasha Faculty of Agriculture	12.774
Faculty of Education for Early Childhood	9713
Faculty of Fine Arts	85000
Faculty of Tourism and Hotels	2156
Faculty of Law	63000
Total	**638518**

6.3.1 - Process to treat waste water

- Water recycling and wastewater treatment are central components of the university's integrated water strategy. More than 50% of wastewater is reported to be treated and reused for non-potable applications, including landscape irrigation, agriculture, campus cleaning, and research activities. Recycled water supports green areas, agricultural research farms, rooftop gardens, and aquaculture facilities. Innovative projects include greywater recycling systems, air-conditioning condensate recovery, wastewater treatment units, a 100 m^3 desalination plant, and renewable energy-powered desalination technologies. These initiatives demonstrate the potential of an integrated approach to water conservation, resource recovery, and sustainable development while reducing freshwater demand and wastewater discharge.

- The university also promotes the development and evaluation of advanced water treatment technologies to improve water quality and pollutant removal. Relevant treatment processes include filtration, adsorption, membrane separation, reverse osmosis, and disinfection, depending on the characteristics of the water source and the intended application. Wastewater assessment may include the measurement of ph, or hydrogen-ion concentration, biochemical oxygen demand, dissolved oxygen, nitrogen, phosphorus, and the concentration of heavy metals such as iron, copper, zinc, chromium, and arsenic. These parameters help determine treatment performance, identify potential contamination, and evaluate the environmental impact of pollutants on soil, groundwater, surface water, and aquatic ecosystems.

- To protect water resources, Alexandria university applies water pollution control measures involving wastewater treatment, controlled discharge, laboratory analysis, and continuous water quality monitoring. The university's central laboratory and specialized research facilities conduct physical and chemical characterization of water samples in accordance with recognized analytical standards. Such investigations help assess pollutant concentrations, treatment efficiency, and potential health risks associated with contaminated water. Monitoring and risk assessment also contribute to environmental protection by supporting the identification and control of contaminants that may affect aquatic species, plants, animals, and surrounding ecosystems.

- Research and innovation in sustainable water technologies are supported by the Alexandria university water resilience center of excellence (AWR-CoE), which serves as a platform for applied research, capacity building, professional training, and national and international collaboration. The center advances innovative solutions in wastewater treatment, desalination, membrane technology, water recycling, and climate-resilient water management. Its activities include experimental investigation, process optimization, performance evaluation, and the development of sustainable treatment systems in cooperation with academic institutions and industry. Specialized academic programs, workshops, scholarships, and collaborative projects further strengthen scientific capacity and promote the application of research results to real-world water challenges.

- In addition, community initiatives, including coastal cleanup campaigns, marine conservation, and environmental awareness activities, support the prevention of water pollution and the restoration of aquatic environments. These initiatives contribute to protecting sea water, marine species, and coastal ecosystems while promoting responsible water management among the university community and the wider population.

- Through integrated management, continuous monitoring, scientific investigation, and technological development, Alexandria university aims to improve water quality, reduce water consumption, increase wastewater recovery, and protect groundwater and other water resources. The university's strategic approach emphasizes efficient resource

utilization, evidence-based assessment, environmental sustainability, and collaboration with industry and research partners. These efforts provide a foundation for future improvements in water conservation, treatment performance, pollution control, and sustainable water resource management across Alexandria and the surrounding region.



The STDF-funded HMDed project on innovative wastewater treatment technologies concluded with a workshop held at the Faculty of Science, Alexandria University, in December 2025. The workshop combined lectures and hands-on training in water quality analysis and nanomaterial applications, bringing together academics, industry experts, and 51 researchers and students.



The SOA/C workshop was organized by the Alexandria University Water Resilience Center of Excellence (AWR-CoE) to promote knowledge exchange, strengthen research collaboration, and enhance capacity building in sustainable water management and water resilience.




The water Quality Parameters Training and Innovative Strategies Workshop focused on water quality testing, teaching, and the development of innovative strategies for water quality assessment and sustainable water management.



Wastewater treatment unit - 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 preTreatment (RE-NF-MSF) - Faculty of Agriculture

Water recycling initiatives within the university

Alexandria University also documents smaller-scale water recovery initiatives:

- **Faculty of Engineering:** an air-conditioning condensate collection and reuse unit, along with a wastewater treatment unit.
- **Faculty of Pharmacy:** a greywater recycling initiative intended to treat handwashing wastewater for toilet flushing.
- **Faculty of Agriculture:** reuse of water associated with aquaculture and agricultural research for crop irrigation

Alexandria University program for Sewage Disposal

- Providing a sewage treatment plant at the university to make it suitable for irrigating green areas and gardens inside the university campus.
- 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 with natural fertilizers and enhances the crops production.
- In addition, the water recycling in Fish Aquaculture of the Faculty of Agriculture, Alexandria University: The water sewage 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 use of biochar produced from Agricultural waste and waste Forests in residual removal chlorpyrifos pesticide Imidacloprid is from water agricultural drainage. Cooperation project between the Egyptian Academy of Research Science and Technology and the Czech Academy of Sciences.
- The sewage water will be treated and reused in the irrigation of green areas in Alexandria National University.
- Faculty of Pharmacy is seeking to implement a grey water (wastewater) recycling system that depends on reusing wastewater from sewage basins only (without using wastewater from laboratory basins) by repumping it into the flushing bins in the toilets after work. Filtration and primary treatment. The grey water recycling initiative has a significant impact on rationalizing water use.



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 ofAgriculture is recycled to irrigate the crops, vegetables, and fruits of the land farm.



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

- 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* 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.
- Implementation of *Water-Efficient Appliances* has expanded substantially, with 80.1% of all fixtures on campus now classified as water-saving devices. These include 90.97% of bathroom faucets, 50.48% of toilets, and 57.69% of urinals that have been retrofitted with flow-control mechanisms. The University enforces institutional policies mandating water-efficient design standards in all new buildings and major renovations. The *Abis Campus*

exemplifies these efforts, with green infrastructure now covering 52% of its total site area, integrating sustainability principles into the built environment.

- A cooperation protocol was signed between Alexandria University and Alexandria Sewerage Company to employ outstanding graduates from the faculties of Engineering, Commerce, Law, Science, and Arts over the past five years, based on the actual needs and annual workforce plan of the sewerage company. Additionally, the protocol aims to prepare a new generation of skilled professionals in modern technologies. It includes agreements for employees to access masters and doctoral programs at reduced fees and to conduct workshops and training courses with professors from Alexandria University to enhance partnerships for sector performance and achieve sustainable development goals.
- 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.
- Recent initiatives of the Center of Excellence for Water include student training in wastewater treatment operations, entrepreneurship bootcamps on water innovation, and workshops on EU-funded research opportunities. These activities have positioned Alexandria University as a national and regional leader in sustainable water governance, demonstrating how academic excellence, technological advancement, and environmental responsibility can be effectively integrated to address Egypt's water and climate challenges.





Raising awareness among Alexandria University students about wastewater treatment was achieved through summer training activities conducted at Alexandria Sewerage for students from various faculties,
including Science, Engineering (Civil, Mechanical, and Mechatronics), Commerce, Arts (Surveying, Mapping, and GIS), and Fine Arts (Architecture), September 2024.








The Center of Excellence for Water at Alexandria University is organizing a training program for scholarship students in collaboration with EPROM Company. This initiative aims to equip students with practical skills in water management including training courses about Water Treatment for Industrial Applications, and Wastewater Plant Operations and Troubleshooting, ensuring they are well-prepared for the business sector
and aligned with labor market requirements (March, 2024).

Alexandria University also has a large number of research projects in the field ofwaste recycling, treatment and reuse of sewage and industrial wastewater.

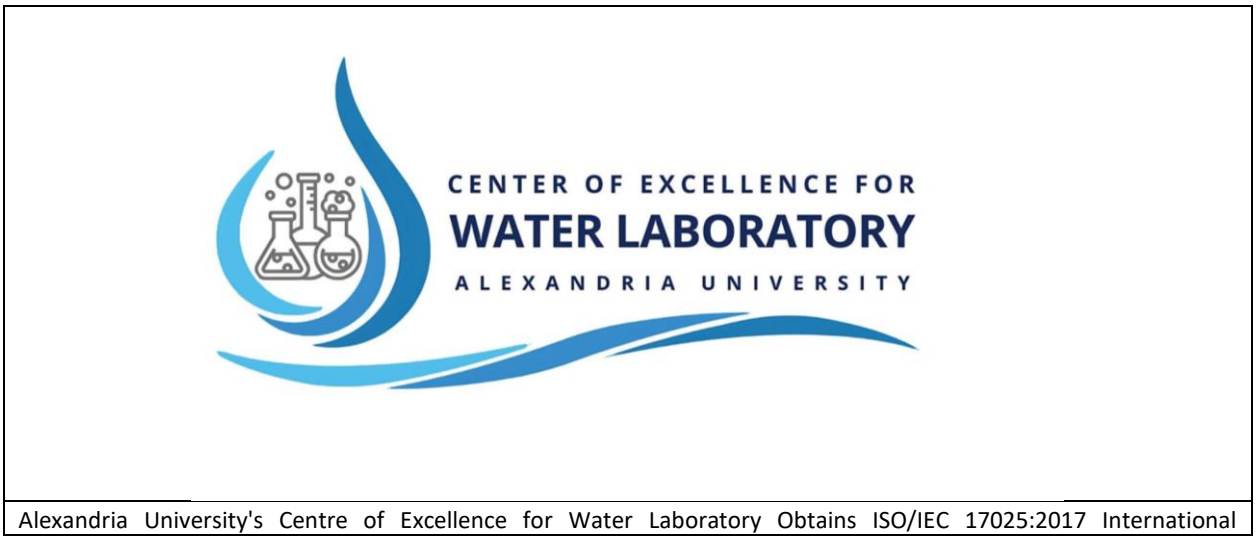
- Enhancing Resource Recovery and Improving Wastewater Reuse Through Synergistic Cooperation Between Bioelectrochemical Systems and Forward Osmosis (2019–2024). This project focused on combining treatment technologies to improve water recovery and resource utilization.
- A novel combined approach for Poultry slaughterhouse wastewater treatment: prototype design and development,(2021-2024).
- Agricultural sustainability and water reuse in Egypt: innovative wastewater treatment and soil health, (2021-2024).
- Towards a green Economy Farm: Innovative Solar Collector for Biochar Production from Agricultural & Food Industry Wastes, Power Generation, and Crops Drying, (2021-2023).
- Wastewater Treatment by Integrated Green Coagulation and Membrane Technology for Reuse, (2021-2024).
- Construction of a Self-Charging Unit for Collecting Wasted Mechanical Energy from Basic Human Motion, (2023-2025).
- Production, modification and new prospects of biochar derived from biomass waste, (2023-2026).
- Microbial technology as a bioremediation tool for heavy metals removal from industrial wastewater through proteomic and nanotechnological approaches, (2023-2025).

6.3.2 - Process to prevent polluted water entering the water system, including pollution caused by accidents and incidents at the university

- Pollution caused by accidents and incidents at Alexandria University can have a significant impact on water resources, water quality, soil, plants, animals, and the surrounding environment. To reduce water pollution and protect the ecosystem, the University has developed an integrated Water Management System that emphasizes water conservation, wastewater treatment, waste management, environmental monitoring, and pollution control. More than 50% of Waste Water is treated through appropriate Wastewater Treatment processes and reused for non-potable applications, including Irrigation, agricultural research, landscape maintenance, rooftop gardens, and aquaculture facilities. These applications help reduce freshwater consumption, improve Water Supply efficiency, and support sustainable development.
- To safeguard water resources, Alexandria University has established comprehensive water pollution control policies that include wastewater treatment, controlled discharge systems, accredited laboratory monitoring, and continuous water quality assessment. The University's Central Laboratory and specialized research facilities perform chemical and physical analyses of water quality in accordance with internationally recognized standards, ensuring effective environmental monitoring and protecting surrounding ecosystems. Community initiatives, including coastal cleanup campaigns, marine conservation activities, and environmental awareness programs, further strengthen the University's contribution to protecting aquatic environments.
- Alexandria University continues to strengthen its role as a leading research institution by advancing high-impact sustainability research that addresses global environmental, social, and economic challenges. During the 2025 academic year, the University published 6,690 scholarly publications related to sustainability. These publications span a wide range of disciplines, including climate change, renewable energy, environmental protection, water resources, waste management, pollution control, biodiversity conservation, ecosystem restoration, sustainable agriculture, and green technologies, reflecting the University's multidisciplinary approach to sustainable development.
- The University's Waste Water Treatment System incorporates different technologies and methods for pollutant removal, water recovery, and the control of contaminants before discharge. Innovative projects include greywater recycling, air-conditioning condensate recovery, wastewater treatment units, a 100 m^3 Desalination plant, and renewable energy-powered desalination technologies. Depending on the characteristics of the wastewater, treatment processes may involve filtration, membrane separation, biological treatment, adsorption, and disinfection to reduce the concentration of organic pollutants, nutrients, bacteria, heavy metals, and other chemical water pollutants. These methods aim to improve treatment performance, reduce the environmental impact of wastewater discharge, and protect Groundwater, Surface Water, and other Water Resources from contamination.
- To prevent and control pollution resulting from accidental spills, sewage leaks, uncontrolled discharge, and other environmental incidents, Alexandria University implements water pollution control policies supported by laboratory Analysis, systematic sampling, and continuous Water Quality Monitoring. The University's Central Laboratory and specialized research facilities conduct chemical and physical analyses to determine important Water Quality parameters, including pH (Hydrogen-Ion Concentration), temperature, turbidity, nutrient concentration, and other indicators of contamination. Where appropriate, parameters such as Biochemical Oxygen Demand, nitrogen, phosphorus, metals, and bacteria can be evaluated to assess the effectiveness of treatment processes and identify potential environmental risks. The results of these measurements support Risk Assessment, pollution prevention, and the development of efficient solutions for protecting the environment and maintaining compliance with

recognized standards.

- Furthermore, the University promotes Research, technological Development, and integrated Water Management approaches to improve the removal of pollutants and optimize wastewater treatment performance. The recovery and reuse of treated effluent for agricultural activities and Irrigation contribute to Water Conservation, reduce waste generation, and support sustainable agricultural production. Community initiatives, including coastal cleanup campaigns, marine conservation projects, and environmental awareness programs, strengthen the University's role in Environmental Protection. Through continuous monitoring, appropriate treatment methods, preventive measures, and sustainable technologies, Alexandria University seeks to reduce the risk of Water Pollution, minimize the impact of environmental accidents and incidents, protect aquatic ecosystems, and ensure the sustainable use of Water Resources for future generations.
- *Water Pollution Control* is rigorously maintained through strict adherence to Egyptian environmental legislation and international standards such as the *APHA Standard Methods*. The University's accredited *Central Laboratory at the Faculty of Science and the Faculty of Engineering and the Institute of Graduate Studies and Research* conduct regular monitoring of physical, chemical, and biological parameters in stormwater, sewage, and coastal discharges. In parallel, Alexandria University actively contributes to marine conservation through shoreline clean-up initiatives, environmental impact assessments for coastal infrastructure, and research programs addressing marine biodiversity and pollution mitigation. The University's pivotal role in advancing research and innovation for the protection of Mediterranean coastal ecosystems is exemplified through collaborative projects such as the EU-funded *"Circular Economy: From the Beach to the Lab"* initiative and the *Erasmus+* programs on the blue economy and sustainable aquaculture.
- **Water pollution control in campus area**
  - The campus water pollution control to prevent polluted water from entering the water system is performed. Alexandria University has accredited laboratories for the regular check water quality (Physical, Chemical parameters) on your campus. In addition, the biological parameters are analyzed by the Microbiology Professor and staff members regularly.
  - Alexandria University's Centre of Excellence for Water Laboratory Obtains ISO/IEC 17025:2017 International Accreditation
  - Accreditation Certificate of Central Laboratory – Faculty of Science (Alexandria University).
  - Accreditation of Institute of Graduate Studies and Research (Alexandria University)



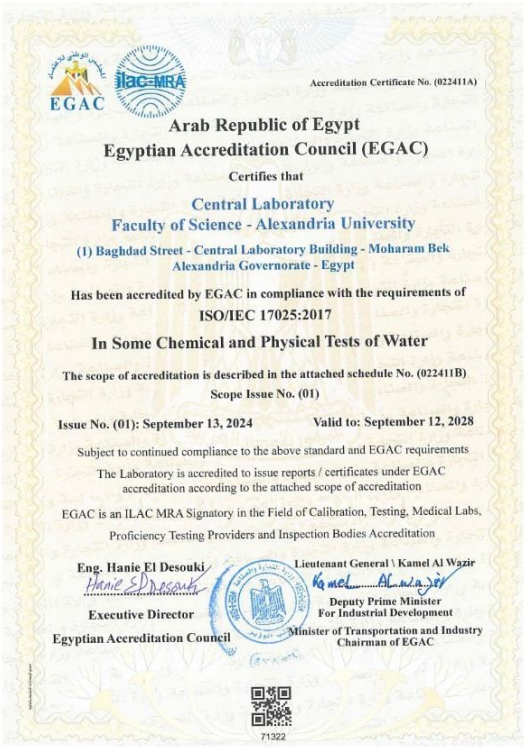
Alexandria University's Centre of Excellence for Water Laboratory Obtains ISO/IEC 17025:2017 International

Accreditation

This accreditation represents a significant achievement, as it confirms the laboratory's ability to conduct chemical and physical water testing in accordance with international standards. This enhances the reliability of results, supports research projects, and contributes to addressing the challenges of water scarcity, pollution, climate change, and sustainable development at both the local and international levels.

Guideline standard

Standard Methods for the Examination of Water and wastewater 22 edition (APHA).



Accreditation Certificate No. (022411A)

Arab Republic of Egypt

Egyptian Accreditation Council (EGAC)

Certifies that

Central Laboratory

Faculty of Science - Alexandria University

(1) Baghdad Street - Central Laboratory Building - Moharam Bek
Alexandria Governorate - Egypt

Has been accredited by EGAC in compliance with the requirements of

ISO/IEC 17025:2017

In Some Chemical and Physical Tests of Water

The scope of accreditation is described in the attached schedule No. (022411B)

Scope Issue No. (01)

Issue No. (01): September 13, 2024 Valid to: September 12, 2028

Subject to continued compliance to the above standard and EGAC requirements

The Laboratory is accredited to issue reports / certificates under EGAC accreditation according to the attached scope of accreditation

EGAC is an ILAC MRA Signatory in the Field of Calibration, Testing, Medical Labs, Proficiency Testing Providers and Inspection Bodies Accreditation

Eng. Hanie El Desouki
Executive Director
Egyptian Accreditation Council

Lieutenant General \ Kamel Al Wazir
Deputy Prime Minister
For Industrial Development
Minister of Transportation and Industry
Chairman of EGAC

71322

Water quality analysis and monitoring at Alexandria University

Accreditation Certificate of Central Laboratory – Faculty of Science (Alexandria University)

Ministry of
Trade and Industry
Egyptian Accreditation Council
EGAC

وزارة التجارة والصناعة
المجلس الوطنـــي للإعتمـاد
إيجاك

EGAC

Schedule of Accreditation

for Testing Laboratory According to ISO/IEC 17025

Issued to

ICP-OES Labaratory

Institute of Graduate Studies and Research Alexandria Univeristy

(163) Horryia Avenue Shatby
Alexandria Governerate – Egypt

Schedule No.:0222210B 1st Accreditation date: July 29, 2022 Issue No. (1): July 29, 2022 Revision No. (-): Valid to: July 28, 2026

Materials / Products Tested	Types of Tests / PropertiesMeasured / Range of Measurements		Standard Specifications / Techniques Used	
Water	Element	LOQ (ppb)	EPA method 200.7:2001 EPA method 6010 C:2007	Inductivity Coupled Plasma Optical Emission Spectrometer (ICP-OES) Model 5100 ICP-OES VDV S.N AU16020119
	Al	26.6		
	As	73.4		
	Ag	4.00		
	Ba	4.32		
	Co	7.13		
	Cr	4.40		
	Cu	6.94		
	Fe	24.0		
	Mo	19.0		
	Ni	22.5		
	Pb	28.2		
	Zn	104		
	Sb	42.9		
	Se	101		
	Sr	7.93		
	K	25.9		
	Na	66.6		
	Cd	4.00		
	Mn	2.97		
	Mg	18.9		

Kornish El-Maadi, Riad El-Maadi Tower 1 - Cairo - Egypt
Tel.: (202) 25275220/5/6/7
Fax: (202) 25275224

F-AWI-4-TCL
1 / Dec 2018

Page 1 of 2

كورنيش المعادى – برج رياض المعادى١ – القاهرة – مصر
تليفون : ٢٥٢٧٥٢٢٠/٥/٦/٧ (٢٠٢)
فاكس : ٢٥٢٧٥٢٢٤ (٢٠٢)

Industrial Investment Map: http://invegypt.com: الصفحة الرسمية لخريطة الاستثمار الصناعي في مصر

Ministry of
Trade and Industry
Egyptian Accreditation Council
EGAC

EGAC

وزارة التجارة والصناعة
المجلس الوطنـــي للإعتمـاد
إيجـاك

Schedule of Accreditation

for Testing Laboratory According to ISO/IEC 17025

Issued to

ICP-OES Labaratory

Institute of Graduate Studies and Research Alexandria Univeristy

(163) Horryia Avenue Shatby
Alexandria Governerate – Egypt

Schedule No.:0222210B **1st Accreditation date: July 29, 2022** **Issue No. (1): July 29, 2022** **Revision No. (-):** **Valid to: July 28, 2026**

Materials / Products Tested	Types of Tests / PropertiesMeasured / Range of Measurements		Standard Specifications / Techniques Used	
Soil	Element	LOQ (ppb)	EPA method 200.7:2001 EPA Method 3051 A:2007 EPA Method 6010 C:2007	**Inductivity Coupled Plasma Optical Emission Spectrometer (ICP-OES)** Model 5100 ICP-OES VDV S.N AU16020119
	Ag	43.2		
	As	52.8		
	Ba	11.1		
	Cd	12.3		
	Co	8.78		
	Cr	42.8		
	Cu	12.7		
	Mg	48.5		
	Mn	12.6		
	Mo	18.5		
	Ni	46.5		
	Pb	29.1		
	Zn	30.5		
	Se	21.8		
	Sr	2.31		
	Sb	46.5		
	Ti	15.6		
	Na	228		
	Fe	202		

Kornish El-Maadi, Riad El-Maadi Tower 1 - Cairo - Egypt
Tel.: (202) 25275220/5/6/7
Fax: (202) 25275224

كورنيش المعادى – برج رياض المعادى١ – القاهرة – مصر
تليفون : ٢٥٢٧٥٢٢٠/٥/٦/٧ (٢٠٢)
فاكس : ٢٥٢٧٥٢٢٤ (٢٠٢)

6.3.4 Building standards to minimize water use

- Alexandria University is committed to reducing Water consumption in accordance with the targets established in its 2030 Strategic Plan. The University implements projects to install water-efficient faucet equipment and improve the performance of the Water Supply System, thereby reducing water loss and supporting Water Conservation. Awareness workshops and educational activities are organized to encourage students and staff to adopt sustainable water-use practices and understand the environmental Impact of excessive consumption. These projects are subject to annual Monitoring, Assessment, and Evaluation to determine their effectiveness, analyze relevant Data, measure changes in consumption levels, and adapt the Methodology and implementation strategies to existing Conditions and emerging environmental challenges.
- Furthermore, Alexandria University adopts an Integrated Water Management approach that combines efficient resource use, Wastewater Treatment, Waste Water Recycling, Water Quality Monitoring, and innovative Technology Development to support Sustainable Development. Water Management projects include advanced Irrigation Systems, water-efficient devices, greywater recycling, wastewater recovery, and renewable energy-powered Desalination technologies. These processes contribute to reducing freshwater demand, improving Water Supply efficiency, controlling Water Pollution, and protecting Groundwater Resources, Surface Water, and marine Ecosystems. The University also promotes Research and Development into efficient treatment Methods, pollutant Removal, water-quality Analysis, and sustainable solutions for addressing environmental risks associated with Climate Change, drought, and increasing water demand. Through environmental education, community participation, and continuous performance Evaluation, Alexandria University strengthens its contribution to Environmental Protection and sustainable Water Resources Management.
- Alexandria University has designated approximately 22.41 million m^2, representing 78.89% of its total campus area, as permeable or semi-permeable surfaces that support sustainable Water Management, natural water infiltration, and Groundwater recharge. These surfaces improve the interaction between Rain, Soil Water, and the underlying Groundwater Resources by increasing infiltration and reducing surface Runoff. This approach helps control stormwater flow, reduce the risk of localized flooding, and minimize the transport of pollutants and contaminants into nearby water systems. The vegetation and landscaped areas also contribute to Ecosystem protection, biodiversity conservation, and climate resilience by improving soil conditions and supporting sustainable environmental Development. Continuous Environmental Monitoring and Assessment of land-cover characteristics can help evaluate the effectiveness of these measures in protecting Water Resources and reducing the environmental Impact of Climate Change.
- Furthermore, Alexandria University has implemented a comprehensive Water Conservation Program aimed at improving Water Supply efficiency and reducing water consumption by more than 50%, according to the reported institutional performance. The program integrates improved Irrigation Systems, leak detection, regular maintenance, water-efficient technologies, water recycling, and environmental awareness campaigns. Water-saving equipment, including low-flow taps, sensor-operated faucets, and optimized flushing systems, has been installed across more than 80% of campus facilities. These technologies help reduce water demand, minimize losses from the distribution network, and improve the overall Performance of the University's Water Management System. Regular inspection, Measurement, and Monitoring of water consumption support the Evaluation of conservation strategies and the identification of opportunities for further Improvement. Through these integrated approaches, Alexandria University strengthens sustainable Water Resources Management, reduces water waste, and contributes to Environmental Protection and the achievement of Sustainable Development goals.
- Water recycling is a central component of Alexandria University's Sustainability Strategy and Integrated Water Management System. More than 50% of wastewater is reported to be treated and reused for non-potable Applications, including landscape Irrigation, agricultural activities, and campus cleaning. Recycled Water supports green areas, agricultural Research farms, rooftop gardens, and aquaculture facilities,

contributing to Water Conservation and reducing demand on freshwater Water Resources. Innovative projects include greywater Recycling Systems, air-conditioning condensate Recovery, Wastewater Treatment units, a 100 m^3 Desalination plant, and renewable energy-powered Desalination Technologies. These Processes improve water-use efficiency and support Sustainable Development. To prevent Water Pollution and protect the Environment, Alexandria University applies water pollution control policies that incorporate Wastewater Treatment, controlled Discharge Systems, accredited laboratory Monitoring, and continuous Water Quality Assessment. The University's Central Laboratory and specialized Research facilities conduct physical and chemical Analysis of water Samples to evaluate relevant Quality Parameters, identify potential Contaminants, and assess the effectiveness of treatment Methods in accordance with recognized standards. These activities support Environmental Monitoring, pollution prevention, and the protection of surrounding aquatic Ecosystems. In addition, community initiatives, including coastal cleanup campaigns, marine conservation activities, and environmental awareness programs, promote sustainable Water Management and strengthen the University's contribution to Environmental Protection.

- Research and Innovation in sustainable Water Resources Management are further supported by the Alexandria University Water Resilience Center of Excellence (AWR-CoE), which serves as a platform for applied Research, capacity building, professional Training, and national and international Collaboration. The Center promotes the Development and Evaluation of innovative Water Technologies and integrated Solutions addressing Wastewater Treatment, Desalination, water Recycling, circular economy approaches, and Climate Change resilience. Its activities focus on improving treatment Performance, optimizing resource Recovery, reducing environmental Impact, and strengthening the sustainable use of Water Resources. Through specialized academic Programs, workshops, scholarships, and partnerships with leading institutions, the Center supports knowledge exchange, technological Development, and evidence-based Water Management strategies. These initiatives contribute to improved water security, pollution control, and ecosystem protection while advancing the Sustainable Development Goals and reinforcing Alexandria University's commitment to Sustainability, Research Excellence, and environmental stewardship.



The STDF-funded HMDed project on innovative wastewater treatment technologies concluded with a workshop held at the Faculty of Science, Alexandria University, in December 2025. The workshop combined lectures and hands-on training in water quality analysis and nanomaterial applications, bringing together academics, industry experts, and 51 researchers and students.



The SOA/C workshop was organized by the Alexandria University Water Resilience Center of Excellence (AWR-CoE) to promote knowledge exchange, strengthen research collaboration, and enhance capacity building in sustainable water management and water resilience.



The water Quality Parameters Training and Innovative Strategies Workshop focused on water quality testing, teaching, and the development of innovative strategies for water quality assessment and sustainable water management.

- Under the Water Conservation Program, Alexandria University has implemented a range of water-efficient technologies to improve Water Management, reduce water consumption, and protect Water Resources. These technologies include sensor-activated faucets, low-flow toilets, and bidets, which contribute to an estimated 50% reduction in potable Water Supply consumption across its faculties. A proactive leak detection and preventive maintenance System helps identify losses associated with aging infrastructure, improve distribution efficiency, and reduce unnecessary water waste. The University also applies innovative Irrigation Methods, including drip Irrigation Systems and soil moisture sensors, across landscaped areas to optimize water application according to soil conditions and plant requirements. The introduction of drought-tolerant Plants further reduces irrigation demand and strengthens resilience to drought and Climate Change. In addition, awareness campaigns organized in collaboration with the Alexandria Drinking Water Company and the Holding Company for Water and Wastewater promote Water Conservation and sustainable consumption practices among students, academic staff, and employees. These integrated approaches support efficient resource use, Environmental Protection, and the long-term Sustainability of campus water systems.
- The Water Recycling Program at Alexandria University demonstrates progress in wastewater reuse, resource Recovery, and Integrated Water Management. Treated sewage effluent (TSE) from the campus, reported at

approximately 1.12 million m^3 annually, is reused for landscape Irrigation, reducing dependence on potable water and supporting sustainable land management. At the Faculty of Pharmacy, a greywater pilot System treats hand-washing wastewater for toilet flushing, while air-conditioning condensate Recovery Systems in selected buildings provide additional water for Irrigation and flushing Applications. Rainwater harvesting and storage in a central retention lake provide another source for green-area Irrigation and help manage stormwater Runoff. At the Faculty of Agriculture, the aquaculture facility reuses nutrient-rich effluent from its eight-pond fish farm to irrigate adjacent Crops, supporting nutrient Recycling, soil fertility, and agricultural Yield. Furthermore, the University operates a 100 m^3/day solar-powered Desalination unit at Wadi El-Natroun and has developed a renewable energy-driven multi-stage flash desalination System (RE-NF-MSF) incorporating nanofiltration pre-treatment. These innovative Technologies demonstrate the potential of membrane separation, renewable energy, and advanced treatment Processes to improve water Recovery and treatment Performance. Through these initiatives, Alexandria University strengthens sustainable Water Resources Management, reduces Water Pollution risks, and supports environmental resilience and the achievement of Sustainable Development objectives.

- Alexandria University has significantly expanded the implementation of Water-Efficient Appliances as part of its Water Conservation Program and Integrated Water Management Strategy. Approximately 80.1% of all campus fixtures are reported to be water-saving devices, including 90.97% of bathroom faucets, 50.48% of toilets, and 57.69% of urinals equipped with flow-control mechanisms. These technologies help reduce water consumption, improve the efficiency of the Water Supply System, minimize water loss, and support the sustainable use of Water Resources. The University also applies institutional policies that require water-efficient design standards in new buildings and major renovation projects, integrating Water Conservation into campus infrastructure Development. The Abis Campus provides an example of sustainable land management, with green infrastructure covering approximately 52% of its total site area. These landscaped and green areas support soil infiltration, reduce surface Runoff, improve the ecological quality of the campus Environment, and contribute to climate resilience. Through regular Monitoring, Assessment, and maintenance, these initiatives help evaluate water-use efficiency and strengthen the University's commitment to Sustainable Development and Environmental Protection.
- Furthermore, the Faculty of Pharmacy at Alexandria University is pursuing a greywater Recycling System designed to reuse wastewater from sanitary washbasins and sewage collection basins, excluding wastewater generated by laboratory basins because of the potential presence of hazardous Chemicals and Contaminants. The proposed System involves collecting wastewater from appropriate sources, applying Filtration and primary Treatment, and transferring the treated water to toilet-flushing cisterns for non-potable Applications. The initiative also considers Rainwater harvesting and reuse for Irrigation and other suitable operational purposes, subject to appropriate treatment and water-quality requirements. Before implementation, the System should include an assessment of wastewater characteristics, treatment Performance, microbiological risks, and the suitability of the recycled water for its intended use. This approach can reduce potable Water Supply demand, improve Water Conservation, and lower monthly water bills, helping to ease financial pressure on the Faculty's budget. Overall, the proposed initiative supports Wastewater Treatment, water Recovery, pollution prevention, and sustainable Water Management while demonstrating Alexandria University's commitment to resource efficiency and environmentally responsible campus operations.





Adopting a mechanism to maintain water pipes to prevent waste resulting from leaks (Alexandria University, Egypt)





Supplying water taps with water conservation units (Alexandria University, Egypt)





Supplying water taps with water conservation units (Alexandria University, Egypt)





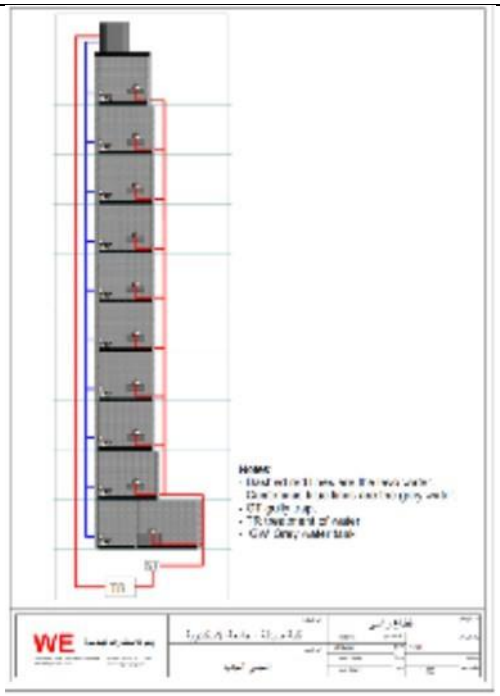
Air conditioning water collection and reuse unit - Faculty of Engineering

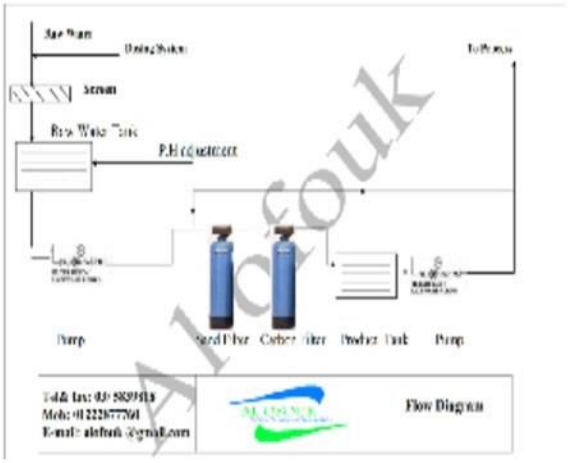


Wastewater treatment unit at the Faculty of Engineering



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





Grey water recycling system organized by Faculty of Pharmacy (Alexandria University)

Smart Building in Alexandria University

No.	Name	Place	automation		safety				energy		water		Indoor environment				lighting				Building Area (m^2)
			B1	B2	S1	S2	S3	S4	E1	E2	A1	A2	I1	I2	I3	I4	L1	L2	L3	L4	
1	University Alexandria; Abis Campus, Buildings 1-11	Alexandria, Egypt			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	667,730.988
2	University administration building	Alexandria, Egypt		x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	1940
3	Faculty of Physical Education for Boys	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	113311.93
4	Faculty of Physical Education for Girls	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	2891
5	The medical complex	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	91216
6	Faculty of Science in Horia Street	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	22197
7	Faculty of Science in Moharram Bek	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	5485
8	Faculty of Engineering	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	111034
9	Campus of Humanities and Social Sciences	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	80707
10	Faculty of fine Arts	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	2569
11	Faculty of Specific Education	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	1194
12	Faculty of Early Childhood Education	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	1407
13	Medical Research Institute (Horia Street - Smouha)	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	2500

14	Higher Institute of Public Profession	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	700
15	University land in Smouha (College of Nursing - Children's Hospital - Faculty members residences)	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	105218.22
16	Land of Mouwasat Hospital	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	20234.27
17	Institute of Graduate Studies and Research	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	2764
18	Faculty of Agriculture Saba Pasha	Alexandria, Egypt		x		x	x		x	x	x	x	x	x		x	x	x	x	x	144200.934
	Total																				1,377,300.34

6.4.1 1. Alexandria University Policy Statement for water Use

1. Introduction

Alexandria University is committed to promoting sustainable water management by maximizing water reuse, reducing freshwater consumption, and improving water-use efficiency across its campuses, faculties, research facilities, hospitals, and administrative units.

The University recognizes water scarcity as a significant environmental challenge and seeks to integrate water conservation, recycling, and reuse into institutional planning, campus operations, research, and community engagement.

This policy supports Egypt's national water conservation priorities and the United Nations Sustainable Development Goal 6 (Clean Water and Sanitation).

2. Scope

This policy applies to all University campuses, faculties, research institutes, laboratories, hospitals, administrative units, staff, students, contractors, and service providers.

3. Policy Objectives

Alexandria University aims to:

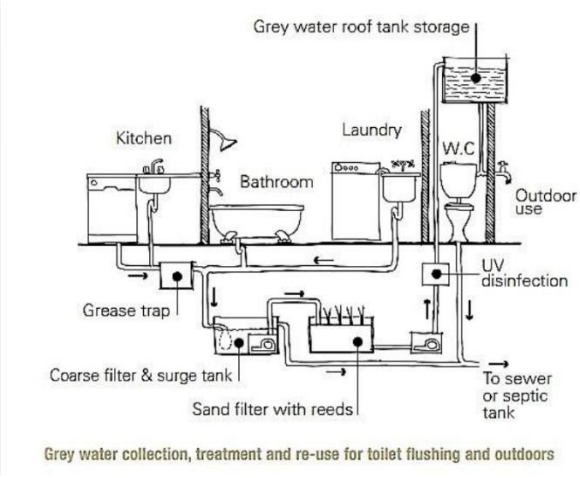
1. Maximize the safe reuse and recycling of water across University facilities.
2. Reduce dependence on freshwater resources through efficient water management.
3. Promote the collection, treatment, and reuse of suitable wastewater.
4. Encourage the use of alternative water sources for irrigation and other non-potable applications.
5. Integrate water-efficient technologies into campus infrastructure and development.
6. Strengthen awareness, research, and innovation in sustainable water management.

4. Policy Commitments

4.1 Water Reuse and Recycling

The University shall promote the collection, treatment, and safe reuse of water wherever technically feasible and environmentally appropriate, including:

- Reuse of treated greywater for landscape irrigation and other suitable non-potable purposes.
- Collection and reuse of air-conditioning condensate where practical.
- Recovery and reuse of water from appropriate laboratory and operational processes, subject to safety requirements.
- Exploration of treated wastewater reuse through approved treatment technologies.



Grey water collection, treatment and re-use for toilet flushing and outdoors

4.2 Sustainable Landscape Irrigation

The University shall encourage the use of recycled and alternative water sources for campus landscaping through:

- Water-efficient irrigation systems.
- Selection of drought-tolerant and locally adapted vegetation.
- Rainwater harvesting and storage where feasible.
- Reduction of potable water use for irrigation.

4.3 Water-Efficient Infrastructure

The University shall integrate water conservation and reuse considerations into the design, renovation, and maintenance of buildings and facilities, including water-efficient fixtures, appropriate treatment systems, and monitoring technologies.



4.4 Research, Education, and Innovation

The University shall encourage academic research, interdisciplinary collaboration, and student participation in water recycling, wastewater treatment, sustainable irrigation, and innovative water management technologies.

4.5 Environmental and Health Protection

All water reuse activities shall comply with applicable Egyptian environmental, public health, and water quality regulations.

Reuse of laboratory, clinical, or potentially contaminated wastewater shall be prohibited unless appropriate treatment, risk assessment, and regulatory requirements have been satisfied.

5. Institutional Responsibilities

- University Administration: Provide institutional oversight and integrate water reuse objectives into strategic and operational planning.
- Facilities and Maintenance Units: Identify opportunities for water recovery, implement appropriate systems, and monitor water consumption.
- Faculties and Research Institutes: Support water reuse initiatives through research, education, and responsible operational practices.
- Staff and Students: Adopt responsible water-use practices and participate in awareness and conservation initiatives.

6. Monitoring and Performance Indicators

The University shall periodically monitor the implementation of this policy using appropriate indicators, including:

- Total annual water consumption (m^3/year).
- Volume of water recycled and reused (m^3/year).
- Percentage of total water demand met through recycled or reused water.
- Reduction in freshwater consumption compared with the established baseline.
- Number of operational water reuse and recycling systems.
- Percentage of landscaped areas irrigated using alternative water sources.
- Compliance of reused water with applicable quality and safety standards.

7. Review and Continuous Improvement

This policy shall be reviewed periodically to reflect technological developments, regulatory requirements, institutional priorities, and measured environmental performance.

Alexandria University is committed to progressively expanding safe water reuse and recycling practices as part of its long-term environmental sustainability strategy.

A policy to maximize water reuse across the university

Below is the policy endorced document.

Water reuse policy

ALEXANDRIA UNIVERSITY

Policy on Energy and water sustainable use

Alexandria university is Committed to pursuing sustainable development within and through the university and to reassessing higher education and its role in the transition to more sustainable societies. This includes building synergies and collaboration in the search for effective and innovative approaches to solving today's as well as future sustainable development challenges.

The university ensures that all renovations and establishment of new buildings are following energy efficiency standards and water conservation strategies.

The university ensures divesting investments and purchases from Carbon-intensive energy industries particularly coal and oil.

The university through its faculties is committed to maximise water reuse across the university buildings and through all services provided in the process of education and research

The objective of this statement is Commitment to offering an open, interactive and collaborative forum for discussion and action, to raise awareness and advocate for changes needed changes in higher education to best serve the goals of sustainable development, (SDGs) as well as building international linkages and cooperation on the basis of core values of academic freedom, institutional autonomy and related local and global responsibilities to society.

Being uncompliant with the commitment to purse sustainable development issue will be regarded as interfering with personal development of the students, and the university administration will act accordingly

Policy created September 2019

Policy reviewed October 2022

Prof. Abdel Aziz Konsowa

University President

A. Konsowa

Alexandria university implements an integrated water management strategy focused on water

conservation, efficient resource utilization, wastewater treatment, recycling, and water quality protection across its campuses. In accordance with the United Nations sustainable development goals (SDGs) and Egypt's vision 2030, the university develops initiatives to reduce freshwater consumption, optimize operational performance, and address drought and water scarcity through education, research, and sustainable infrastructure.

- The university's water management framework integrates efficient irrigation systems, water-saving technologies, greywater recycling, renewable energy-powered desalination, and environmental monitoring. These methods support wastewater recovery, improve water resource efficiency, and protect freshwater and marine ecosystems. Through technological innovation, scientific investigation, and community awareness programs, Alexandria university strengthens water security, promotes environmental protection, and advances sustainable campus development.
- 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.
- Research and technological development are strengthened through the **Alexandria University Water Resilience Center of Excellence (AWR-CoE)**, a national platform for applied research, capacity building, professional training, and international cooperation. The center advances sustainable water technologies through investigations into wastewater treatment, desalination, water reuse, circular economy solutions, and climate change resilience. Specialized academic programs, workshops, scholarships, and institutional partnerships further support innovation and sustainable water management.



The STDF-funded HMDed project on innovative wastewater treatment technologies concluded with a workshop held at the Faculty of Science, Alexandria University, in December 2025. The workshop combined lectures and hands-on training in water quality analysis and nanomaterial applications, bringing together academics, industry experts, and 51 researchers and students.



The SOA/C workshop was organized by the Alexandria University Water Resilience Center of Excellence (AWR-CoE) to promote knowledge exchange, strengthen research collaboration, and enhance capacity building in sustainable water management and water resilience.



The water Quality Parameters Training and Innovative Strategies Workshop focused on water quality testing, teaching, and the development of innovative strategies for water quality assessment and sustainable water management.



Wastewater treatment unit - Faculty of Engineering

- 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.
- Raising awareness among Alexandria University students from various faculties—including Science, Engineering (Civil,Mechanical, and Mechatronics), Commerce, Arts (Surveying, mapping, and GIS), and Fine Arts (Architecture)—about wastewater treatment was achieved through summer training and periodic visits to the laboratories of the Alexandria Sewerage Company. This effort supports the achievement of the Sustainable Development Goals by enhancing partnerships for sustainable development and fostering collaborations that mobilize and share knowledge, expertise, and technology. The training aimed to provide students with essential scientific skills and practical experience to prepare them for the job market (September 2024).
- A cooperation protocol was signed between Alexandria University and Alexandria Sewerage Company to employ outstanding graduates from the faculties of Engineering, Commerce, Law, Science, and Arts over the past five years, based on the actual needs and annual workforce plan of the sewerage company. Additionally, the protocol aims to prepare a new generation of skilled professionals in modern technologies. It includes agreements for employees to access masters and doctoral programs at reduced fees and to conduct workshops and training courses with professors from Alexandria University to enhance partnerships for sector performance and achieve sustainable development goals.
- The faculty of pharmacy is advancing the "Green Circle" project, which is a non-profit project that seeks to keep the environment cleanand green in a sustainable way by separating waste for recycling. Also, the faculty implement a grey water (wastewater) recycling system that depends on reusing wastewater from sewage basins only (without using wastewater from laboratory basins) by re-pumping it into the flushing bins in the toilets after work. Filtration and primary treatment.




Innovative Renewable Energy RE-Multi-stage flash system (MSF) with salt precipitator and nanofiltration (NF-MSF) to pre-treat feedwater (RE-NF-MSF). Faculty of Agriculture, Alexandria University




A 100 m^3 desalination unit in Wadi Natroun (Faculty of Agriculture, Alexandria University)




Raising awareness among university staff about water conservation through seminars and workshops organized in collaboration with Alexandria Drinking Water Company at the Faculty of Science.









Raising awareness among Alexandria University students about wastewater treatment was achieved through summer training activities conducted at Alexandria Sewerage for students from various faculties, including Science, Engineering (Civil, Mechanical, and Mechatronics), Commerce, Arts (Surveying, Mapping, and GIS), and Fine Arts (Architecture), September 2024.

Alexandria University also has a large number of research projects in the field ofwaste recycling, treatment and reuse of sewage and industrial wastewater.

- Enhancing Resource Recovery and Improving Wastewater Reuse Through Synergistic Cooperation betweenBioelectrochemical Systems and Forward Osmosis, (2019-2024).
- A novel combined approach for Poultry slaughterhouse wastewater treatment: prototype design and development,(2021-2024).
- Agricultural sustainability and water reuse in Egypt: innovative wastewater treatment and soil health, (2021-2024).
- Wastewater Treatment by Integrated Green Coagulation and Membrane Technology for Reuse, (2021-2024).
- Construction of a Self-Charging Unit for Collecting Wasted Mechanical Energy from Basic Human Motion, (2023-2025).
- Production, modification and new prospects of biochar derived from biomass waste, (2023-2026).
- Microbial technology as a bioremediation tool for heavy metals removal from industrial wastewater throughproteomic and nanotechnological approaches, (2023-2025).

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.
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- 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.
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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.

6.5.1 Educational opportunities for local communities to learn about good water management

Alexandria University is committed to advancing sustainable development by engaging the surrounding public in environmental stewardship. To address regional water scarcity and promote sustainable practices, the institution offers structured educational opportunities for local communities to learn about good water management. Through specialized workshops, public awareness campaigns, outreach programs, and practical demonstrations led by university experts and research centers, Alexandria University empowers community members, farmers, and local organizations with the knowledge and tools needed to conserve resources, adopt innovative recycling techniques, and achieve long-term water resilience.

- Alexandria University has created an integrated governance and sustainability framework that integrates sustainable development within institutional leadership, operations, education, research, and community engagement. Sustainability initiatives are overseen centrally by the Vice President for Community Service and Environmental Development and executed across faculties via Vice Deans and faculty sustainability committees.

- The institution also advances sustainability through educational and public engagement initiatives like the FAO Model on food security and sustainable agriculture, Children's University activities under the theme "Sustainability as a Way of Life," seminars on biomimicry, and workshops on sustainable biofilms and circular economy approaches for water treatment.

- Alexandria University actively empowers its students to lead sustainability initiatives that promote environmental protection, innovation, community engagement, and social responsibility. During the reporting Period, more than 30 sustainability-related activities were organized by student organizations across the University, demonstrating a strong Culture of student participation in advancing the Sustainable Development Goals (SDGs). These activities included international conferences, scientific symposia, green chemistry campaigns, climate change awareness events, water entrepreneurship bootcamps, research and innovation conferences, engineering competitions, sustainability workshops, environmental exhibitions, and community outreach programs.

- Alexandria university adopts an integrated water management approach that combines water conservation, efficient resource use, wastewater treatment and reuse, innovative research, and environmental education to support sustainable development across the campus area. Through advanced irrigation systems, water-efficient technologies, greywater recycling, renewable energy-powered desalination, water quality monitoring, and community awareness initiatives, the university enhances water security, improves water

management, and protects fresh water and marine ecosystems while reducing water pollution and supporting long-term environmental sustainability.

- Alexandria University further integrates biodiversity conservation into its education through student participation in field surveys, environmental mapping, landscape Analysis, and ecological documentation. These practical experiences contribute to campus sustainability planning while providing students with hands-on learning opportunities in Environmental Assessment, urban Ecosystem Analysis, Land Cover evaluation, and Sustainable Landscape Management, supporting Environmental Protection and biodiversity restoration.

- Research and innovation are supported through the Alexandria University Water Resilience Center of Excellence (AWR-CoE), which serves as a national platform for applied research, capacity building, professional training, and international collaboration. The Center advances sustainable water technologies through research on wastewater treatment, desalination, water reuse, circular economy approaches, and climate resilience while offering specialized academic programs, workshops, scholarships, and partnerships with leading national and international institutions).

- The institution's Central Laboratory and specialized research facilities conduct chemical and physical testing of water quality in line with internationally recognized standards, guaranteeing robust environmental monitoring and safeguarding surrounding ecosystems. Community outreach, including coastal cleanup drives, marine conservation efforts, and environmental awareness programs, additionally reinforces the University's dedication to preserving aquatic environments.





Water Quality Parameters Testing Program by Alexandria Water Resilience – Center of Excellence:

Intensive 5-day program, with the participation of 14 students from the Civil and Environmental Engineering program at the Faculty of Engineering, Alexandria University. This program equipped the participants with valuable knowledge and skills to master the tools and techniques used in the water analysis laboratory.





Centre of Excellence for Water at Alexandria University Organizes Workshop on Relationship between Water, Energy and Food in Cooperation with the Arab Water Council:

The workshop aimed to deepen the comprehensive understanding of the interrelationship between these three resources (water, energy and food), highlight the challenges they face, and propose sustainable solutions, and the latest developments in this field, exchanging creative ideas, and enhancing cooperation between industry and academic institutions.





Alexandria University Participates in Cairo Water Week 2025 in Collaboration with the European Union Delegation to Egypt

As part of the ongoing collaboration between Alexandria University and the European

Union Delegation to Egypt to promote innovation in water resources management, the university took part in the final stage of the “AI and Innovation Hackathon for Waterpreneurs”, organized by the EU Delegation and held on 15 October 2025 in Cairo within the framework of Cairo Water Week 2025.

The event featured the presentation of finalist projects before a distinguished jury representing the public, private, academic, and technological sectors, where young Egyptian innovators showcased AI-driven solutions addressing major water challenges such as smart irrigation, water quality monitoring, and digital tools for sustainable water management.





the Water Entrepreneurship Training Program in Cooperation with the European Union titled "Youth in Water: Shaping the Future" (EU for Water ln Egypt Aqua Dialogues) May 2025:

young participants focused on water challenges and discussed various topics, including:

- 🔷Global trends in the water sector
- 🔷Climate adaptation and resilient water solutions
- 🔷Entrepreneurial mindset and innovation
- 🔷Circular water economy & non-conventional water resources
- 🔷The role of AI, tech, and digital tools in water management





Within the framework of the Center of Excellence for Water at Alexandria University's interest in Research and Sustainability, and the visit of Prof. Brent Haddad, Professor of Environmental Studies at the University of California- Santa Cruz and Chair of the Research and Policy Committee, the center organized a seminar entitled: "Towards Public Private Partnerships (PPP) in Alexandria within the Research Roadmap."





Under the Strategic Partnership between the Arab Republic of Egypt and the European Union. Ministry of Planning, Economic Development and International Cooperation Witnesses the Launch of the "EU 4 Water Preneurs" Training Camp for Entrepreneurs in the Water Sector 🇪🇬🇪🇺

The event was held at Alexandria University within the framework of the strategic partnership between the Arab Republic of Egypt and the European Union, and in partnership with the **PrimaProgram**. The initiative aims to stimulate the young energies of Egyptian innovators, researchers, and students, and encourage them to develop scientific and realistic solutions applicable on the ground to address the increasing and interconnected challenges facing Egypt in the fields of water, energy, and food.



Student organizations such as the ACS Alexandria University Student Chapter, Society of Petroleum Engineers (SPE), Alexandria Engineering Students Union, and Alexandria Scientific Pharmaceutical Students' Association (ASPSA) played a leading role in delivering these initiatives. Their activities promoted green chemistry, circular economy principles, Climate Change action, sustainable Materials, Water Innovation, biodiversity conservation, scientific communication, entrepreneurship, and environmental education through hands-on workshops, public awareness campaigns, interactive exhibitions, field training, and international collaborations, strengthening sustainable Development, environmental awareness, and community engagement across the University.

Water conservation off campus

Alexandria University is advancing Water Conservation and Water Management through a data-driven Model that analyzes Rain patterns and Water Resources using remote sensing Data and environmental Analysis. The System supports improved Water Supply, Wastewater Treatment, and reduced Water Pollution across campus and surrounding Areas. By integrating modern Technology and Sustainable Methods, the University enhances System Performance, strengthens Environmental Protection, and promotes long-term Sustainable Development. This Integrated Approach improves Drinking Water Quality, manages Surface Water Runoff, supports Groundwater Resources, reduces Contamination, and protects local Ecosystems through effective Monitoring, Assessment, and sustainable resource Management.

Alexandria University drives critical off-campus water conservation initiatives through community-wide resource management, agricultural partnerships, and public infrastructure developments across the Alexandria Governorate. Given Egypt's strict annual water deficit, the university uses its academic and technical expertise to enhance water security for surrounding local communities, smallholder farmers, and regional municipalities

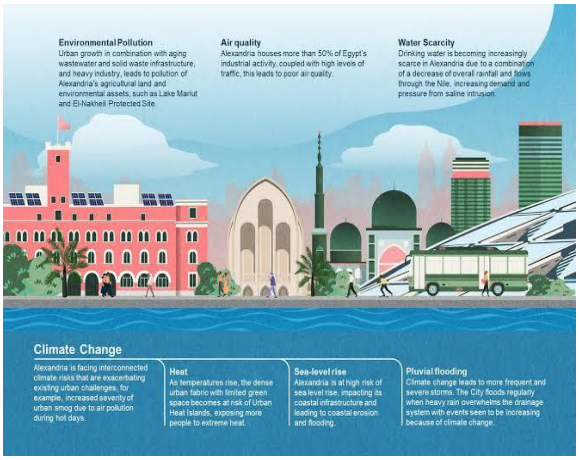
1. Center of Excellence for Water (CoE4W)

- The Center of Excellence for Water is one of Alexandria University's most prominent initiatives, launched in partnership with USAID and the American University in Cairo. The project features high-profile inaugurations, international consortium summits, and heavily upgraded laboratory infrastructure designed to train water engineers and develop national water management strategies.
- Launched as a major $30 million USAID-funded initiative in partnership with the American University in Cairo (AUC), this center is physically hosted across top public universities, with Alexandria University serving as a core hub. The center acts as a cutting-edge research nexus connecting Egyptian academic scholars with prominent U.S. institutions (like Utah State, Washington State, and UC Santa Cruz). Its primary mission is to revolutionize water engineering curricula, fund real-world applied research grants, and bridge the gap between academic innovation and national public policy to combat Egypt's pressing water scarcity.
- Community Impact: It trains the next generation of Egyptian water engineers and provides state-backed solutions directly to the Ministry of Water Resources and Irrigation.



2. The Alexandria Rainwater Drainage & Separation Project

- Alexandria has historically suffered from winter flash floods that overwhelmed its combined municipal sewage network. Faculty of Engineering scholars at Alexandria University have been the primary scientific consultants driving the national engineering strategy to completely separate the rainwater drainage infrastructure from the municipal wastewater grid. The university actively tests, models, and implements smart hydrological frameworks that channel pristine runoff away from sewers.
- Alexandria University's Faculty of Engineering plays a central consulting role in the massive municipal engineering strategy to **separate rainwater networks from the sewer grid**. This framework mitigates regional flash flooding and redirects clean runoff into water treatment facilities or agricultural distribution channels.
- Community Impact: It actively prevents city-wide flooding while safely recycling collected rainwater for agricultural reclamation projects, such as irrigating crops in the nearby Abis research centers.





3. <u>EU 4 Water Preneurs Initiative (EU-Egypt Aqua Dialogues)</u>

- Funded and organized directly by the European Union (EU) in conjunction with Alexandria University and the Mediterranean-wide PRIMA program, this dynamic entrepreneurship initiative officially kicked off its high-profile bootcamps and hackathons on the Alexandria University campus. The platform empowers young researchers and university students by providing them with institutional funding, business development mentoring, and enterprise AI literacy.
- Supported by the European Union, this entrepreneurial framework works directly within Alexandria University to host technical training, academic webinars, and innovation bootcamps. The focus is on encouraging student-led startups to market smart water solutions and decentralized desalination technologies.
- Community Impact: It accelerates youth-led startups working on highly practical local problems, such as decentralized desalination prototypes and AI-enabled water allocation systems.





4. <u>The AG-WaMED Project (Advancing Non-Conventional Water Management)</u>

- Co-funded via international frameworks and the Academy of Scientific Research and Technology (ASRT), this project targets the climate-resilient governance of water in the Mediterranean basin. Alexandria University researchers lead regional "Living Labs"—

territorial laboratories where academics work alongside local farmers and municipal officials.

- The **AG-WaMED initiative** focuses on non-conventional water resource management across the Mediterranean. Alexandria University's active researchers collaborate on optimizing treated agricultural wastewater usage, replenishing groundwater supplies, and running regional "living labs" to aid local agricultural communities.
- Community Impact: The project integrates Non-Conventional Water (NCW) resources—specifically treating agricultural drainage, optimizing groundwater aquifer recharge, and utilizing treated wastewater—to combat severe agricultural water shortages.



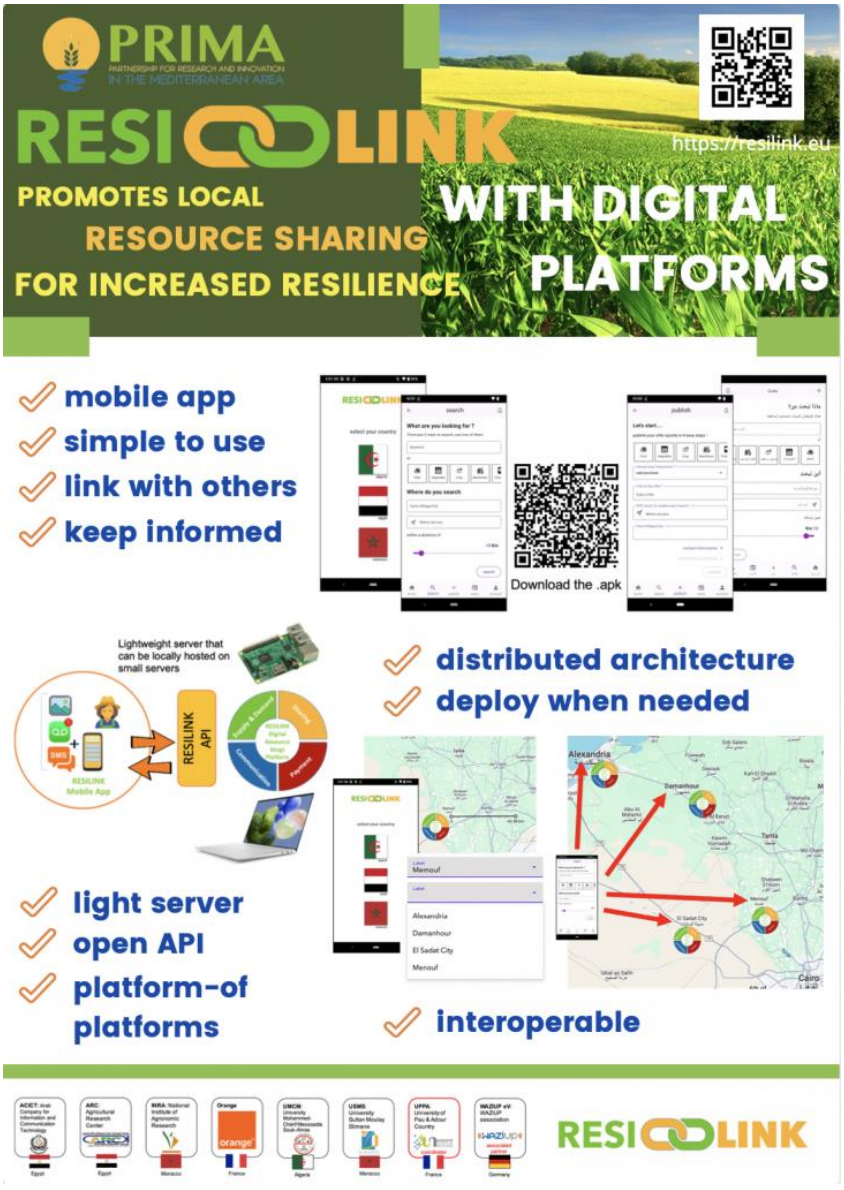
5. <u>Agricultural Water Recycling in the Abis Experimental Station</u>

- The Faculty of Agriculture manages an off-campus network of eight dedicated aquaculture ponds (measuring 1.25 acres per pond) situated in the rural Abis region.
- The station actively intercepts the nutrient-heavy effluent ("sewage") discharged from the fish aquaculture operations. Instead of discarding this wastewater into regional drainage networks, the university channels the recycled water directly into adjacent agricultural research plots.
- Because aquaculture effluent is naturally enriched with organic compounds and nitrates excreted by fish, it acts as a bio-fertilizer. This circular loop minimizes the extraction of fresh municipal water while lowering the local farmers' dependence on chemical synthetic fertilizers.

6. <u>PRIMA Sustainable Irrigation & the RESILINK Mobile App</u>

- This digital transformation initiative is powered by RESILINK, a collaborative research project under the European Union's PRIMA Programme (Partnership for Research and Innovation in the Mediterranean Area).
- IoT Infrastructure on the Farm: The project deployed an Internet of Things (IoT) platform explicitly within the Alexandria University Farm for agroecological farming. This platform utilizes local soil moisture sensors and environmental monitors to collect micro-climate metrics.
- The RESILINK Application: The field data integrates directly with the RESILINK Mobile App, an open-source, distributed digital resource management tool. By tracking localized

agricultural assets and soil needs in real-time, the app allows smallholder farmers to automate precision irrigation schedules—ensuring crops receive exact required volumes and preventing the heavy water run-off standard in traditional flood irrigation.

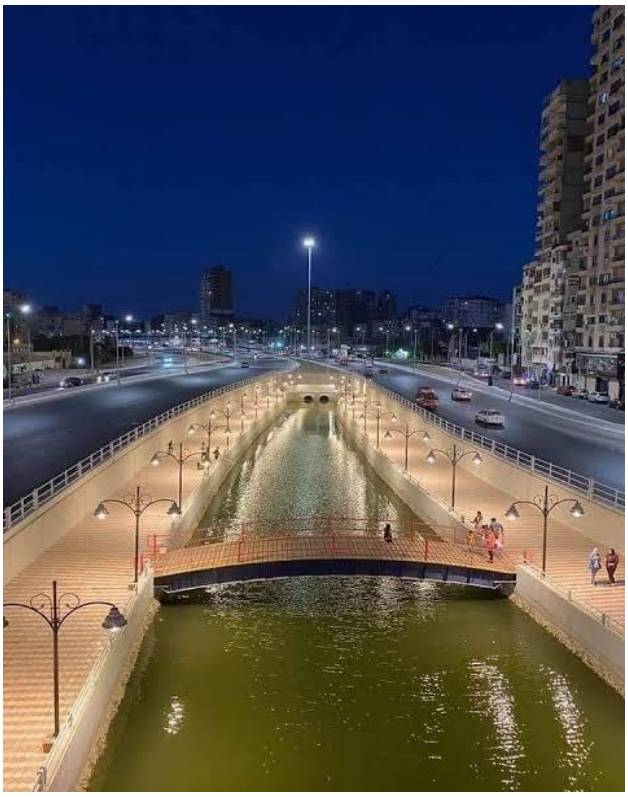


7. <u>Technical Advisory for the Mahmoudieh Canal Transformation</u>

- Faculty members from the Faculty of Engineering at Alexandria University serve as official technical consultants for the $330 million Mahmoudieh Axis transformation.
- Hydrological Problem Solving: The historical 77-kilometer Mahmoudieh Canal serves as the absolute lifeline for Alexandria, feeding six of the city's key water treatment plants (WTPs). However, as an open, unlined earthen channel, it faced immense issues including water evaporation, illegal industrial dumping, and seasonal spikes in toxic free ammonia or nitrites.

- The Modernized Axis: University engineering teams provided the precise structural assessments and design guidance necessary to convert vulnerable open channels into controlled, closed municipal water conduits. By replacing exposed open-water pathways with managed stormwater drainage and sub-surface governance, the project drastically mitigates water pollution, stabilizes raw water intake quality, and eliminates structural municipal water losses across the governorate.





Extracted water from aquifers, lakes or rivers and utilization of sustainable water extraction technologies on associated university grounds on and off campus

Alexandria University promotes sustainable water resource management through the application of advanced water treatment, desalination, recycling, and efficient irrigation technologies across its campus facilities and associated off-campus research sites.

1. Available evidence from Alexandria University

Project or activity	Relevance	Evidence strength
Water desalination facility at Wadi El-Natroun	University-associated off-campus facility using desalination technology	Strong for sustainable treatment technology; extraction source needs confirmation
Renewable energy-powered desalination research	Demonstrates energy-efficient treatment of saline water	Strong technological evidence
Smart irrigation project at the Faculty of Agriculture	Demonstrates controlled irrigation to reduce water demand	Supporting evidence; does not independently prove extraction
Water management at Abis agricultural research facilities	Demonstrates water reuse and sustainable agricultural water management	Supporting evidence; water abstraction method needs confirmation
AG-WaMED project, Marsa Matrouh, 2025	Research on sustainable use of non-conventional water resources	Strong research evidence; site-level extraction needs verification

The following images illustrate the water management technologies described in Alexandria University's sustainability documentation.



Figure 1. Solar-Powered Water Desalination – Wadi El-Natroun

The Faculty of Agriculture reports a solar-powered desalination facility at Wadi El-Natroun, with a stated treatment capacity of 100 m^3/day. The source of abstracted water requires confirmation. Illustrative photograph, not verified as the Alexandria University facility.

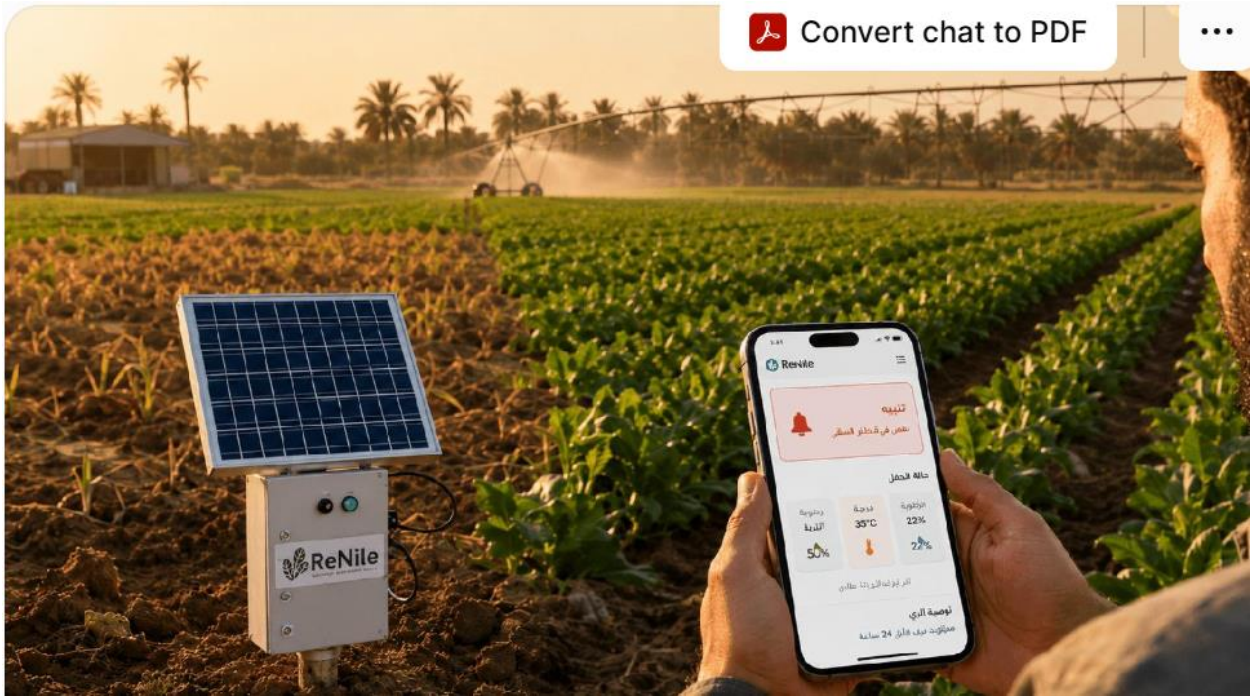


Figure 2. Smart Irrigation Technologies – Faculty of Agriculture

Smart irrigation systems support efficient water application, reduced water losses, and more sustainable agricultural water management. Illustrative photograph of irrigation technology.



Figure 3. Recycling Aquaculture Water – Abis Research Facilities

Figure 3. Recycling Aquaculture Water – Abis Research Facilities
Water from aquaculture activities is reported to be reused for agricultural irrigation, reducing demand for additional freshwater.

The Faculty of Agriculture operates a solar-powered desalination facility at Wadi El-Natroun, with a reported treatment capacity of 100 m^3/day. The University has also developed renewable energy-driven desalination technologies incorporating nanofiltration and multi-stage flash processes. At the Faculty of Agriculture's experimental research facilities in Abis, water from aquaculture activities is recycled for agricultural irrigation. Additional initiatives include smart irrigation technologies, rainwater harvesting, and water recovery systems that reduce pressure on conventional freshwater supplies.
These initiatives demonstrate the University's commitment to improving water-use efficiency, developing sustainable water technologies, and supporting responsible water resource management in Egypt.

The University's official 2024–2025 sustainability documentation provides supporting technical descriptions and photographic evidence of these activities.
Alexandria university applies an integrated water management approach that combines sustainable water extraction from local sources with advanced treatment, recycling, and irrigation systems to protect regional water resources. Through continuous analysis, innovative models, and modern technology, the university enhances wastewater reuse, reduces water pollution, and improves environmental conditions on and off campus. These efforts support efficient processes such as greywater recovery, effluent reuse, desalination, and controlled rain

harvesting, while strengthening system performance and long-term sustainability. This integrated system demonstrates Alexandria university's commitment to developing innovative solutions that enhance water supply, support agriculture, improve water quality, and protect ecosystems across the region, contributing to environmental protection and sustainable development.

Alexandria university implements data-driven sustainable water extraction, management, and recycling practices across its urban campuses and off-campus research sites, supporting water conservation, water supply, and environmental protection.

- The University has allocated approximately 22.41 million m^2, representing 78.89% of its total campus area, to permeable or semi-permeable surfaces that enhance natural water absorption, groundwater recharge, and sustainable stormwater management. These landscapes decrease surface runoff, promote soil infiltration, and strengthen climate resilience while elevating the ecological quality of the campus environment.

- Alexandria University has effectively executed a comprehensive Water Conservation Program, attaining over 50% water savings through optimized irrigation networks, leak detection and maintenance, water-saving technologies, reuse initiatives, and educational awareness campaigns. Water-efficient fixtures, such as low-flow taps, sensor-operated faucets, and high-efficiency flushing systems, are installed across more than 80% of campus facilities. Routine maintenance of water distribution networks further prevents water loss and enhances operational efficiency.

- Water recycling remains a core element within the University's sustainability framework. Over half of all generated wastewater undergoes effective treatment and subsequent reuse across non-potable applications, encompassing landscape irrigation, farming activities, and various campus sanitation. Treated water irrigates green zones, agricultural study farms, modern rooftop gardens, and aquaculture sites. Notable initiatives feature greywater recycling networks, air-conditioning condensate recovery, wastewater treatment units, a 100 m^3 desalination plant, and renewable energy powered desalination technologies effectively highlighting integrated water resource management. To protect vital water supplies, Alexandria University enforces comprehensive modern water pollution control policies featuring wastewater treatment, controlled discharge systems, accredited laboratory monitoring, and thorough continuous water quality assessment.

- Research and innovation advance through the Alexandria University Water Resilience Center of Excellence (AWR-CoE), operating as a national hub for practical research, capacity development, professional training, and global collaboration. The Center drives sustainable water technologies by investigating wastewater treatment, desalination, water reuse, circular economy frameworks, and climate resilience while delivering specialized academic tracks, workshops, scholarships, and strategic partnerships alongside prominent national and international institutions.

SOAC

State-of-the-Art Water Curriculum

SOAC workshop - Alexandria University Water Resilience Center of Excellence AWR-CoE







AWR-CoE

Alexandria University Water Resilience Center of Excellence

Water Quality Parameters Testing Training &Innovative Teaching Strategies Workshop



Wastewater treatment unit - 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 preTreatment (RE-NF-MSF) - Faculty of Agriculture

Water recycling initiatives within the university

Alexandria University also documents smaller-scale water recovery initiatives:

- **Faculty of Engineering:** an air-conditioning condensate collection and reuse unit, along with a wastewater treatment unit.
- **Faculty of Pharmacy:** a greywater recycling initiative intended to treat handwashing wastewater for toilet flushing.
- **Faculty of Agriculture:** reuse of water associated with aquaculture and agricultural research for crop irrigation

Alexandria University program for Sewage Disposal

- Providing a sewage treatment plant at the university to make it suitable for irrigating green areas and gardens inside the university campus.
- 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 water sewage 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 use of biochar produced from Agricultural waste and waste Forests in residual removal chlorpyrifos pesticide Imidacloprid is from water agricultural drainage. Cooperation project between the Egyptian Academy of Research Science and Technology and the Czech Academy of Sciences.
- The sewage water will be treated and reused in the irrigation of green areas in Alexandria National University.
- Faculty of Pharmacy is seeking to implement a grey water (wastewater) recycling system that depends on reusing wastewater from sewage basins only (without using wastewater from laboratory basins) by repumping it into the flushing bins in the toilets after work. Filtration and primary treatment. The grey water recycling initiative has a significant impact on rationalizing water use.



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.



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



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





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

Off-campus agricultural extraction and desalination

The faculty of agriculture operates two major field sites where raw water extraction and advanced treatment technologies are directly integrated:

- **wadi natroun experimental site:** located in an arid area dependent heavily on groundwater resources, the university operates a 100 cubic meter per day desalination unit. This system treats extracted brackish groundwater through an advanced process to provide an adequate water supply for agricultural research, irrigation, and crop trials.
- **abis research station:** in the abis region, the university manages an extensive aquaculture system consisting of eight large ponds, each spanning 1.25 acres. To reduce reliance on fresh water resources and continuous groundwater extraction, the station implements a closed-loop

water recycling approach. Effluent from fish aquaculture ponds, naturally enriched with organic nitrogen and other nutrients, is captured and redirected to irrigate adjacent fruit, vegetable, and field crops. This process reduces fertilizer requirements, improves water management, and decreases raw water extraction.

On-campus conservation and mechanical recovery

Within the main metropolitan campuses, the university focuses on reducing municipal water intake and introducing alternative water recovery and recycling methods.

- **condensate harvesting:** at the faculty of engineering, specialized air-conditioning water collection and reuse units recover atmospheric condensation from central HVAC systems. This non-potable water is redirected for facility maintenance and campus greenery, improving water conservation and resource efficiency.
- **on-site wastewater treatment:** the faculty of engineering operates a decentralized wastewater treatment unit. Greywater generated on campus undergoes treatment to achieve appropriate quality standards for irrigation of green spaces and gardens, supporting circular water management and reducing wastewater discharge.
- **demand-side reduction:** Alexandria university has retrofitted campus fixtures with sensor-activated faucets, high-efficiency low-flow toilets, and flow regulators. According to the provided data, these measures have reduced overall potable water demand by approximately 50% across university facilities, demonstrating the impact of efficient technologies on water conservation.

Academic and policy leadership

Alexandria university contributes to Egypt's national water strategy through the center of excellence for water, a major research initiative focused on developing innovative solutions to water scarcity, transferring technologies for industrial wastewater treatment, and advancing groundwater modeling. These activities support water resources assessment, water quality monitoring, sustainable desalination, and improved water management, strengthening environmental protection and promoting sustainable development across agricultural, urban, and industrial areas.

University cooperate with local, regional, national or global governments on water security

Alexandria university strengthens water security through active cooperation with local, regional, and national authorities, integrating scientific analysis, modern water management systems, and sustainable environmental practices. By partnering with governmental agencies on wastewater treatment, rainwater management, and water resources planning, the university supports impactful projects, enhances capacity building, and promotes long-term sustainability across the region. These collaborations improve water supply, reinforce infrastructure, advance technology adoption, and expand joint training programs that prepare skilled professionals. Through its integrated approach, Alexandira university contributes to developing effective solutions for Egypt's water scarcity, climate change challenges, water pollution, and environmental protection, supporting sustainable development and the conservation of fresh water resources.

Alexandria university actively cooperates with local, regional, national, and international governments to address water scarcity and enhance water security through infrastructure development, policymaking, and international research initiatives.

Local and regional cooperation

- **rainwater management and infrastructure:** the university collaborates with local government bodies and the Arab academy for science, technology and maritime transport (AASTMT) on the rainwater management strategy project. This collaborative approach addresses stormwater management, rainwater harvesting, sewage treatment upgrades, and groundwater restoration to support local irrigation needs and protect regional water resources.

The faculty members from the Faculty of Engineering are offering their expertise and advice on the construction of the Mahmoudiyah axis. These engineering consultations may include technical guidance, design recommendations, structural assessments, and other professional input to ensure the project's success, safety, and efficiency throughout the construction process.





م	البيان	الوحدة	الكمية	ما تم تنفيذة	المتبقى
١	خطوط إنحدار (٢٠٠ ـ ٨٠٠ مم)	متر	٣٥٠٠	٢٣٣٦	١١٦٤
٢	خط طرد (٧١٠ مم)	متر	٢٥٠	٠	٢٥٠
٤	محطات رفع	عدد	١	٠	١
٥	مطابق	عدد	٢٤	٢٤	٠
٦	شنايش مطر	عدد	٩٨	٥٠	٤٨
٧	أسفلت	م٢	٥٢٠٠٠	٠	٥٢٠٠٠





Integrated strategy project for rainwater management in Alexandria Governorate in cooperation with Alexandria University





Integrated strategy project for rainwater management in Alexandria Governorate in cooperation with Alexandria University



Before performing the integrated strategy project



After performing the integrated strategy project
Mahmoudiyah Axis Project before and after performing the project

- **sanitation and municipal management:** Alexandira university channels over 1.1 million cubic meters of annual wastewater through the municipal Alexandira sanitation company for secondary and tertiary treatment. This process integrates campus infrastructure with regional sanitation systems, supporting water quality improvement, pollution control, and sustainable wastewater management.

A cooperation protocol was signed between Alexandria University and Alexandria Sewerage Company to employ outstanding graduates from the faculties of Engineering, Commerce, Law, Science, and Arts over the past five years, based on the actual needs and annual workforce plan of the sewerage company. Additionally, the protocol aims to prepare a new generation of skilled professionals in modern technologies. It includes agreements for employees to access masters and doctoral programs at reduced fees and to conduct workshops and training courses with professors from Alexandria University to enhance partnerships for sector performance and achieve sustainable development goals.



National cooperation

- **Egypt's new delta project:** a significant portion of the university's treated wastewater is directed toward the national new delta agricultural reclamation project, supporting national objectives for food security, water supply, irrigation, and sustainable agricultural development.
- **ministerial partnerships:** through its water research centers, the university cooperates with the ministry of water resources and irrigation, the ministry of higher education and scientific research, and the national water research center. These partnerships support regulatory coordination, scientific research, technology development, and alignment with Egypt vision 2030, promoting sustainable development and efficient water management.



Global government cooperation

- **USAID center of excellence for water:** located at Alexandira university, this $30 million applied research center was funded by the U.S. Agency for international development (USAID). Managed in collaboration with the American university in Cairo (AUC), the center connects international funding with an academic consortium comprising five Egyptian universities and five American institutions, including Washington state university and uc Santa Cruz. Its activities advance innovative technologies, water treatment methods, groundwater modeling, and practical solutions to water scarcity.



- **international technical pilots:** the university participates in international engineering research programs, including a water security project co-sponsored by the Egyptian academy of scientific research and technology and the Czech academy of sciences. It also collaborates on automated irrigation pilots with international industry partners such as the shanghai water saving irrigation corporation. These initiatives promote efficient water use, innovative irrigation systems, resource conservation, and environmental protection.

Through these partnerships, Alexandira university strengthens integrated water management, encourages international knowledge exchange, and supports the development of sustainable solutions for water pollution, water scarcity, and regional environmental challenges.

University actively promote conscious water usage on campus

Alexandria university actively promotes responsible water usage by integrating sustainable water management systems, expanding water conservation programs, and improving wastewater treatment and recycling across campus. Through awareness campaigns, technical training, and collaborative initiatives with local water authorities, the university enhances efficient use of water resources, reduces water pollution and environmental impact, and strengthens long-term sustainability. This integrated approach combines scientific analysis, technological innovation, and community engagement to improve system performance, advance modern water treatment technologies, and support national objectives for efficient water management, environmental protection, and sustainable development.

Alexandria university's water conservation initiatives are documented through sustainability assessments and institutional reports. The campus water management strategy integrates infrastructure upgrades, faculty-led recycling programs, and international research initiatives to improve water quality, reduce water consumption, and promote sustainable development.

1. Water-saving appliances and infrastructure updates

According to the university's reported internal audits, water conservation modifications have replaced conventional fixtures across multiple campuses, achieving an overall 56.5% adoption rate of water-efficient appliances.

- **Faucets and taps:** approximately 68% of campus bathroom faucets have been converted to water-efficient or sensor-controlled automatic units, reducing unnecessary water consumption.
- **Showers and toilets:** around 67% of campus showers and 43% of toilets and bidets use low-flow or high-efficiency components, supporting the objective of reducing water use.
- **Network monitoring:** regular maintenance and monitoring of internal pipeline networks help identify leakage, prevent water loss, and improve infrastructure performance.

	
Supplying water taps with water conservation units(Alexandria University, Egypt)	Adopting a mechanism to maintain water pipes toprevent waste resulting from leaks (Alexandria University, Egypt)

2. Faculty-specific recycling and reuse programs

University faculties implement specialized water recycling and recovery systems to reduce demand for fresh water resources and improve sustainable water management.

- **Faculty of engineering:** specialized air-conditioning water collection units and decentralized wastewater treatment equipment capture and recover condensed water for appropriate reuse, supporting water conservation and resource efficiency.
- **Faculty of agriculture:** the experimental research station in the abis region operates a closed-loop recycling system in which drainage water from fish aquaculture ponds is reused for irrigation of fruits, vegetables, and field crops. This nutrient-rich effluent reduces dependence on municipal water supply and conventional fertilizers.
- **Campus-wide irrigation:** treated wastewater is used to irrigate campus gardens and green spaces, reducing fresh water consumption while supporting sustainable landscape management and environmental protection.



Air conditioning water collection and reuse unit - Faculty of Engineering

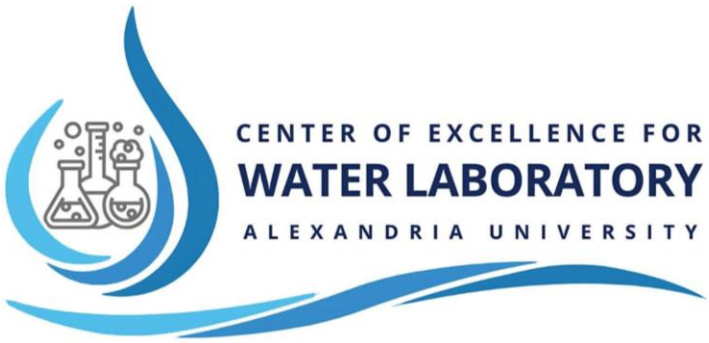


Wastewater treatment unit at the Faculty of Engineering

3. Center of excellence for water (AWR-COE)

Established at Alexandria university through a reported $30 million USAID grant, the Alexandria water resilience center of excellence serves as a research hub in collaboration with the American university in Cairo (AUC) and a consortium of American universities, including Washington state university and uc Santa Cruz.

- **Laboratory accreditation:** the center's primary laboratory reportedly achieved ISO/IEC 17025:2017 accreditation, supporting reliable measurement and evaluation of water quality, desalination performance, and wastewater treatment efficiency.
- **IOT agricultural project:** in collaboration with the shanghai water saving irrigation corporation, the university farm serves as a pilot site for an internet of things (IOT) automated irrigation system. Smart sensors measure crop water requirements and optimize water distribution, supporting precision agriculture and addressing water scarcity.



Alexandria University's Centre of Excellence for Water Laboratory Obtains ISO/IEC 17025:2017 International Accreditation

This accreditation represents a significant achievement, as it confirms the laboratory's ability to conduct chemical and physical water testing in accordance with international standards. This enhances the reliability of results, supports research projects, and contributes to addressing the challenges of water scarcity, pollution, climate change, and sustainable development at both the local and international levels.





Water Quality Parameters Testing Program by Alexandria Water Resilience – Center of Excellence:

Intensive 5-day program, with the participation of 14 students from the Civil and Environmental Engineering program at the Faculty of Engineering, Alexandria University. This program equipped the participants with valuable knowledge and skills to master the tools and techniques used in the water analysis laboratory.





The AG-WaMED Final Event "Governing non conventional water resources (NCW) in the Mediterranean: the experience of the AG-WaMED PRIMA project"

Lots of interesting presentations and discussions, with roundtables and interactive moments with the participation of Prima Program PRIMA Nexus-Ness and SALAM - MED. The creation of a IAHS - International Association of Hydrological Sciences working group on Non-Conventional Water (NCW) use for Integrated Water Resources Management.





Alexandria University's Faculty of Agriculture Organizes a Workshop Titled "Soil and Water: The Source of Life" in Celebration of World Soil Day 2025. the workshop's activities coincided with the celebration of World Soil Day, and included a series of scientific lectures addressing key topics in soil and water sciences, such as the use of artificial intelligence in agricultural research and the importance of smart agriculture in enhancing soil safety and urban health. These discussions reflect the global trend toward sustaining natural resources and innovating scientific solutions to environmental challenges.





Centre of Excellence for Water at Alexandria University Organizes Workshop on Relationship between Water, Energy and Food in Cooperation with the Arab Water Council:
The workshop aimed to deepen the comprehensive understanding of the interrelationship between these three resources (water, energy and food), highlight the challenges they face, and propose sustainable solutions, and the latest developments in this field, exchanging creative ideas, and enhancing cooperation between industry and academic institutions.





Alexandria University Participates in Cairo Water Week 2025 in Collaboration with the European Union Delegation to Egypt

As part of the ongoing collaboration between Alexandria University and the European Union Delegation to Egypt to promote innovation in water resources management, the university took part in the final stage of the “AI and Innovation Hackathon for Waterpreneurs”, organized by the EU Delegation and held on 15 October 2025 in Cairo within the framework of Cairo Water Week 2025.

The event featured the presentation of finalist projects before a distinguished jury representing the public, private, academic, and technological sectors, where young Egyptian innovators showcased AI-driven solutions addressing major water challenges such as smart irrigation, water quality monitoring, and digital tools for sustainable water management.





the Water Entrepreneurship Training Program in Cooperation with the European Union titled "Youth in Water: Shaping the Future" (EU for Water ln Egypt Aqua Dialogues) May 2025: young participants focused on water challenges and discussed various topics, including:

🔷Global trends in the water sector

🔷Climate adaptation and resilient water solutions
🔷Entrepreneurial mindset and innovation
🔷Circular water economy & non-conventional water resources
🔷The role of AI, tech, and digital tools in water management




Within the framework of the Center of Excellence for Water at Alexandria University's interest in Research and Sustainability, and the visit of Prof. Brent Haddad, Professor of Environmental Studies at the University of California- Santa Cruz and Chair of the Research and Policy Committee, the center organized a seminar entitled: "Towards Public Private Partnerships (PPP) in Alexandria within the Research Roadmap."




Under the Strategic Partnership between the Arab Republic of Egypt and the European Union. Ministry of Planning, Economic Development and International Cooperation Witnesses the Launch of the "EU 4 Water Preneurs" Training Camp for Entrepreneurs in the Water Sector 🇪🇬🇪🇺

The event was held at Alexandria University within the framework of the strategic partnership between the Arab Republic of Egypt and the European Union, and in partnership with the **PrimaProgram**. The initiative aims to stimulate the young energies of Egyptian innovators, researchers, and students, and encourage them to develop scientific and realistic solutions applicable on the ground to address the increasing and interconnected challenges facing Egypt in the fields of water, energy, and food.



Student organizations such as the ACS Alexandria University Student Chapter, Society of Petroleum Engineers (SPE), Alexandria Engineering Students Union, and Alexandria Scientific Pharmaceutical Students' Association (ASPSA) played a leading role in delivering these initiatives. Their activities promoted green chemistry, circular economy principles, Climate Change action, sustainable Materials, Water Innovation, biodiversity conservation, scientific communication, entrepreneurship, and environmental education through hands-on workshops, public awareness campaigns, interactive exhibitions, field training, and international collaborations, strengthening sustainable Development, environmental awareness, and community engagement across the University.

University actively promote conscious water usage in the wider community

Alexandria university actively promotes conscious water usage in the wider community by supporting environmental management initiatives, conducting scientific studies on coastal ecosystems, and engaging the public in reducing water pollution and protecting shared water resources. Through community cleanup campaigns, awareness programs, and partnerships with local and international organizations, the university enhances regional sustainability, strengthens environmental protection, and encourages practical solutions that improve water quality and support long-term water security.

The university's central laboratory and specialized research facilities perform chemical and physical analysis of water quality in accordance with internationally recognized standards, ensuring effective environmental monitoring and protecting surrounding ecosystems. Community initiatives, including coastal cleanup campaigns, marine conservation activities, and environmental awareness programs, further strengthen the university's contribution to protecting aquatic environments, reducing pollutants, and promoting sustainable water management and resource conservation.

Researchers at Alexandria University are working on studies aimed at protecting and preserving the marine environment located close to the university's campus. Their research likely involves efforts to prevent pollution, protect marine biodiversity, and maintain the health of the coastal ecosystem. The focus is on ensuring that the nearby marine environment remains sustainable and unharmed by human activities or other environmental threats.





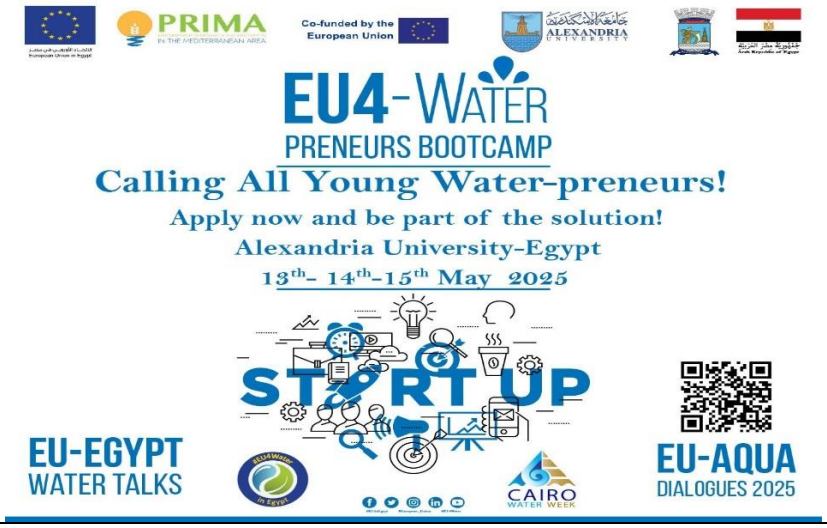
Water Quality Parameters Testing Program by Alexandria Water Resilience – Center of Excellence:
Intensive 5-day program, with the participation of 14 students from the Civil and Environmental Engineering program at the Faculty of Engineering, Alexandria University. This program equipped the participants with valuable knowledge and skills to master the tools and techniques used in the water analysis laboratory. Throughout this program, the students delved into the essential water quality parameters and their significance, gaining the required skills of proper

testing procedures and techniques and understanding the role and importance of the different equipment present in the laboratory.
Beyond the laboratory bench, the students have also embraced the understanding of the importance of safe and reliable water resources and the importance of compliance with regulations and standards to ensure public health and ecosystem protection.





Centre of Excellence for Water at Alexandria University Organizes Workshop on Relationship between Water, Energy and Food in Cooperation with the Arab Water Council:
The workshop aimed to deepen the comprehensive understanding of the interrelationship between these three resources (water, energy and food), highlight the challenges they face, and propose sustainable solutions, and the latest developments in this field, exchanging creative ideas, and enhancing cooperation between industry and academic institutions.



the Water Entrepreneurship Training Program in Cooperation with the European Union titled "Youth in Water: Shaping the Future" (EU for Water In Egypt Aqua Dialogues) May 2025:
young participants focused on water challenges and discussed various topics, including:

- 🔷Global trends in the water sector
- 🔷Climate adaptation and resilient water solutions
- 🔷Entrepreneurial mindset and innovation
- 🔷Circular water economy & non-conventional water resources
- 🔷The role of AI, tech, and digital tools in water management