

BUC SDG 6

CLEAN WATER AND SANITATION

Summary

Sustainable Development Goal (SDG) number 6 (Clean Water and Sanitation) is divided into 5 main components:

1. Research on clean water and sanitation
2. Water usage
3. Water care
4. Water in the community
5. Proportion of reused or recycled water

1. Research on clean water and sanitation

Badr University in Cairo (BUC) has always directed special attention to research in fields that have direct impacts on improving people's life. Water Resources Management is one of these major fields, especially in Egypt. Therefore, it is at the top of BUC research strategic objectives. Table below contains the paper published from 2018 to 2021 that address the water issue.

#	Title	Year
1	AOP Performance at Wastewater Treatment Plants: Recent Developments	2018
2	Green Synthesis of Nano Iron Carbide: Preparation, characterization and Application for Aqueous Phosphate Removal	2018
3	Techno-economic estimation of electroplating wastewater treatment using zero-valent iron nanoparticles: batch optimization, continuous feed, and scaling up studies	2019
4	Study the Degradation and Adsorption Processes of Organic Matters from Domestic Wastewater using Chemically Prepared and Green Synthesized Nano Zero-Valent Iron	2019
5	Semi-Pilot Plant for Tertiary Treatment of Domestic Wastewater using Algal Photo-Bioreactor, with Artificial Intelligence	2019
6	Life Cycle Assessment of Upgrading Primary Wastewater Treatment Plants to Secondary Treatment Including a Circular Economy Approach	2020
7	Isotherm and kinetic studies for heptachlor removal from aqueous solution using Fe/ Cu nanoparticles, artificial intelligence, and regression analysis	2020
8	Mitigation Plan and Water Harvesting of Flashflood in Arid Rural Communities Using Modelling Approach: A Case Study in Afouna Village, Egypt	2020
9	Effective Chromium Adsorption From Aqueous Solutions and Tannery Wastewater Using Bimetallic Fe/Cu Nanoparticles: Response Surface Methodology and Artificial Neural Network	2021
10	Comprehensive Assessment for the Potential Environmental Impacts of the Grand Ethiopian Renaissance Dam on the Downstream Countries: Itaipu Dam in the Rearview Mirror	2021
11	A prototype of textile wastewater treatment using coagulation and adsorption by Fe/Cu nanoparticles: Techno-economic and scaling-up studies	2021

12	Effective Municipal Wastewater Treatment at Low-Cost Using Coagulation/Precipitation Followed by Nano-Disinfection	2021
13	Effective Adsorption of Chromium from Tannery Wastewater Using Green Synthesis Nano-Zero Valent Iron (GT-nZVI)	2021
14	Comparison of aluminum and iron nanoparticles for chromium removal from aqueous solutions and tannery wastewater, empirical modeling and prediction	2021
15	Adsorption of Tartrazine anionic dye by novel fixed bed Core-Shell- polystyrene Divinylbenzene/Magnetite nanocomposite	2021
16	Viral outbreaks detection and surveillance using wastewater-based epidemiology, viral air sampling, and machine learning techniques: A comprehensive review and outlook	2021

2. Water usage

Based on a report received from the financial department in the university (shown below), the total annual water consumption on BUC campus for year 2020 was about 120,000 m³. And the total number of persons in year 2020 (students and staff) was about 17,000. The water not only used for personal use, but also of irrigation purposes.

3. Water care

BUC has established a long-term sustainable water initiative to meet the water challenges that faces Egypt by fostering new research on water, water resources and wastewater. BUC has established a plan to be a green campus by 2025 and water care was one of its targets.

BUC has received a grant from Joint the Academy of Scientific Research and Technology (ASRT) and the Bibliotheca Alexandrina (BA) Research Grants Program to build a decentralized wastewater treatment system for household level in BUC Campus.

BUC also encourage students to participate in projects related to water care:

- Project 1: Multi-stage for Wastewater Treatment (Students project), funded by BUC – Received 3rd place in the Fourth International Festival of Badr University
- Project 2: Atmospheric Water Generation (Students project), funded by BUC.

BUC has also a separate sewer system for all of its buildings, which allow the separation of black and gray water. This is a good point that may help in the treatment process and may reduce the treatment cost.

BUC provides free drinking water for students, staff and visitors. The campus has about 24 water dispensers and 28 water filters distributed in different buildings. As an action to reduce the water consumption on campus, all green areas are irrigated using sprinklers or drip irrigation method. Another action taken by the university to reduce water consumption is the use of water sensor taps in all of its buildings. The campus has about 500 water sensor tap distributed in its buildings.

The water network in the university is also supported by some tools to reduce/avoid water leakage, such as a pressure control valve which close the water supply if the pressure increased. It is also

worth mentioning that all the pipes used on Campus are made of PVC which reduces pumping costs and energy use, and their leak-free fittings eliminate water loss. BUC campus has also 2 isolated underground water tanks with a total capacity of 1500 cubic meter to ensure water supply sustainability if water is cut off for any reason. BUC campus also provides water tank trucks for irrigation purposes in case water shortage.

BUC has a well-trained operation and maintenance labor staff that deal with any leakage in the water network in order to reduce waste losses. BUC has 5 plumbers inside the campus standby for any accident or leakage in the water network inside and outside the buildings. BUC has also a maintenance plan for each building to frequently check the status of the water network and avoid any leakage. About 20% of BUC campus are plant landscape which help minimize water usage. The water and irrigation water network at BUC are well designed to prevent polluted water entering water systems. It is also worth mentioning that the sewer network is located under the water network with a distance of at least 1 meter to prevent the leakage of wastewater to the water system in the event of cracks.

4. Water in the community

BUC encourage students for rational use of water by establishing seminars presented by professors at BUC who is expert in the water field. These seminars cover the following topics: (1) World Water Resources, (2) World Water Challenges, (3) Egypt Water Resources, (4) Challenges facing the water sector in Egypt, (5) Water Sensitive Urban Design (WSUD), and (6) Integrated Water Resources Management (IWRM). One of these presentations titled “Water Resources Integrated Designs” which has been presented by Associate Professor Mohamed Khaled Mostafa (Faculty member at Faculty of Engineering at BUC) to students in school of applied arts at BUC. BUC also invites guest speakers to increase the student awareness about the concept of sustainability. For example, BUC has invited Associate Professor. Moustafa Samir Moussa, Program Director, Environmental Engineering Program at Zewail City of Science and Technology, who presented a presentation in front of BUC students titled “Challenges for Sustainable Development”.

BUC also encourage students to save water and use water rationally, where many labels have been distributed on campus that contain statements related to water conservation and reduce water consumption. BUC has also distributed some labels on the wall of the campus from outside to encourage people living in the community to reduce water consumption.

BUC support the collaboration with Egyptian government on water scarcity issues. For example, BUC has approved the enrollment of one of its faculty members in Water and Irrigation Research Council at the Ministry of Higher Education & Scientific Research. The output of this council were: (1) Road map “Future of Water Desalination in Egypt” and (2) Road map “Re-use of water and sanitation”. A faculty member at BUC (Associate Professor Mohamed Khaled Mostafa) has also collaborated with the government and international institutions in conducting many national projects, such as:

1. Rehabilitation and extension of various water and wastewater treatment plants under the national rural sanitation programme, 2018, funded by European Investment Bank.

2. Kitchener Drain Rehabilitation Project, Technical Assessment Report: Update to the Omar Bek Diversion Component, September 2018, funded by European Bank for Reconstruction and Development (EBRD).
3. Technical Assistance to Support the Implementation of the “Kafr el Sheikh Waste Water Development Project”, November 2019.
4. Pre-Feasibility Study for The Rehabilitation and Extension of Various Water and Wastewater Treatment Plants Under the National Rural Sanitation Programme, Helwan Wastewater Expansion Project. This project is financed by the European Commission, 2020.
5. Technical and Engineering Services to the project entitled "Impact evaluation of UN- Habitat's water and sanitation interventions in Luxor, Assiut, Sohag and Damietta: River Bank Filtration" funded by UN-Habitat Egypt Programme, 2021.

5. Proportion of reused or recycled water

Currently the water reuse is limited to a large pool with fountain which is located at the center of the BUC campus with a water volume of about 250 m³. Below is a photo of the pool along with the water filtration and reuse system. Based on the university plan, a wastewater treatment plant will be built on campus to treated the wastewater and reuse it for irrigation purpose. Currently, a prototype is being built and will be ready for operation by May 2022 under a project funded by Joint ASRT-BA Research Grants Program. The prototype unit will help for the optimization process and will have a capacity of about 20 m³/day.