6.5.4 Sustainable Water Extraction on Campus

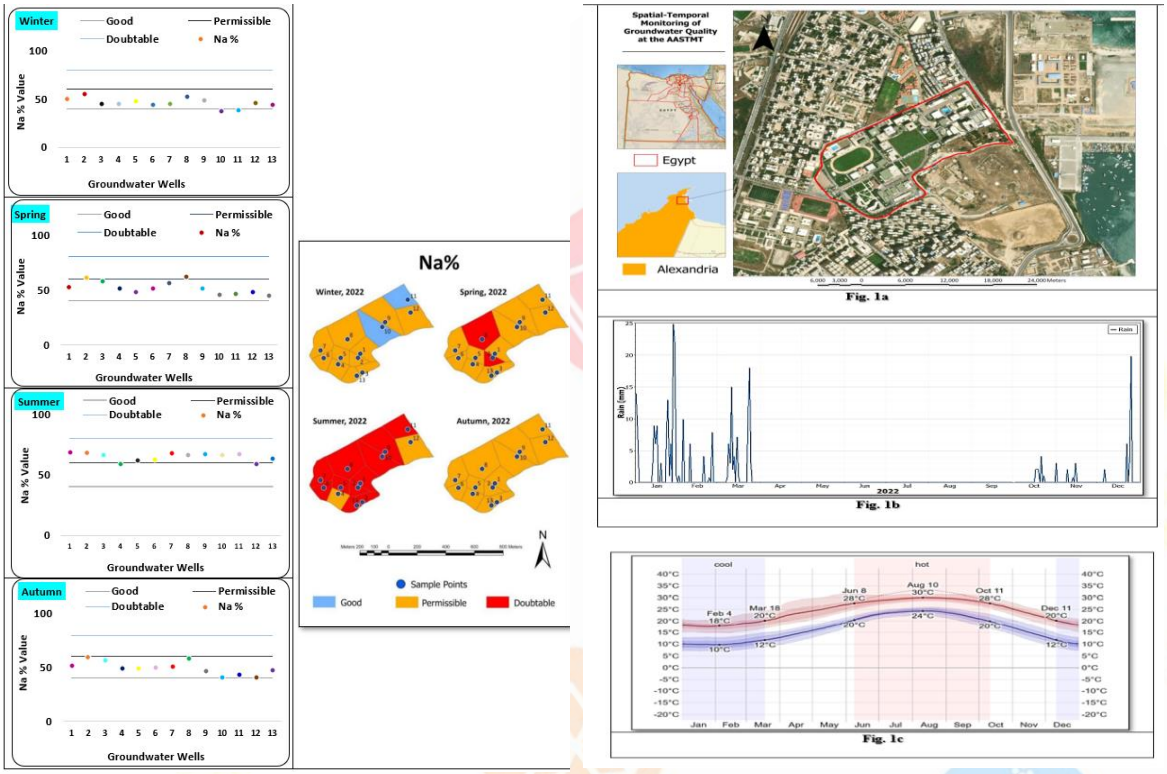
2023–2024

AASTMT supports sustainable water extraction on its campuses through several key initiatives. On the Abu Qir campus, the Academy extracts groundwater from borehole wells primarily for irrigation, ensuring sustainable use of resources. This water is carefully monitored and treated using advanced techniques like nanotechnology to improve water quality. Additionally, AASTMT utilizes solar-powered systems to operate water pumps, integrating renewable energy into its water extraction process. These initiatives align with SDG 6 by promoting efficient water use and improving overall sustainability in water resource management.

Strengthening Groundwater Quality and Sustainable Water Management at AASTMT to Advance SDG 6

Before 2024, AASTMT launched a comprehensive groundwater enhancement project to address growing water demand and rising pollution pressures. Beginning in 2021, the project focused on improving groundwater quality in the Abu Qir campus through continuous monitoring of 13 boreholes, assessing physical, chemical, and biological parameters across all seasons. The Academy introduced innovative nanotechnology-based treatment to upgrade groundwater for irrigation and drinking, while also working to reduce contamination from sewage leakage, excessive fertilizers, and industrial waste. By 2022–2023, AASTMT installed a solar-powered pumping and nano-filtration system to ensure cleaner, more sustainable water extraction that supports reliable irrigation and safe water use. These steps strengthened water quality management practices and contributed directly to the goals of clean water, sanitation, and sustainable resource use.

Based on 52 samples from the same 13 wells across the four seasons of 2022, the results showed clear seasonal variations in groundwater quality: winter demonstrated the best overall values due to rainfall dilution, with low Sodium Adsorption Ratio (SAR) and more favorable Kelly Ratio (KR) readings. However, during summer and autumn, the absence of rainfall and higher evaporation rates caused several indicators—such as Residual Sodium Carbonate (RSC), sodium percentage (Na%), magnesium hazard, and potential salinity—to rise significantly, pushing the water into moderate to poor quality categories for irrigation. Despite these fluctuations, the Permeability Index (PI) remained within the suitable range throughout all seasons, indicating that soil permeability is not severely affected. The monitored changes highlight how climatic conditions influence groundwater composition and reinforce the importance of continuous treatment, nano-filtration technology, and solar-powered pumping to stabilize water quality and ensure safe, sustainable use for both irrigation and drinking at the AASTMT campus.



Analysis of underground well water among 4 seasons

[Strengthening Groundwater Quality and Sustainable Water Management at AASTMT to Advance SDG 6]

Groundwater Extraction for Irrigation

AAST extracts underground water for irrigation by utilizing a series of borehole wells that tap into the groundwater reserves beneath the campus of Abukir. These wells are strategically drilled to access water from aquifers, ensuring a sustainable supply. Water is extracted through deep wells using mechanical drilling, and submersible pumps are used to extract the groundwater which is used for irrigation and landscaping purposes instead of drinking water. The amount of underground water extracted for the year 2022-2023 is 115000 cubic meters.

underground water extraction

underground water extraction

Underground water analysis and monitoring

Internally Funded Research Projects related to Water Resources Management in AAST Campuses

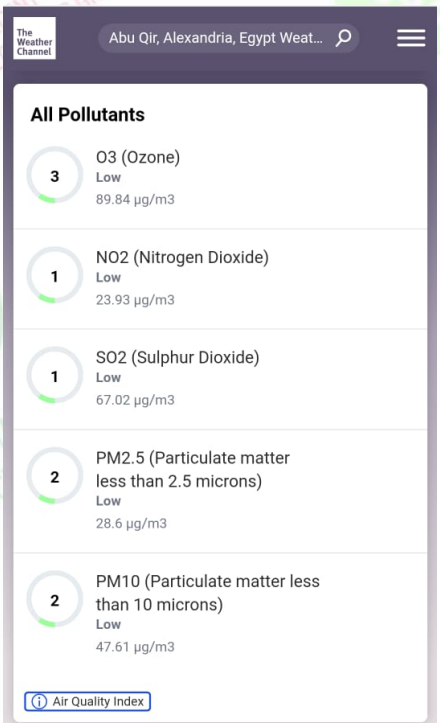
Monitoring, Assessment, and Innovative Treatment Technology to Enhance Groundwater Quality for Irrigation Toward Climate Change Adaptation

This project started in 2021 as an AAST funded project aiming to tackle the growing demand for clean water due to population growth and increasing water pollution by focusing on enhancing the quality of groundwater for irrigation and drinking purposes. It involves the regular assessment of the physical, chemical, and biological properties of groundwater from 13 boreholes at AASTMT, located in Abu Qir, Alexandria, to monitor water pollution and its relationship with climatic changes and environmental factors. To improve the usability of this groundwater, the project utilizes innovative nanotechnology for water treatment, ensuring the water meets the required standards for safe drinking and irrigation in arid regions. Additionally, the project aims to mitigate pollution from sources such as unsanitary sewage disposal, over-fertilization, and industrial waste, ensuring the sustainability of groundwater resources.

In 2022-2023 a complete design and installation of solar photovoltaic (PV) system to power the water pumps is carried out. This system is designed to lift water from a well and channel it through a four-stage nano-filtration system to ensure water purity for various applications, including cultivation and drinking which is used in AAST campus in Abukir. This system provides a sustainable and efficient solution to meet water needs, utilizing solar energy and renewable energy requirements to achieve high efficiency and reliability in water treatment.

For more information, and details on the project
Monitoring, Assessment, and Innovative Treatment Technology to Enhance Groundwater Quality for Irrigation Toward Climate Change Adaptation on AASTMT webpage

Solar powered unit for underground water extraction



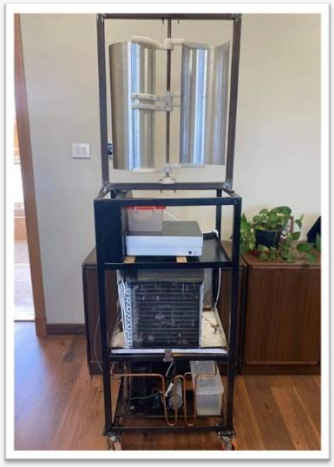
Using IoT to monitor water quality

Pilot Projects Employing Sustainable Sources

1. Development of an automated and mobile water treatment system using solar-powered reverse osmosis to provide and deliver water to arid and remote areas in Egypt. The desalination unit produces between 1.5 to 3 liters per minute, depending on the salinity of groundwater. This system desalinates water using PV system as a sustainable source of energy
2. The atmospheric water generator (AWG) extracts water from the humidity present in the air through the process of condensation and purifies it. The atmospheric water generators are divided into two types: production volume rate depending on the size of the application, the target market is bifurcated into residential, commercial, and others. This system is designed to extract 3 liters water per hour. This system extracts water using a wind turbine system as a sustainable source of energy
3. Development of a micro aquaponic integrated system with a capacity of 400 kg per day. This system recycles water used in fish tanks for agriculture purposes since the nutrient content of the water is high and rich for soil.

solar-powered reverse osmosis

micro aquaponic integrated system



Wind powered atmospheric water generator (AWG) extracts

Pilot Projects Employing Sustainable Sources on AASTMT webpage