6.4.2 Water Reuse Measurement

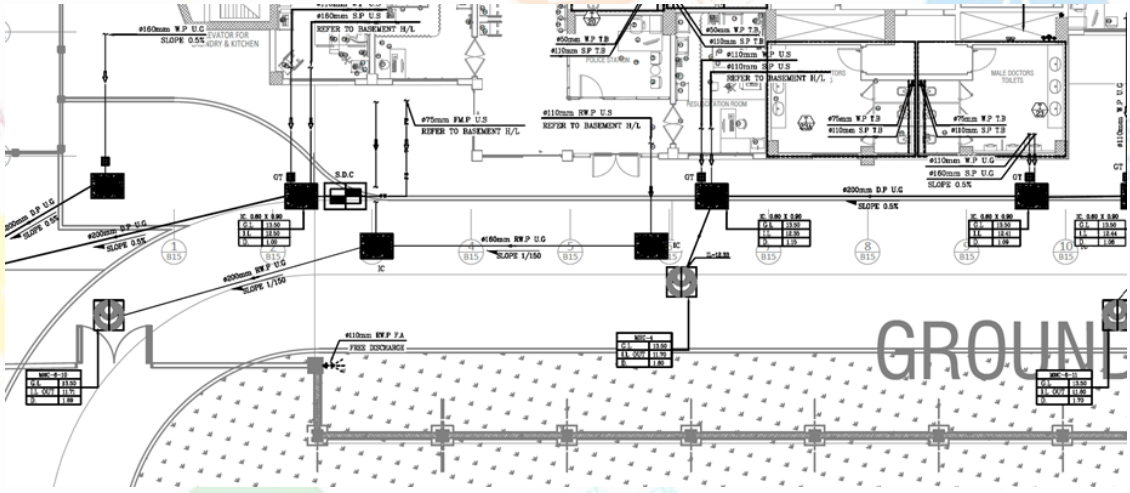
2023–2024

AASTMT practices sustainable water management practices at AASTMT, focusing on groundwater extraction, rainwater harvesting, and innovative pilot projects.

- **Groundwater Utilization:** The institution extracted 81,000 cubic meters of groundwater in 2022-2023 for irrigation and fire protection systems. Submersible pumps and borehole wells, monitored monthly, ensure water quality compliance with irrigation standards.
- **Rainwater Harvesting:** Rainwater is collected via drainage systems and reused for irrigation, supporting green landscapes and alleviating pressure on municipal water systems. Storage in tanks facilitates year-round use for hydroponics and agriculture.
- **Sustainable Technologies:**
    - Solar-Powered Water Systems: A solar-powered nanofiltration setup treats groundwater, producing drinking water and water suitable for agriculture while reducing water contamination and reliance on non-renewable energy.
    - Desalination Units: Solar-powered reverse osmosis units produce potable water from saline groundwater, offering a sustainable solution for arid regions.
    - Atmospheric Water Generation: Using wind energy, these systems extract water from humidity for residential and commercial applications.
- **Innovative Projects:** A micro-aquaponic system recycles water from fish tanks for agriculture, leveraging nutrient-rich effluents to enhance soil productivity.

Stormwater Collection System Implemented at Al Alamein Hospital

As part of the sustainable infrastructure design for the AAST Al Alamein Hospital, the latest drainage layout showcases a comprehensive stormwater collection network ensuring efficient rainwater management across the facility. The system integrates rainwater pipes (RWP), gully traps (GT), inspection chambers (IC), and main manholes (MHC) strategically distributed around key building zones. Stormwater collected from roofs and paved areas is directed through underground pipes sloped at 0.5% to maintain steady flow, eventually reaching the free discharge points positioned along the southern perimeter. Additionally, storm drain connections (S.D.C) link the gully traps to the inspection chambers, facilitating maintenance and monitoring while minimizing the risk of surface flooding. This setup demonstrates AAST's commitment to sustainable water management and climate-resilient building design.

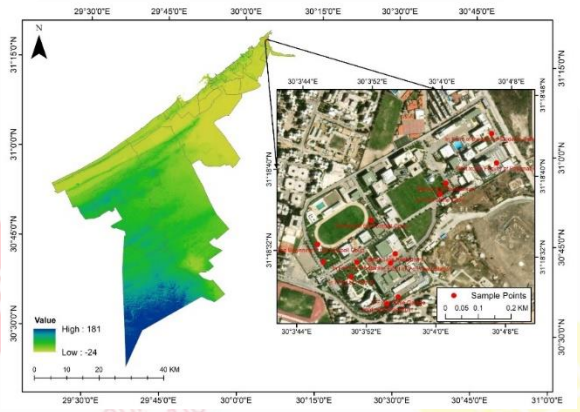


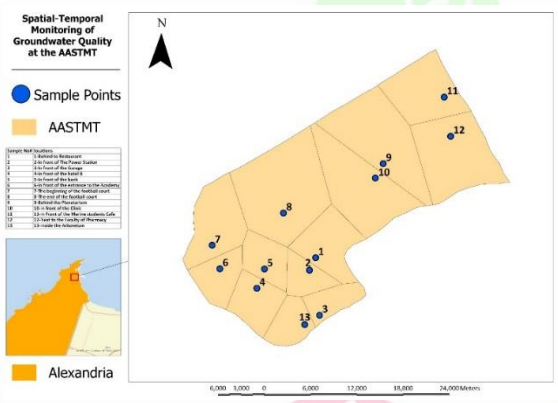
Storm water management system

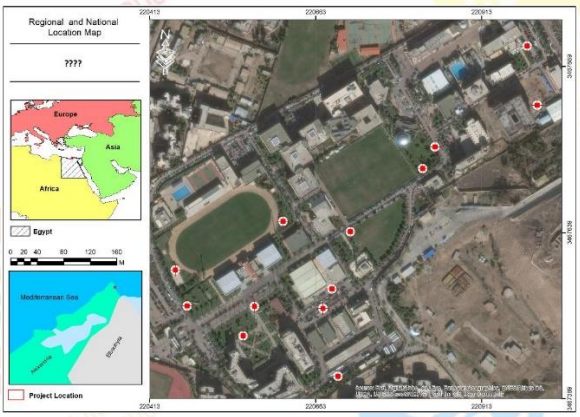
[Stormwater Collection System Implemented at Al Alamein Hospital](#) on AASTMT webpage

Sustainable Underground Water Extraction through PV- automated Pumping System

Some AASTMT campuses (especially those with large landscape areas) uses underground water extraction for irrigation. The Abukir campus in AASTMT is about 25-acre of landscape area that is mostly gardens. In that area, palm trees as well as the green land cover are irrigated by borehole wells of groundwater distributed as shown in Figures. Locations and Coordinates of the Borehole Wells are shown below. Water is extracted through deep wells using mechanical drilling, and submersible pumps are used to draw groundwater.


Value
High : 181
Low : -24
Sample Points


Spatial-Temporal Monitoring of Groundwater Quality at the AASTMT
Sample Points
AASTMT
Alexandria
N


Regional and National Location Map
????
Europe
Asia
Africa
Egypt
Mediterranean Sea
Project Location

The depth of each well is 15 meters, each is equipped with the following:

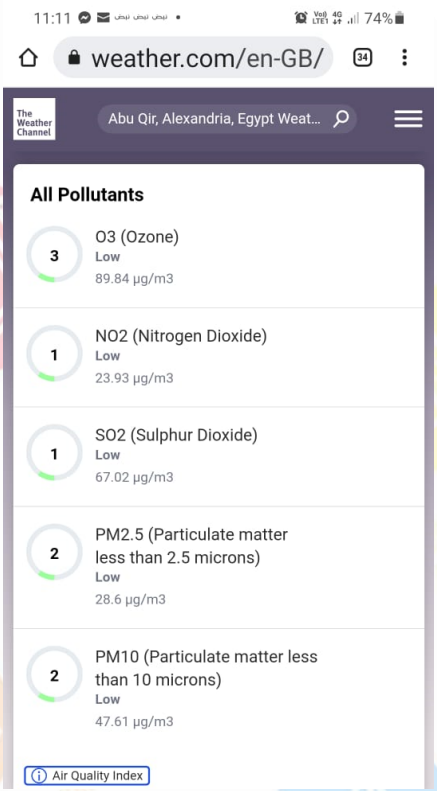
- A submersible water pump with a power of 3 horsepower.
- Each well covers an area of 8,000 square meters.
- Extracted water flows into dedicated pipes (black in diagram)
- Each well is equipped with a water meter to measure the amount of water extracted during the month.

Underground water is utilized to cover all irrigation needs for all green areas in AAST as well as for filling up fire protection water system. Underground is carefully monitored and analyzed monthly to make sure that water quality meets irrigation specifications. The amount of underground extracted water for the year 2023-2024 was 81000 cubic meters. Underground water is monitored via metering systems monthly and the annual extraction in cubic meters is as follows in table 1:

Table 1: Underground Water Extraction Capacity (m^3)				
2020-2019	**2020-2021**	**2021-2022**	**2022-2023**	**2023-2024**
216,000	237,000	102,000	81000	85000

Part of the underground water extracted is being treated, utilizing solar energy to power a three-phase pump and an advanced four-stage nanofiltration system. The setup includes JA Solar Mono-455 W photovoltaic panels that capture solar energy, an ABB inverter to convert this power to operate the pump, and the pump itself, which extracts water from the well. The extracted water then passes through the nanofiltration system, designed with four filtration stages to ensure purity, making it suitable for drinking and agricultural use. The nanofiltration approach effectively removes contaminants at a microscopic level, ensuring high-quality, purified water. This solar-powered system is environmentally friendly, reducing reliance on non-renewable energy sources and providing a reliable, renewable method for water purification in remote or resource-limited areas. By combining solar energy with advanced filtration technology, it offers a sustainable, efficient solution for clean water access.

Sustainable Underground Water Extraction through PV- automated Pumping System on AASTMT webpage



Rainwater Reuse Measures in Campus

Rainwater is harvested through drainage systems and pipes, redirected to soil, green areas, and landscapes for reuse in irrigation and other non-potable applications. Open drainage channels on public surfaces and walkways guide rainwater to agricultural basins and green spaces, reducing pressure on the sanitary sewer network. A rainwater collection pit, located near the College of Architecture and Computers, channels harvested rainwater to garden pipes for campus landscaping.

Additionally, rainwater is collected from greenhouse roofs in the Aquaculture Center and stored in ten water tanks with a 500-liter capacity. This water is used year-round in hydroponic systems and fertilizer production units, promoting efficient water use and supporting sustainable agricultural practices.




Some buildings feature sloped roofs designed for optimal rainwater harvesting. Specialized piping systems channel water from roof surfaces to collection points, where it flows through gutters and downspouts into designated storage or usage systems, ensuring effective and sustainable rainwater reuse.


Aquaculture Research Center on AASTMT webpage

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