6.5.3 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

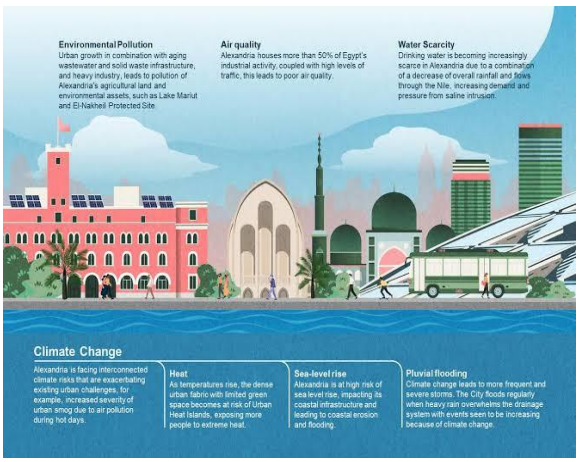
1. Center of Excellence for Water (CoE4W)

- 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. <u>The Alexandria Rainwater Drainage & Separation Project</u>

- 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.



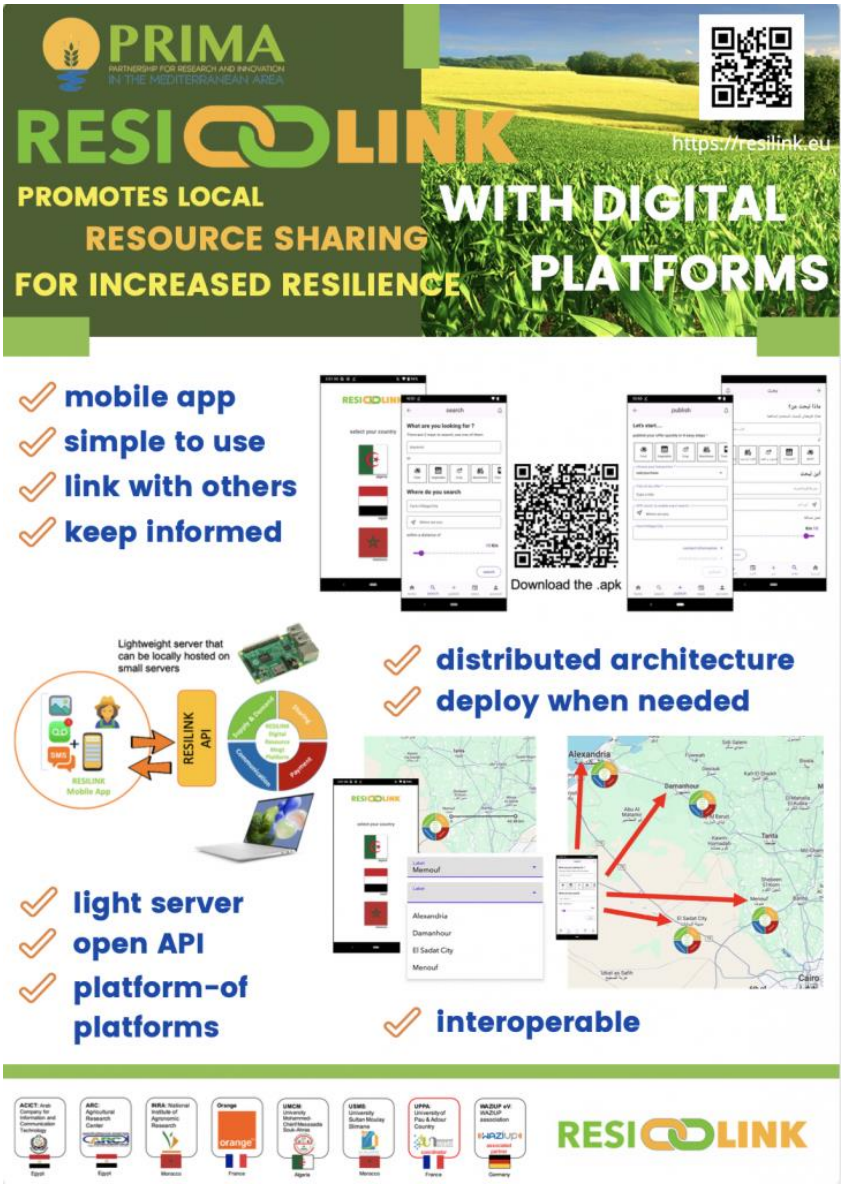
5. <u>Agricultural Water Recycling in the Abis Experimental Station</u>

- 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.



