

SDG06

CLEAN WATER AND SANITATION

ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL



CLEAN WATER AND SANITATION

SDG 6 KEY HIGHLIGHTS (2025-2026)

1. RESEARCH ON CLEAN WATER AND SANITATION

SDG06 PUBLICATIONS

2. WATER STEWARDSHIP ON CAMPUS

3. NATIONAL, REGIONAL, AND GLOBAL ENGAGEMENT IN WATER MANAGEMENT AND QUALITY

4. WATER MANAGEMENT EDUCATIONAL OPPORTUNITIES

5. CONSCIOUS WATER USAGE IN THE WIDER COMMUNITY

6. PROMOTING SDG6 THROUGH STUDENT ACTIVITIES

SDG 6 Key highlights (2025-2026)

- 21 SDG 6 Publications
- 100 m^3/day Wastewater Treated and Reused
- 4 Water Supply Sources
- 250 m^3/day Well Capacity
- 4 Smart Water Dispensers Installed
- 90 Participants Trained Through ENGAGE
- 4,000+ Students Reached Through Water Expo
- 1,000+ Additional Students Registered in 2025
- 1 million Youth Water-Education Commitment by 2030

1. Research on Clean Water and Sanitation

During the last two years, University of Balamand researchers contributed to advancing water security, water quality, sanitation, wastewater treatment, pollution prevention, and sustainable water governance. Research focused on desalination technologies and sustainable water reuse [9,15,16], wastewater treatment optimization and environmental performance assessment [2,3], water quality monitoring, groundwater contamination assessment, and organic pollutant detection [10,18,21], stormwater management and climate-resilient urban water infrastructure [4,7], and water governance frameworks and drinking water management systems [19,20]. Additional studies addressed the remediation of emerging contaminants and nitrate pollution [5,12,15,16], marine pollution and plastic contamination in aquatic environments [1], and sustainable industrial water use and resource-efficiency approaches [13]. Research also examined environmental monitoring technologies, sustainable materials, circular-economy approaches, and the impacts of chemical pollutants on freshwater and marine ecosystems [8,11,17]. Collectively, these publications support evidence-based water management practices, promote the sustainable use of water resources, strengthen sanitation systems, improve pollution control measures, and contribute to environmental protection at local, regional, and global levels [1-21].



SDG06 Publications

[1]. Bel Hassen, M., Bellaaj-Zouari, A., Abdennadher, M., ...Gomes, L., Hamd, W. (2025). Plastics pollution: pathways, impacts, and regulatory challenges in marine environments. Frontiers in Environmental Science.

[2]. Boutros, M., Puig, R., Bartolí, E., El Bachawati, M. (2025). Sustainability Assessment of Hospital Wastewater Treatment Techniques: A Comprehensive Review. Sustainability (Switzerland).

[3]. Boutros, M., Romero-Güiza, M.S., Palatsí, J., ...Pérez, G., Puig, R. (2025). Environmental performance of a full-scale wastewater treatment plant with advanced process control: A multi-year life cycle assessment using dual functional units. Journal of Water Process Engineering.

[4]. Cheng, M., Isleem, H.F., Tejani, G.G., Jahami, A. (2026). Adaptive infrastructure intelligence: integrated urban stormwater management framework for climate-resilient cities. Journal of Hydrology.

[5]. Das, G., Singha Roy, S., Prakasam, T., ...Kundu, S., Trabolsi, A. (2026). Covalent Organic Frameworks with Intrinsic Pendant Aldehydes for Efficient Nitrate Electroreduction. Small.

[6]. Dimassi, W., El Marji, A., Khachab, M.M., ...Chidiac, M.A., El Chaar, M. (2026). Climate change and surgical site infections in the MENA region: burden, mechanisms, and mitigation. Journal of Infection and Public Health.

[7]. El Bachawati, M., Abiad, A., Abiad, M., Atallah, C. (2025). Physical characteristics of typical Lebanese soil for green roofs. E3S Web of Conferences.

[8]. El Bachawati, M., Belarbi, Y.E., Zakhem, H., Belarbi, R. (2026). Life Cycle Assessment of Sustainable Materials: A Comprehensive Analysis of Methodological Asymmetries and Environmental Trade-Offs. Buildings.

[9]. El-Mir, A., Hwalla, J., Zafar, A.M., ...El-Dieb, A., El-Hassan, H. (2026). Valorization of desalination reject brine in blended geopolymer composites. Results in Engineering.

[10]. Ghaleb, S., Yammine, P., El-Nakat, H., ...Obeid, P.J., Chmayssem, A. (2026). Analysis of benzene, toluene, and xylene contaminants in the groundwater of Tripoli, Lebanon. Asian Journal of Water, Environment and Pollution.

[11]. Hamadeh, F., Gnimadi, T.A.C., Mathew, M.J., ...El Hajj, R., El-Badan, D. (2026). Optimized Decolorization of Methylene Blue by Bacillus cereus: A Genomic and Analytical Approach. Applied Microbiology (Switzerland).

[12]. Jrad, A., Garai, B., Aouad, S., ...Olson, M.A., Trabolsi, A. (2025). Redefining forever: Advancements, challenges, and opportunities in covalent organic frameworks for the remediation of forever chemicals. Chem.

[13]. Kayal, B., Nasr, Y., Zakhem, H., El Bachawati, M. (2025). Optimizing Brown Stock Washing in the Pulp and Paper Industry: A System Dynamics Approach. Processes.

[14]. Khatib, M. (2025). The Effect of Civilization on the Water Quality (SDG 1, 6, 15): Case Study. Advances in Transdisciplinary Engineering.
[15]. Koumeir, D., Yammine, P., Riachi, N., ...El-Nakat, H., Chmayssem, A. (2025). Amlodipine besylate photocatalytic degradation using titanium dioxide: Adsorption isotherms and kinetics. Desalination and Water Treatment.
[16]. Koumeir, D., Hleis, D., Yammine, P., ...Zakhem, H., Chmayssem, A. (2026). Adsorption and photocatalysis of escitalopram: Kinetics, catalyst loading, and matrix effects. Desalination and Water Treatment.
[17]. Rabie, M., Khazaal, S., Othman, M.M., ...Louka, N., El-Darra, N. (2026). Valorization of Onion By-Products and Assessment of Their Biological Activities. Foods.
[18]. Sabat, M., Jabali, Y., Millet, M., Khoury, D. (2025). Spatio-temporal assessment and source identification of heavy metals in the Abou Ali River, North Lebanon. Environmental Challenges.
[19]. Tahsaldar, M., Chehade, I., El Nemar, S., Vrontis, D., Hasnaoui, J. (2025). Change Management of Water Governance and Public Service: The Case of Drinking Water Management. Strategic Change.
[20]. Tahsaldar, M., Chehade, I., El Nemar, S., Kokkinopoulou, E., Vrontis, D. (2025). Optimizing internal control systems for effective management: a COSO framework of water governance. Kybernetes.
[21]. Yammine, P., Sari-Chmayssem, N., El-Nakat, H., ...Jaber, F., Chmayssem, A. (2026). Correlation Between Theoretical Permanganate Index Method and Electrochemical Responses of Cyclic Voltammetry for the Detection of Organic Matter. Chemistry (Switzerland).

2. Water Stewardship on Campus

Campus Water Supply and Resource Management

The University of Balamand manages its water supply through a diversified system consisting of four water sources. The primary sources include the **Monastery Well** with a capacity of **80 m^3/day**, and **two wells at Hreiche** with a combined capacity of **150 m^3/day**, which supply the campus through a gravity-fed distribution network. The University also utilizes the **public water supply** when available, providing an additional **20 m^3/day**. To ensure continuity of irrigation services, supplementary water is procured through tanker deliveries for landscaping and green areas when necessary. During **2024**, total water consumption reached **42,184 m^3**, reflecting the University's commitment to monitoring water usage and ensuring a reliable water supply to support campus operations while advancing sustainable water-resource management.

For more info refer to the Clean Water and Sanitation at UOB.

Campus Water Supply (2025)

- 4 water supply sources
- 250 m^3/day well capacity
- 20 m^3/day public water supply capacity
- 42,184 m^3 total water consumption

Preventing Water System Pollution

The University of Balamand implements a comprehensive water-quality management program to prevent contamination across its water distribution network. The University maintains continuous **chlorination of water supplies**, with chlorine levels kept between **0.80 and 1.2 ppm** and daily treatment of the main water network. Additional protection is provided through the installation of **ultraviolet (UV) disinfection systems** on water pipelines supplying campus restaurants, dormitory kitchens, and drinking fountains. To maintain water quality, all storage tanks are **cleaned and disinfected annually**, preventing microbial growth and sediment accumulation. Furthermore, the Environmental Engineering Laboratory conducts regular **physicochemical and microbiological testing** of water sources and drinking fountains to ensure compliance with **LIBNOR** and **World Health Organization (WHO)** drinking-water standards. Together, these measures support safe drinking water provision, protect public health, and contribute to sustainable water management on campus.

Key Highlights: To prevent contamination and ensure safe drinking water, the University maintains chlorination levels between 0.80–1.2 ppm, conducts daily network disinfection, operates UV treatment systems in key facilities, performs annual cleaning of water storage tanks, and regularly tests water quality against LIBNOR and WHO standards

through continuous monitoring and laboratory analysis.

Water Reuse and Wastewater Management

The University of Balamand is committed to sustainable water-resource management through the implementation of comprehensive water reuse and wastewater management practices across its campuses. Guided by the Sasaki Associates Campus Development Plan, the University has established a framework for wastewater collection, treatment, and reuse that supports the efficient use of water resources while reducing environmental impacts.

The University's strategy includes the integration of centralized wastewater treatment and dedicated greywater collection systems serving campus buildings. Greywater generated from lavatories, showers, and floor drains is collected separately and directed to designated storage and treatment facilities, reducing the hydraulic load on wastewater treatment infrastructure and improving overall system efficiency.

The University's Wastewater Treatment Plant (WWTP) serves as the primary source of reclaimed water on both the Koura and Souk El Gharb campuses. At the Koura campus, the plant currently treats up to **100 m^3 of wastewater per day**, with the treated effluent reused for landscape irrigation and other non-potable applications. Water quality is regularly monitored through laboratory analyses to ensure compliance with **Lebanese Ministry of Environment**, **LIBNOR**, and **World Health Organization (WHO)** standards for safe water reuse.

Through the recovery and reuse of treated wastewater and greywater, the University reduces freshwater demand, promotes circular water management practices, and advances its commitment to **SDG 6: Clean Water and Sanitation**.

Free Drinking Water Provision

The University of Balamand provides safe drinking water through a network of fountains across academic buildings, residences, and outdoor areas. Water quality is regularly monitored through physicochemical and microbiological testing conducted by the Environmental Engineering Laboratory to ensure compliance with LIBNOR and WHO drinking water standards.





Sustainable Drinking Water Access and Plastic Reduction

The University provides free drinking water to faculty and staff through dispensers located across campus kitchens and lounges. To further promote sustainability, UOB partnered with H2Go, a Lebanese startup specializing in eco-friendly water dispensing solutions, to install four smart water dispensers across campus by the end of 2025. The systems provide filtered and chilled drinking water using advanced filtration and UV sterilization technologies and operate on a refillable bottle model. This initiative promotes a refill culture, reduces reliance on single-use plastic bottles, and supports both SDG 6 (Clean Water and Sanitation) and SDG 12 (Responsible Consumption and Production). In parallel, the University is conducting a research study to assess student readiness to shift from bottled water consumption to reusable bottles and identify factors influencing sustainable behavior change.

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

UOB Advances Regional Water Diplomacy and Climate Resilience

The University of Balamand continued to play a leading role in regional water governance, climate resilience, and hydrodiplomacy through the contributions of Prof. Fadi Comair and University leadership. Through participation in international conferences, policy dialogues, media platforms, and regional initiatives, UOB promoted integrated approaches to water security, climate adaptation, hydrodiplomacy, and the Water-Energy-Food-Ecosystems (WEFE) Nexus. These efforts strengthened regional cooperation, supported evidence-based policymaking, and reinforced the University's position as a key contributor to sustainable water management across the Eastern Mediterranean.

International Partnerships

1. **Strategic Partnership with The Cyprus Institute:** The University of Balamand and The Cyprus Institute launched a strategic partnership to strengthen climate research, science diplomacy, higher education, and sustainable water management across the Eastern Mediterranean. The partnership supports collaboration in climate science, water sustainability, artificial intelligence, and evidence-based policymaking while contributing to regional resilience and cooperation.



2. In June 2026, Professor Fadi Comair, Founder of UOB's Climate Diplomacy and Sustainable Peace Hub, was appointed Vice President of the **Mediterranean Water Institute (IME)**. This appointment strengthens UOB's role in regional water governance and expands opportunities for collaboration with governments, water authorities, international organizations, and research institutions addressing water security and climate resilience across the Mediterranean.
   https://www.facebook.com/share/p/18F8eiaboU/

3. The University continues to expand its impact through international research collaborations with institutions in France focused on emerging contaminants, disinfection by-products, and post-war explosive residues in water systems. Current partners include **ANSES Laboratory** in Paris and the **University of Strasbourg**.
4. **Wavemakers United Global Commitment**: Through its Memorandum of Understanding with Wavemakers United (Netherlands), UOB joined the global Water Action Agenda commitment, pledging to educate one million young people worldwide on water-related challenges by 2030.
5. SWaTH International Consortium: The SWaTH project brings together 11 institutions from Europe and Lebanon to assess hospital wastewater-treatment practices, compare Lebanese and European approaches, and undertake environmental, social, and lifecycle analyses. The consortium has delivered international workshops, seminars, and training opportunities for students, staff, and faculty on advanced wastewater-management practices. Following the successful completion of the project, UOB has continued to build on the SWaTH project through seminar series, student engagement activities, professional training programs, and knowledge-sharing initiatives that promote sustainable wastewater treatment and environmental stewardship.
6. Joint **BTech Program in Water Studies**: A co-diplomation agreement between the University of Balamand and the University of Limoges established a joint Bachelor of Technology (BTech) program in Water Studies. The partnership promotes academic exchange and contributes to building future expertise in sustainable water-resource management.

National Water Governance

*U*OB Celebrates World Water Day 2025:

The University of Balamand organized World Water Day 2025 under the patronage of the President of the Republic of Lebanon and in partnership with the Ministry of Energy and Water. The event, entitled “Safeguarding Lebanon’s Glaciers,” highlighted the importance of protecting Lebanon’s water resources and commemorated the 50th anniversary of UNESCO’s International Hydrological Programme (IHP). The event brought together national and international experts to address water security, climate resilience, hydrodiplomacy, the Water-Energy-Food-Ecosystems (WEFE) Nexus, and sustainable water governance. During the event, UOB signed strategic partnerships with the Arab Water Council, the Water Embassy, and the Institut Méditerranéen de l’Eau, reinforcing its commitment to advancing water research, education, and regional cooperation.










OF UNESCO-IHP


SENATOR
MR. OLIVIER CADIC
COMMISSION DES AFFAIRES ÉTRANGÈRES ET DE LA DEFENSE NATIONALE


MR. ALAIN MEYSSONIER
INSTITUT MÉDITERRANÉEN DE L'EAU






VERSARY OF UNESCO-IHP
LEBANON'S GLACIERS

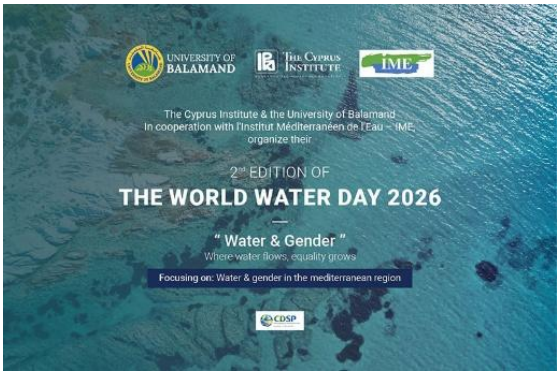

WORLD WATER DAY 2025
50TH ANNIVERSARY OF UNESCO-IHP


H.E. MR. JOE SADDI
MINISTER OF ENERGY & WATER - LEBANON


WES-BCA (2024-2027)

UOB Marks World Water Day 2026 with Focus on Gender and Water Governance:

The University organized an international webinar entitled “Where Water Flows, Equality Grows” in collaboration with The Cyprus Institute and the Institut Méditerranéen de l’Eau. The event explored the intersection of water governance, climate resilience, hydro-diplomacy, and gender-responsive policies while promoting regional cooperation and sustainable water management across the Mediterranean region.



Dr. Chawki Lahoud Appointed as a Member of the Board of Directors of the South Lebanon Water Establishment:

The appointment of Dr. Chawki Lahoud to the Board of Directors of the South Lebanon Water Establishment reflects the University’s contribution to strengthening national water governance and sustainable management of water infrastructure. His role supports policy development, governance, and the delivery of efficient and sustainable water services.





Community & Emergency Support

Water for All Initiative: Ensuring Safe Drinking Water During Times of Crisis

Through its Environmental Engineering Laboratory and in collaboration with national Water, Sanitation and Hygiene (WASH) partners, the Faculty of Engineering implemented the Water for All Initiative to support vulnerable and displaced communities during periods of crisis. The initiative provided free water quality testing services for shelters and distribution networks, analyzing physicochemical and microbiological parameters to ensure compliance with safe drinking water standards. In addition to laboratory testing, faculty experts provided technical guidance and support on water quality monitoring, water disinfection practices, and emergency response measures. Through its continued implementation in 2025 and 2026, the initiative contributed to protecting public health, reducing waterborne disease risks, and strengthening emergency water and sanitation services across affected communities.









Specialized WASH Sector Training in Lebanon Water and Wastewater Characteristics

The Faculty of Engineering hosted a specialized training program on water and wastewater characteristics in collaboration with the WASH Sector in Lebanon.





The training combined theoretical and practical sessions covering water sampling, testing methodologies, wastewater characteristics, and laboratory analysis. By strengthening the technical capacities of WASH practitioners and partner organizations, the initiative contributed to improving water quality management, pollution prevention, and sustainable sanitation practices across Lebanon.

Emergency Water Quality Response: During the COVID-19 pandemic and the Hepatitis A outbreak, the Environmental Engineering Laboratory provided free water-quality testing services for municipalities across Lebanon. UOB additionally established a public hotline for water disinfection guidance and launched a national awareness campaign offering free testing services to municipalities, institutions, and households.







SDG06.16

4. Water Management Educational Opportunities

Bridging Divides: A Diplomatic Conversation

As part of its commitment to advancing water management education, the University hosted the high-level roundtable “Bridging Divides: A Diplomatic Conversation” on 14 July 2025. The event featured Professor Fadi Georges Comair, who emphasized the importance of integrating climate change, water diplomacy, and hydrodiplomacy into higher education curricula. The initiative strengthened awareness of regional water challenges and reinforced UOB’s role in water governance education and capacity building.

ENGAGE Water Management Program

Through the USAID Water, Sanitation and Conservation (WSC)-funded ENGAGE Project, the University developed a comprehensive water management curriculum integrated into its Continuing Education Program. The certificate program includes modules on water governance, water treatment, water quality management, and water conservation. Through two free training cycles, 90 participants from civil society organizations completed the program and received University certificates.

C3WASH Initiative: Strengthening WASH Education in the MENA Region

The Faculty of Engineering joined the international C3WASH initiative to strengthen Water, Sanitation and Hygiene education across the MENA region. Through curriculum development, capacity-building activities, professional training, and collaboration with regional partners, the initiative contributes to developing future leaders and professionals in sustainable water management.



Water Expo on the Move: Advancing Community Water Education

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.





5. Conscious Water Usage in the Wider Community

Sustainable Landscape and Water-Conscious Infrastructure

The University of Balamand promotes responsible water use through the integration of sustainable design principles, nature-based solutions, and climate-resilient infrastructure. Through the university-funded **REEEB (Rainwater Management, Energy Performance, Economic Outlook, and Environmental Impacts of Biosolar Roofs)** project, the Faculty of Engineering is evaluating the hydrological, energy, economic, and environmental performance of biosolar roof systems using experimental studies, numerical simulations, and theoretical analyses. Comparative research is being conducted in collaboration with the **University of Lleida (Spain)** and **La Rochelle University (France)**, contributing to the development of innovative solutions that enhance rainwater management, improve resource efficiency, and support sustainable urban development.

Further demonstrating its commitment to water-conscious urban planning, the Faculty of Engineering was selected to participate in the prestigious **High-Level Scientific Stay (SSHN)** program, supported by the **French Embassy in Lebanon** and the **French Institute of Lebanon**. The research residency at **La Rochelle University** focuses on integrating green roofs with urban water-management systems to reduce flooding risks and strengthen climate resilience in Lebanese cities. This initiative reinforces the University's leadership in developing innovative approaches to sustainable water management and green infrastructure.

Student engagement also contributes to advancing sustainable water solutions. In 2025, a team of Faculty of Engineering students presented their research at the **6th International Conference on Environmental Design and Health (ICED 2025)**, examining the physical characteristics of typical Lebanese soils and their suitability for vegetative roofing systems. The study contributes valuable knowledge to the development of climate-resilient infrastructure and supports the University's broader strategy of integrating sustainability into engineering education and campus planning.

Green Field Conversion Advances Sustainable Water Management

Starting **Fall 2026**, the University completed the replacement of natural grass at the Green Field with artificial turf as part of its ongoing commitment to sustainable campus operations and responsible resource management.

The project was undertaken to significantly reduce the water required for irrigation and landscape maintenance, contributing to improved water-use efficiency across campus. By eliminating the need for regular watering, the initiative supports the

University's water-conservation objectives while ensuring the continued availability of high-quality recreational and athletic facilities for students and the wider University community.

This upgrade forms part of the University's broader sustainability efforts under **SDG 6: Clean Water and Sanitation**, demonstrating a proactive approach to reducing operational water consumption and promoting the responsible stewardship of natural resources.

The Green Field conversion represents another step in the University's commitment to integrating sustainability into campus infrastructure and advancing long-term environmental resilience.

6. Promoting SDG6 Through Student Activities

In 2025, University of Balamand students contributed to SDG 6 (Clean Water and Sanitation) through participation in the UOB–Water Expo, awareness campaigns, sustainability clubs such as the Lebanese Water Actors Platform, and SDG Ambassador initiatives that promoted water sustainability and environmental awareness on campus.

Water Warriors 2025 Competition: Inspiring Youth for a Sustainable Water Future:

The Faculty of Engineering hosted the Water Warriors Competition which brought together secondary school students from North Lebanon to compete in educational challenges related to water conservation and sustainability. The initiative fostered environmental awareness and encouraged youth engagement in addressing water-related challenges.



The **1MAP – One Million Action Postcard Initiative** was launched by the UOB-LEWAP student chapter through the Principles of Environmental Engineering course by Dr. Yasmine Jabali. The campaign engaged schools in raising awareness about water sustainability and water-related challenges and is supported internationally by Wavemakers United. This year, UOB's 1MAP initiative, was shortlisted as a finalist for the QS ImpACT Awards 2026 for its contribution to water and sustainability education. Through its partnership with Wavemakers United, UOB has committed to educating one million young people on water-related issues by 2030, supporting SDG 6.



Community Fair: On 16 September 2025, the University of Balamand hosted its annual Community Fair, bringing together more than 27 NGOs and community organizations. Among the participants were environmentally and water-focused initiatives including the SWaTH Project, World Vision Lebanon, كلنا للبيئة, and the Lebanon Reforestation Initiative, providing students with opportunities to engage in volunteering, sustainability, environmental protection, and water-related awareness activities. The event strengthened student exposure to community-based actions supporting SDG 6 and other Sustainable Development Goals.



SWaTH Project: As part of its *post-project outreach activities*, the SWaTH team participated in the University's 2025 Community Fair, where students interacted with project representatives, explored opportunities for environmental volunteering and research engagement, and learned about sustainable wastewater-management solutions and their role in advancing SDG 6.

The project also participated in the celebration of #ErasmusDays in collaboration with the Student Society of Chemical Engineering and the Society of Petroleum Engineers, promoting international cooperation and raising awareness of sustainable wastewater-management solutions among students.



The University of Balamand demonstrates a mature and well-documented approach to SDG 6 through strong research performance, robust campus water stewardship, measurable wastewater reuse, regional leadership in water governance, extensive educational programming, and meaningful student and community engagement.