Advancing SDG 6 at UOB:
A Commitment to Clean Water and Sanitation

This report highlights the University of Balamand's multifaceted efforts to advance Sustainable Development Goal 6 (SDG 6) — Clean Water and Sanitation — through a series of targeted initiatives and practices. It begins with an overview of the campus's water supply systems, followed by strategies aimed at preventing water system pollution and ensuring free access to drinking water. The report then explores the integration of water-conscious building standards and sustainable planting practices that reflect ecological awareness. Further sections examine water reuse measurement and the university's commitment to education through water management learning opportunities. UOB's engagement at national, regional, and global levels underscores its leadership in water quality advocacy. Finally, the report details efforts to promote conscious water usage both on campus and within the wider community, reinforcing the university's role as a catalyst for sustainable water stewardship.

This report complements the Sustainability Report Communication and Engagement -SDG6 for the Year 2023 and 2024 which incorporates all **research** related to SDG6 at Balamand.
To select a specific section, please click on the links below:

- Water Supply
- Preventing water system pollution
- Free Drinking Water Provision
- Water-conscious building standards
- Water-conscious planting
- Waterguideline and reuse measurement
- Water Management Educational Opportunities
- National, Regional, and Global Engagement in Water Management and Quality
- Promoting Conscious Water Usage on Campus
- Promoting Conscious Water Usage in the wider community

Water Supply

The University has four sources of water supply (Sasaki Associates, Inc., 2005):

1. The **Monastery well**, having a capacity of about 80 m³/day, feeds the tanks on the roof of the buildings in the lower campus.
2. Two **wells at Hreiche**, having a total capacity of about 150 m³/day, pump water from the valley up to the water tanks (20 m³) at the highest point of the university. From these tanks, water is transferred by gravity to the water tanks on the roof of the buildings in the upper campus, in addition to the Zakhem and administration buildings.This network also feeds the green field water tank,which is used for the irrigation of the green field.
3. The **public water supply**, when available, supplies the university with 20 m³/day. This source is directly connected to the gravity network of the 20 m³ water tanks.
4. The fourth source of water supply is what the **university buys** for the irrigation. Water is supplied by trucks that come regularly, on a contract basis, for the irrigation of all green areas except for the green field.

Table 1:Water Source and Capacity

Water Source	Name	Capacity (m3/day)
Source 1	Monastery Well	80
Source2	Hreiche well 1 and 2	150
Source 3	Public water supply	20
Source 4	University buys	
	Year 2024	42,184

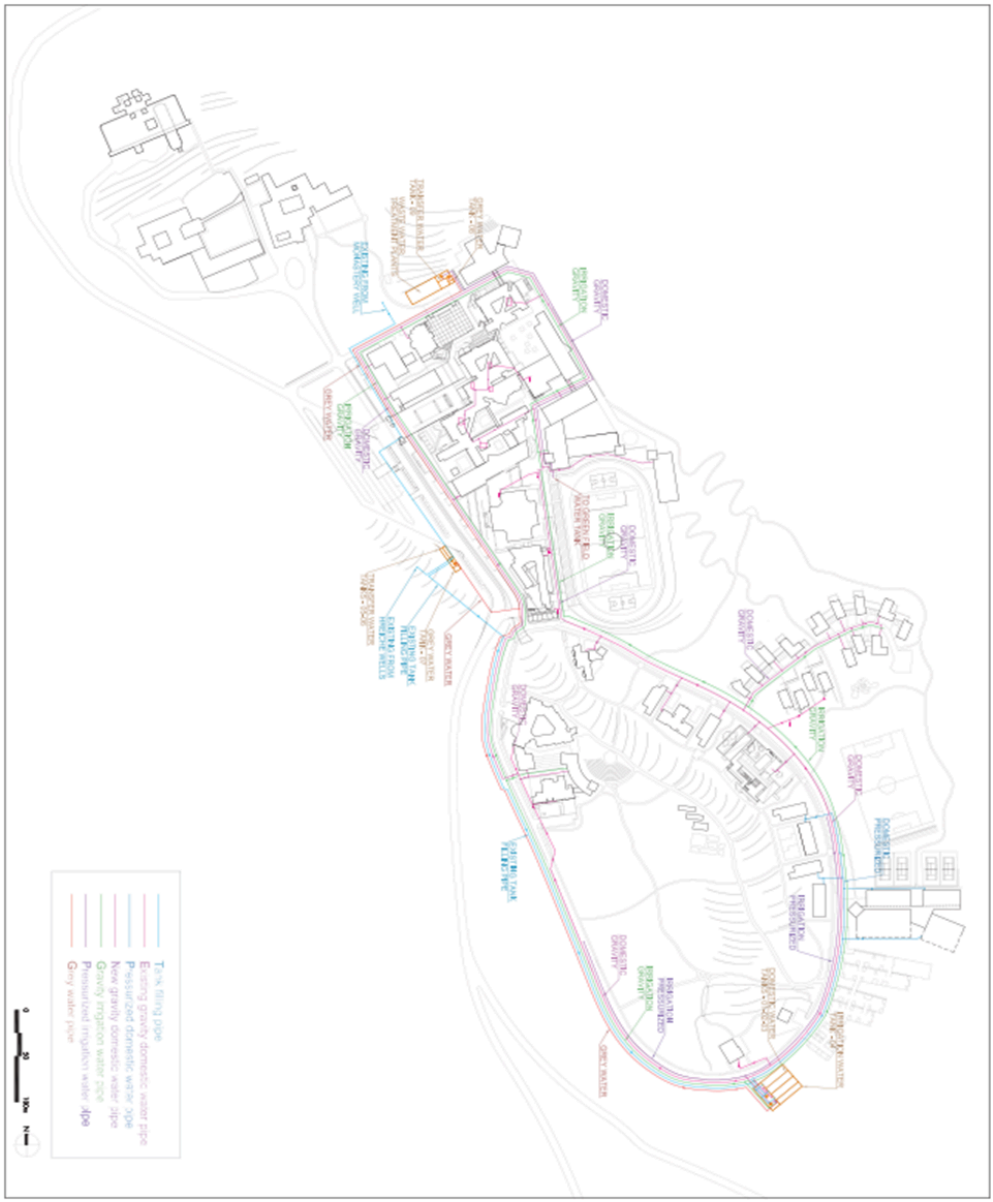


Figure1:Water Supply Infrastructure Networks (Sasaki Associates, Inc., 2005)

Preventing Water System Pollution

To prevent water system pollution, the University implements the following measures:

Chlorination System:

- The university maintains chlorine levels in the water between **0.80 and 1.2 ppm** to ensure disinfection and prevent contamination.
- This chlorination process is performed daily on the main water pipes across the university network.

UV Lamp Installation:

- **Restaurants:** UV lamps are installed on the **main pipe feeding the kitchens** in the THM (Tourism and Hospitality Management) restaurants.
- **Dormitory Kitchens**: Similar UV lamp systems are installed on the main pipes feeding the dormitory kitchens.
- **Drinking Fountains:**All drinking fountains are equipped with UV lamps to provide an additional layer of water purification.

Water Storage Tank Maintenance:

- All water storage tanks are cleaned and disinfected on a yearly basis to prevent microbial growth and sediment accumulation.

Regular Water Quality Testing:

- The Environmental Engineering Laboratory conducts regular physicochemical and microbiological testing of all fountains to guarantee compliance wit**h LIBNOR and World Health Organization (WHO)** drinking water standards.

Free Drinking Water Provision

The University of Balamand ensures universal access to safe and high-quality drinking water for its entire community through a well-distributed network of drinking water fountains located across all academic buildings, student residences, recreational areas, and outdoor spaces. These fountains provide continuous access to potable water and are maintained under strict hygienic conditions. The Environmental Engineering Laboratory conducts regular physicochemical and microbiological testing of all fountains to guarantee compliance with LIBNOR and World Health Organization (WHO) drinking water standards.



Figure 2: Drinking Water Dispensers and Fountains

Moreover, free drinking water is provided for all faculty and staff members through dispensers installed in every kitchen and faculty lounge, ensuring accessible hydration throughout the working day.

To further promote sustainability and reduce plastic consumption, the University has partnered with H2Go, a Lebanese startup that develops innovative, eco-friendly water dispensing solutions.

By the end of 2025, four H2Go smart dispensers will be installed across campus to provide filtered and chilled drinking water at a low cost, operating on a “fill-any-bottle” model. Each unit uses advanced filtration and UV sterilization technology to ensure consistent water safety and quality. This initiative supports the University’s sustainability mission by encouraging refill culture, reducing reliance on single-use plastics, and providing affordable drinking water options aligned with SDG 6 (Clean Water and Sanitation) and SDG 12 (Responsible Consumption and Production).

In parallel, a research study will be conducted to examine student behavior and readiness to shift from purchasing bottled water to refilling reusable bottles. The study will investigate perceptions of convenience, hygiene, and environmental awareness to better understand how behavioral change can be encouraged and sustained across the university community.

Water-conscious Building Standards

All the guidelines for campus-wide application follow the Sasaki Associates Detailed Implementation Plan (Sasaki Associates, Inc., 2005): Below is a sample taken from the first part of the guidelines for Campus-wide Application:

4.4 Guidelines for Campus-wide Application

4.4.1 Material Selection Criteria

Careful selection of materials ensure a sense of visual continuity and unity throughout the main spaces of the campus. A sustainable model for architecture on the campus will favor the use of local materials and craft. The selection of materials for the building should follow the present criteria:

- Locality: preferred materials are those that are produced locally or regionally or that are locally available.
- Suitability: selected materials must be appropriate for the intended application in the context of the campus location and the material palette characteristic of Balamand.
- Sustainability: building materials are expected to perform relative to conditions of solar radiation, energy transmission and acoustic value, and to contribute to the enhancement of the overall campus environment.
- Durability: material choices should reflect the designer's awareness of the low maintenance standard for the campus. Life cycles should be considered in comparing material alternatives.
- Recyclable content: the ability to recuperate the material post-use would be favored.

4.4.2 Exterior Wall Materials

- The primary cladding material for the walls shall be stone masonry. Local limestone would be preferred as a base material while other locally available stone veneers (sandstone, etc) would be designated as accent materials. An exterior stone skin would reinforce the image of the redevelopment of the campus core and would portray a unified material character for the campus extending from the Monastery up to the hillside.
- Pre-cast concrete or cementicious panels, terracota, laminated wood panels and/or painted plaster/stucco can be used as cladding materials for wall surfaces other than primary building facades.
- Colonnades shall typically be clad in stone masonry.
- Sloping roof surfaces shall be clad in terracota tile (typical of the recent campus buildings).



Fenestration and Shading

Figure 3: Fenestration and Shading

Water-conscious Planting

All the landscape and planting strategy at the university follows the Sasaki landscape design guidelines and mainly section 3. Landscape Design Guidelines with a specific section related to the overall Planting Strategy 3.3, in addition to a specific section for vegetative roofs and the type of planting there, as well specific planting and material list for each type of green roof, whether extensive or intensive.

3. LANDSCAPE DESIGN GUIDELINES

The Landscape Design Guidelines are a series of regulations, recommendations, and directives concerned with principles of landscape design and land use. They are intended to guide architects and designers responsible for the development and are part of the implementation of the University of Balamand Master Plan.

3.3 Overall Planting Strategy

The existing vegetation will remain the dominating feature on campus. The Nature Reserve will provide the landscape type for the green buffer zones between the individual campus zones. Olive and citrus terraces shall be maintained for leisure and contemplation.

Only the immediate surroundings of the academic and residential buildings shall obtain more intensive plantings, including tall trees, which are not found in the natural environment.

The reasons for this conservative approach are:

- Appreciation of the existing environment and recognition of the its value and specific beauty;
- Creation of a strong contrast between the built environments and the natural surroundings, in order to highlight the value of both elements; and
- Economic feasibility.

Plant and Material List

For extensive and shallow intensive Green Roofs use the Roof Gardens Plant and Material List (section 3.1.3.2).

For deep intensive Green Roofs use the Grand Courtyards Plant and Material List (section 3.1.2.2).

- In alignment with the University of Balamand's sustainability goals, the **Rainwater management,Energy performance, Economic outlook,** and **Environmental impacts of Biosolar roofs (REEEB)** project represents a major interdisciplinary initiative funded by the university. Various roof mockups have been built and will be used to evaluate the hydrological, energetic, economic, and environmental performance through experimental studies, numerical simulations, and theoretical analyses. Comparative studies will be conducted with similar installations at the University of Lleida in Spain and the University of La Rochelle in France, positioning UOB as a regional leader in biosolar roof research and innovation.
- Further supporting its commitment to sustainable urban development, the Faculty of Engineering was selected to participate in the prestigious High-Level Scientific Stay (SSHN) program, supported by the French Embassy and the French Institute of Lebanon. The awarded research residency, hosted at La Rochelle University in France, focuses on integrating green roofs with urban water management systems to mitigate road flooding in Lebanon. The training, titled **"Synergie entre la gestion de l'eau et les toits verts pour la durabilité urbaine au Liban"**, strengthens the faculty's international collaborations and reinforces its leadership in developing innovative,climate-resilientsolutions for Lebanese cities.
- Complementing these efforts, a team of students from the Faculty of Engineering presented their experimental work on green roofs at the 6th International Conference on Environmental Design and Health (ICED 2025). Their research explored the physical characteristics of typical Lebanese soil and its suitability for vegetative roofing systems, contributing valuable data to the regional discourse on climate-resilient infrastructure. This is an additional initiative reflecting the university's hands-on approach to integrating sustainability into engineering education and supports the university's broader landscape strategy aligned with Sasaki's guidelines.

Water Reuse Guidelines and Measurement

The University of Balamand is committed to a comprehensive water recycling strategy that incorporates the Sasaki Implementation Plan for sewage and wastewater drainage, ensuring sustainable water management across all campuses in alignment with UN SDG 6 and institutional sustainability goals. The plan includes connecting all existing and future buildings to a centralized Wastewater Treatment Plant WWTP near the ALBA building, alongside a dedicated greywater network for lavatories, showers, and floor drains. Greywater from the upper campus will be discharged into a tank near the student parking structure, while greywater from the lower campus will be directed to a tank adjacent to the WWTP, reducing the plant's load from an estimated 300 m^3/day to approximately 200 m^3/day.

Treated effluent and reclaimed greywater will be reused for irrigation, landscaping, and academic research, in full compliance with LIBNOR, WHO, and Ministry of Environment standards.

Key responsibilities include system operation by the Office of Construction and Maintenance and monitoring by the Environmental Engineering and Wastewater Testing Laboratories.
In fact, the University of Balamand's Wastewater Treatment Plant is the primary source of reused water on the Koura campus and the Souk El Gharb campus.

In the main campus, the plant currently treats up to 100 m^3 of wastewater per day, which is reused for irrigation. Water quality is regularly monitored through lab analyses to ensure compliance with Lebanese Ministry of Environment standards.

Water Management Educational Opportunities

The University provides diverse educational opportunities for local communities to enhance their understanding of sustainable water management practices.

- As part of its commitment to advancing water management education, the University hosted a high-level roundtable titled **"Bridging Divides: A Diplomatic Conversation"** on July 14, 2025, at its Dekwaneh Campus. The event featured distinguished speakers, including Professor Fadi Georges Comair, a global authority on hydro diplomacy, who emphasized the urgent need to embed climate change and water diplomacy into academic curricula. His intervention highlighted the role of hydro-diplomacy in addressing regional environmental challenges and fostering sustainable peace. This aligns with UOB's broader educational mission to equip students with the knowledge and tools necessary to tackle complex water governance issues. By integrating environmental diplomacy into academic discourse, UOB reinforces its position as a regional leader in water management education and capacity building.
- Through the **ENGAGE** Project, funded by USAID Water, Sanitation and Conservation (WSC), the University developed a comprehensive curriculum on water management that has now been integrated into the Continuing Education Program. This module allows individuals from outside the university to register, pay a nominal fee, and receive a certificate upon completion. The course covers a wide range of water-related topics, including water governance, treatment, quality management, and conservation. As part of this initiative, two free-of-charge training programs were conducted, reaching 90 participants from civil society organizations. All eight modules were successfully delivered, and participants received official certificates from the University.

- In addition to formal training, the University regularly organizes community workshops in collaboration with national water sector stakeholders to build baseline knowledge on water quality, testing and analysis, and wastewater treatment. Furthermore, annual guest lectures and outreach activities are conducted in schools across Lebanon. In 2024, over 4,000 students participated in interactive sessions that were combined with the **"Water Expo on the Move"** event.
- During this event, students engaged directly with pilot-scale projects and gained hands-on experience in water-related topics such as rainwater harvesting, the water cycle, nature-based wastewater treatment, and water scarcity management.
- Building on this success, in 2025, the University is organizing seven additional **Water Expos** as part of a project funded by the French Development Agency (AFD), targeting public schools in North Lebanon. Over 1,000 students have already registered to attend these events. These efforts collectively demonstrate the University of Balamand's strong commitment to fostering community education, promoting sustainable water management practices, and advancing the implementation of SDG 6.5.1 at the national level.
- Joint **BTech Program** with the University of Limoges: a co-diplomation agreement was established between the University of Balamand (IFFT) and the University of Limoges to launch a joint Bachelor of Technology (BTech) program in Water Studies. This collaboration enhances academic exchange and contributes to building future expertise in sustainable water solutions.

- The 1MAP 1 Million Action Postcard Initiative was launched by the UOB-LEWAP student chapter and its advisor, Dr. Yasmine Jabaly, within the Principles of Environmental Engineering Course at the Faculty of Engineering. The idea was to actively engage in several schools to raise awareness about water-related topics and to spread the word about this initiative. Moreover, the initiative is strongly backed by WaveMakers United on an international level.



- UOB actively promotes water management education through its participation in the SWaTH Project (Sustainable Wastewater Treatment for Hospitals), co-funded by Erasmus+. The project engaged students and faculty in workshops on sustainable wastewater technologies and circular economy principles. For example, UOB hosted a training session on nano-pollutant treatment in hospital effluents, equipping participants with practical skills and environmental awareness. Through SWaTH, UOB strengthens its role in advancing SDG 6 through hands-on learning and international collaboration.

National, Regional, and Global Engagement in Water Management and Quality

At the national level, the University of Balamand has played a leading role in advancing water quality governance and advocacy in Lebanon. Until 2023, the University chaired the National Water Quality Thematic Group, and it continues to serve as an active member of the group in close collaboration with the **Ministry of Energy and Water (MoEW)**. Through this platform, the University has contributed to the development of Standard Operating Procedures (SOPs) for water quality testing and analysis, establishing unified protocols for laboratories and institutions across the country. The University also leads nationwide efforts to promote water conservation strategies and sustainable management practices.

Sustainable Wastewater Treatment for Hospitals / SWaTH is a project led by the Faculty of Engineering at the University of Balamand, bringing together 11 institutions from Europe and Lebanon. The project's main objective is to assess the current Lebanese practices in treating hospital wastewater, compare them with the current European ones, and conduct environmental, social, and cost lifecycle analyses. The project held many international workshops and seminars for students, Faculty, and the national community and provided training for students, staff, and Faculty in leading European institutions about best practices in wastewater management.

During public health crises, including the Hepatitis A outbreak and the COVID-19 pandemic, the University of Balamand was at the forefront of national response efforts. The Environmental Engineering Laboratory offered free-of-charge testing services for municipalities across Lebanon to assess and ensure the safety of water supplies. In parallel, a public hotline was established to guide water disinfection procedures, and a national awareness campaign was launched to offer free water quality testing to households, municipalities, and institutions.

At the regional and global levels, the University of Balamand continues to expand its impact through research collaborations and international partnerships. The University is currently engaged in projects with partners in France focused on the detection of emerging contaminants in water, and has recently secured funding for a new initiative on disinfection by-products and post-war explosive residues, in partnership with the ANSES Laboratory in Paris and the University of Strasbourg. Moreover, through its Memorandum of Understanding (MOU) with Wavemakers United (Netherlands), the University has joined a global commitment to the Water Action Agenda, pledging to educate one million youth worldwide on water-related issues by 2030.

Promoting Conscious Water Usage on Campus

The University of Balamand (UOB) actively promotes conscious and sustainable water usage through education, innovation, and applied research on campus through different courses, as elaborated in the Sustainability Education page and the SDG12 report. This effort is embedded within different courses and student activities. For instance, the newly designed and developed course by Dr. Mantoura Nakad, SUST 229 "Sustainable Development for Engineers", which was launched in September 2023, has inspired the engineering students to implement the concept of sustainability during their daily activities. It has raised their awareness to contribute to their community, which led to the realization of designing posters by student Nour Sarraf that were placed throughout the Faculty of Engineering facilities.



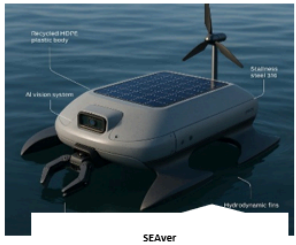
Posters on the kitchen and toilet doors at the Faculty of Engineering – designed for the *SUST229 course.*

Students also conceptually designed water-focused projects as part of the SUST229 course; some of the projects are listed below:



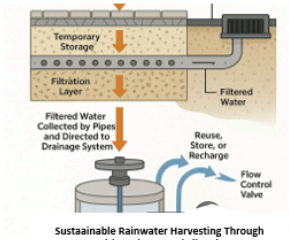
Smart GreyWater Recovery System

By Elvis Raffoul, Yehya Al Youssef, Ahmad Hamza Eid and Lea Chami



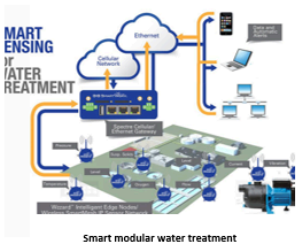
SEAver

By Joyce Aoun, Fatima Youssef, Georgio Al Hazzouri and Charbel Sarkis



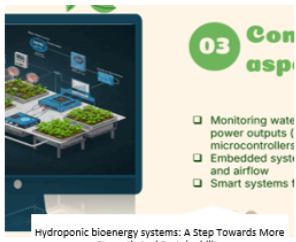
Sustaainable Rainwater Harvesting Through Concrete with Underground Filtration System

By Larissa Shehadeh, Elena Bouty, Bahaaeddine Houssein, Lynn El Harbieh



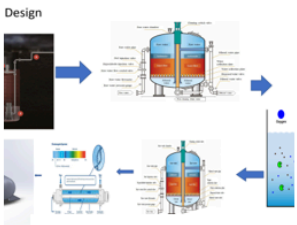
Smart modular water treatment

by Miriam Ibrahim, Maria Faustine Tahchy, Jamil Kammoun, Fadi Omari



Hydroponic bioenergy systems: A Step Towards More Strength And Sustainability

By Maria El Khoury, Nour Srour, Tarek Nasrallah, Saleh Jaafar



Residential Greywater Treatment System

By Steven Azar, Jean Abi Hanna, Majd Boukarroum, Charbel Greige, Marc Najjarian



The sea shield drone

- By Mohamad Hassan Hamadeh, Rafic Srour, Elie Kerbage

Another course, the **Environmental Engineering course (CIVE520)**, where students develop and implement real-world projects that address the United Nations Sustainable Development Goals (SDGs), particularly SDG 6 – Clean Water and Sanitation. Each year, students design practical interventions aimed at improving water efficiency, quality, and awareness. The following projects highlight key initiatives promoting sustainable water use at UOB:

1. **Collection and Use of Air Conditioning (AC) Condensate Water:** Students designed and installed systems to capture condensate water from campus air conditioning units. The collected water is reused for cleaning, irrigation, and laboratory purposes, demonstrating a practical approach to water recovery and reducing dependence on potable sources.
2. **Xeriscaping for Sustainable Landscaping at UOB:** This project focuses on implementing xeriscaping principles—the use of native, drought-tolerant plants and soil moisture optimization—to minimize irrigation water demand across campus landscapes. Students assessed existing green areas, proposed efficient plant selections, and developed low-maintenance designs that conserve water while maintaining ecological balance.
3. **UOB Moving Laboratory for Water Awareness and Testing:** The UOB Moving Laboratory serves as a mobile platform for education and outreach, engaging both students and the local community. It travels across schools and community centers to conduct water quality testing and awareness activities, teaching participants about water conservation, pollution prevention, and basic analytical techniques.
4. **Hydroponic Systems for Water-Efficient Agriculture:** Students designed hydroponic systems to grow vegetables using nutrient-enriched water instead of soil, significantly reducing water consumption compared to conventional agriculture. The system reuses and recirculates water in a closed loop, illustrating innovative, sustainable methods for food production on campus.
5. **Reducing Water Consumption through IoT Monitoring:** This recent project integrates Internet of Things (IoT) technology to monitor and manage water consumption across different campus facilities. Using smart sensors and real-time data analytics, students developed a system that tracks water usage patterns, detects leaks, and identifies inefficiencies. The data collected supports informed decision-making by the facilities department, enabling targeted interventions to reduce waste and optimize consumption.

Promoting conscious water usage in the wider community

The University of Balamand actively promotes environmental awareness and sustainable practices by integrating research excellence, technological innovation, and the involvement of the community. Through interdisciplinary projects and community-based initiatives, the University encourages collaboration between academics, students, and local stakeholders to address pressing environmental challenges and contribute to a better commitment to environmental/ water sustainability.

- "Engineering Team Honored as Champions of Plastic Pollution Prevention in the Mediterranean" The University of Balamand affirms its commitment to environmental sustainability and responsible community engagement, as it was given on October 8th, 2024, the title of "Champion of Plastic Pollution Prevention in the Mediterranean". This honor was deliberated in acknowledgment of the volunteer work of a team at the Faculty of Engineering comprising Dr. Marianne Saba, Dr. Mantoura Nakad, Dr. Wahib Arairo, and Dr. Makram Bachawati. The Engineering team's initiative was part of the Water and Environment Support (WES) in the ENI Southern Neighborhood Region project, an initiative funded by the European Union (EU) and conducted in collaboration with the Union for the Mediterranean and the United Nations Environment Programme's Mediterranean Action Plan (UNEP/MAP). The effort to combat plastic pollution and promote sustainable environmental practices aimed at organizing beach clean-ups and collecting plastic bottles from the faculty of engineering and the beach cleaups and the local community. This resulted in the removal of several tons of plastic waste. The initiative expanded to continuous community-based plastic collection efforts as the team further collaborated with local fishermen to encourage the retrieval of marine plastics and to promote awareness of sustainable fishing practices.