



جامعة ابن طفيل  
+oΘΛΠΞ+ ΣΘΙ ΕΞΗoΠ  
Ibn Tofail University

2023

# SDG6 REPORT

WATER AND  
SANITATION



SUSTAINABLE  
DEVELOPMENT  
IBN TOFAIL UNIVERSITY

# Introduction

In 2023, Ibn Tofail University remained dedicated to advancing the Sustainable Development Goals (SDGs), with a specific emphasis on SDG 6. SDG 6 seeks to guarantee the availability and sustainable management of water and sanitation for all. Throughout the year, the university undertook actions and initiatives to showcase its commitment to preserving water resources, promoting sustainable sanitation, and increasing awareness of these vital issues. This report aims to underscore the university's noteworthy endeavors to support the objectives of SDG 6.

## 6 EAU PROPRE ET ASSAINISSEMENT



# Assessment Of the year

Such as photovoltaic panels and wind energy, to provide drinking water to approximately 4,000 users, with a daily allocation of 3 liters per person.



## wastewater Treatment:

Two remarkable projects illustrate these initiatives:

- UIT Wastewater Treatment Plant has a daily capacity of 500 cubic meters. This facility is dedicated to treating liquid discharges from the vast UIT campus, which spans over 65 hectares and serves over 60,000 users.
- The Hybrid Technology Water Pumping and Treatment Station, combines advanced membrane techniques and utilizes renewable energy sources.

## Key Figures:

- 140,000 cubic meters of campus wastewater are treated and reused to water green spaces. Approximately 60% of the campus is comprised of green areas irrigated with treated wastewater.

## Education Programs:

- Bachelor's Degree in Water Science and Technology in Agriculture
- Bachelor's Degree in Hydro-Agricultural Development
- Bachelor's Degree in Water Engineering
- Master's Degree in Water Engineering

## Other Initiatives

The university has taken several important actions:

- Collaborated with local authorities, environmental associations, and other stakeholders to exchange best practices and work together on water resource conservation.
- Installed water meters and set up regular consumption monitoring to identify high-consumption areas and take corrective measures if necessary.
- Promoted research and the development of innovative technologies and practices for more efficient water management within the university.
- Used appropriate filtration systems to enable the reuse of water from laboratories or research facilities.
- Installed water-efficient equipment and infrastructure, such as low-flow faucets and toilets, rainwater harvesting systems, and Smart Irrigation systems.
- Planned expansions of the UIT wastewater treatment plant to implement water collection and treatment systems for reuse in irrigating public green spaces.
- Implemented a Smart Irrigation System, which uses advanced technologies to optimize the efficiency of watering green spaces.



# WATER USAGE MONITORING AND MEASUREMENT AT IBN TOFAIL UNIVERSITY

Ibn Tofail University actively measures and monitors the total volume of water consumed across its campus to ensure sustainable water management. The water used is primarily sourced from the mains supply and is monitored through various methods to optimize efficiency and minimize waste.

**Smart Metering System:** Smart water meters have been implemented across key points on campus, including research laboratories, administrative buildings, and student residences. This system provides real-time data on water usage, allowing the university to track daily consumption, identify peak usage periods, and detect leaks or inefficiencies.

**Sub-Metering for Specific Areas:** Specific high-consumption areas, such as irrigation systems for campus green spaces, are equipped with sub-meters. This allows for targeted monitoring and the optimization of water use in these areas.

**Annual Water Audits:** The university conducts annual water audits to review total water consumption, helping set reduction targets and identify areas for improvement.

**Rainwater Harvesting:** To reduce reliance on mains water, the university collects rainwater for non-potable uses like irrigation, supporting sustainability goals.

In 2023, the total volume of water used at the university was 337,043 m<sup>3</sup>, including 140,000 m<sup>3</sup> of treated water from the university's wastewater treatment plant, which is reused for irrigating campus green spaces. The wastewater treatment plant, treats up to 500 m<sup>3</sup> per day using advanced membrane bioreactor technology (MBR-UF), contributing to water conservation and enhancing the university's green infrastructure.

Through these efforts, Ibn Tofail University not only tracks water consumption but also actively works towards reducing overall usage and supporting environmental sustainability initiatives.



# APPLICATION OF BUILDING STANDARDS TO MINIMIZE WATER USE AT IBN TOFAIL UNIVERSITY

Ibn Tofail University has implemented comprehensive building standards to reduce water consumption across its facilities. These measures, aligned with national laws and sustainability goals, promote the efficient use of water resources while minimizing environmental impact.

Key regulations guiding these efforts include:

**Law No. 36-15 on Water:** This law focuses on the rational and sustainable management of water resources, promoting integrated and participatory approaches to water usage. Ibn Tofail University has adhered to this by incorporating water-saving technologies in its new architectural plans. These include advanced irrigation systems and water-saving devices installed throughout the campus.

**Law No. 12-03 on Environmental Impact Studies:** This regulation requires all construction projects to meet sustainability standards, ensuring that environmental impact is minimized. As part of this, the university conducts thorough environmental assessments and integrates water-efficient systems into its building designs, such as rainwater harvesting and reduced water flow technologies.

Additionally, these efforts are aligned with the IMANOR Guide, which provides sustainable construction standards. This guide promotes the use of environmentally friendly technologies to reduce the overall water consumption and environmental footprint of building projects.

By following these regulations and standards, Ibn Tofail University is committed to minimizing water usage and contributing to broader water conservation and environmental sustainability objectives.

## Loi n° 12-03 relative aux études d'impact sur l'environnement

### Chapitre Premier : Définitions et champ d'application

**Article Premier :** Au sens de la présente loi, on entend par :

- 1 - " **Environnement** " : ensemble des éléments naturels et des établissements humains, ainsi que des facteurs économiques, sociaux et culturels qui favorisent l'existence, la transformation et le développement du milieu naturel, des organismes vivants et des activités humaines.
- 2 - " **Etude d'impact sur l'environnement** " : étude préalable permettant d'évaluer les effets directs ou indirects pouvant atteindre l'environnement à court, moyen et long terme suite à la réalisation de projets économiques et de développement et à la mise en place des infrastructures de base et de déterminer des mesures pour supprimer, atténuer ou compenser les impacts négatifs et d'améliorer les effets positifs du projet sur l'environnement.
- 3 - " **Pétitionnaire** " : personne physique ou morale, auteur d'une demande d'autorisation ou d'approbation concernant un projet soumis à l'étude d'impact sur l'environnement.
- 4 - " **Acceptabilité environnementale** " : décision prononcée par l'autorité gouvernementale chargée de l'environnement, en conformité avec l'avis du comité national ou des comités régionaux d'étude d'impact sur l'environnement, attestant de la faisabilité du point de vue environnemental d'un projet soumis à l'étude d'impact sur l'environnement.
- 5 - " **Projet** " : tous projets d'activités, de travaux, d'aménagements et d'ouvrages, entrepris par toute personne physique ou morale, privée ou publique qui, en raison de leur nature, de leur dimension et de leur lieu d'implantation dans des zones sensibles ou protégées, doivent faire l'objet d'une étude d'impact sur l'environnement.
- 6 - " **Directives** " : documents de référence définissant les principaux éléments qui doivent être intégrés aux termes de référence de l'étude d'impact d'un projet assujéti à cette étude.
- 7 - " **Termes de références** " : document de référence définissant les aspects et les exigences environnementaux importants devant être pris en considération lors de l'élaboration de l'étude d'impact. Il précise la méthode qu'il faut adopter pour détecter et analyser les répercussions éventuelles du projet sur l'environnement.
- 8 - " **Zones sensibles** " : zones humides, zones protégées et zones d'utilité biologique et écologique ainsi que celles situées sur les nappes phréatiques et sur les sites de drainage des eaux.

1482	BULLETIN OFFICIEL	N° 6506 - 4 moharem 1438 (6-10-2016)
<p><b>Dahir n° 1-16-113 du 6 kaada 1437 (10 août 2016) portant promulgation de la loi n° 36-15 relative à l'eau</b></p> <p style="text-align: center;">LOUANGE A DIEU SEUL ! (Grand Secou de Sa Majesté Mohammed VI) Que l'on sache par les présentes – puisse Dieu en élever et en fortifier la teneur ! Que Notre Majesté Chérifienne, Vu la Constitution, notamment ses articles 42 et 50, A DÉCIDÉ CE QUI SUIT :</p> <p>Est promulguée et sera publiée au <i>Bulletin officiel</i>, à la suite du présent dahir, la loi n° 36-15 relative à l'eau, telle qu'adoptée par la Chambre des représentants et la Chambre des conseillers.</p> <p style="text-align: center;">Fait à Tétouan, le 6 kaada 1437 (10 août 2016).</p> <p>Pour contresigner : Le Chef du gouvernement, ABDEL-ILAH BINKIRAN.</p> <p style="text-align: center;">* * * <b>Loi n° 36-15 relative à l'eau</b> * * *</p> <p style="text-align: center;"><b>Chapitre premier</b> <i>Dispositions générales</i> Section première – <i>Principes généraux</i></p> <p><b>ARTICLE PREMIER.</b> – La présente loi fixe les règles d'une gestion intégrée, décentralisée et participative des ressources en eau pour garantir le droit des citoyennes et des citoyens à l'accès à l'eau et en vue d'une utilisation rationnelle et durable et une meilleure valorisation quantitative et qualitative de l'eau, des milieux aquatiques et du domaine public hydraulique en général, ainsi que les règles de prévention des risques liés à l'eau pour assurer la protection et la sécurité des personnes, des biens et de l'environnement.</p> <p>Elle vise, également, la mise en place des règles et outils de planification de l'eau y compris les eaux usées, les eaux de mer dessalées et autres pour accroître le potentiel hydrique national en tenant compte des changements climatiques afin de s'y adapter.</p> <p style="text-align: center;"><b>Article 2</b></p> <p>Les dispositions de la présente loi se basent sur les principes suivants :</p> <ul style="list-style-type: none"> <li>– faciliter l'égal accès des citoyennes et citoyens à l'eau et à un environnement sain pour satisfaire leurs besoins fondamentaux, conformément aux dispositions de l'article 31 de la constitution ;</li> <li>– la domanialité publique des eaux à l'exception de celles sur lesquelles des droits historiques ont été régulièrement reconnus ;</li> <li>– le droit de toute personne physique ou morale de droit public ou de droit privé d'utiliser les ressources en eau du domaine public hydraulique dans les limites de l'intérêt général et dans le respect des obligations fixées par la présente loi et des textes pris pour son application ;</li> <li>– la prise en compte des besoins en eau des populations des zones montagneuses selon une approche d'éco-développement visant la durabilité ;</li> <li>– la prise en compte des besoins en eau des populations à l'aval des barrages en vue de leur assurer de continuer à profiter des eaux des cours d'eau ;</li> <li>– la gestion de l'eau et du domaine public hydraulique en général selon les règles de bonne gouvernance en associant les administrations, les collectivités territoriales, les opérateurs concernés et les représentants des différents usagers de l'eau pour le traitement des questions liées à l'utilisation et à la protection des eaux et à l'aménagement hydraulique au niveau des bassins hydrauliques et à l'échelle nationale, régionale et locale ;</li> <li>– la gestion intégrée, participative et décentralisée de l'eau en tenant compte du principe de l'équité et de la solidarité spatiales ;</li> <li>– la protection du milieu aquatique et la promotion du développement durable des ressources en eau ;</li> <li>– la prévention, à travers l'évaluation et l'appréciation des impacts des activités susceptibles d'affecter l'eau en particulier et le domaine public hydraulique en général, la définition et la mise en œuvre des mesures concrètes pour supprimer ces impacts ou réduire leurs effets négatifs ;</li> <li>– l'obligation pour les responsables des dommages, causés à l'eau en particulier ou au domaine public hydraulique en général, de procéder à leur réparation ;</li> <li>– l'utilisateur-payeur sauf s'il y a exonération due à des droits historiques régulièrement reconnus ;</li> <li>– le pollueur-payeur ;</li> <li>– l'intégration de la mobilisation des eaux non conventionnelles dans la planification de l'eau ;</li> <li>– l'intégration, à tous les niveaux, de l'adaptation aux changements climatiques dans la planification et la gestion des eaux.</li> </ul> <p style="text-align: center;"><b>Section 2 – Définitions</b> <b>Article 3</b></p> <p>Au sens de la présente loi, on entend par :</p> <ul style="list-style-type: none"> <li>– eau : matière vitale composée d'oxygène et d'hydrogène sous ses trois formes liquide, solide et gazeuse. Elle constitue un bien public qui, sous réserve des dispositions de la section 2 du chapitre II de la présente loi, ne peut pas faire l'objet d'appropriation privée et de transaction par vente ou achat ;</li> </ul>		

# Ibn Tofail University: Sustainable Landscaping Practices to Minimize Water Usage

As part of our commitment to sustainable development, Ibn Tofail University has made significant efforts to reduce water consumption across our green campus. One of the key strategies has been the adoption of drought-tolerant plants and water-efficient landscaping practices. These measures are crucial in promoting environmental sustainability and ensuring responsible water use.

To minimize water usage, the university has implemented several initiatives:

## Water-Saving Landscaping:

We have prioritized planting species that are naturally adapted to drought conditions, reducing the need for excessive irrigation. These plants are incorporated across various parts of the campus, particularly in areas with high sun exposure, helping to conserve water while maintaining the beauty of the campus.

## Research on Sustainable Agriculture:

As a leading research institution, the university actively engages in projects aimed at optimizing water use in agriculture. The Advanced Control System for Sustainable Connected Greenhouses is a prime example, where intelligent control systems help manage water use efficiently in agricultural greenhouses connected to hybrid micro-grids. This innovative approach aligns with our goal of developing sustainable agricultural practices that use minimal water while maintaining high productivity.

These efforts are evidence of Ibn Tofail University's commitment to sustainability, focusing on reducing water consumption while maintaining a vibrant and healthy environment.



# WORLD WETLANDS DAY IN COLLABORATION WITH THE SOCIETY FOR THE PROTECTION OF ANIMALS AND NATURE (SPANA)

In line with the environmental training initiatives offered by UIT, The Faculty of Sciences in Kenitra, in collaboration with the Society for the Protection of Animals and Nature (SPANA), has actively engaged in celebrating World Wetlands Day, highlighting the urgent need to restore the Sidi Boughaba site. The event, which took place on Thursday, February 9, 2023, at the National Center for Environmental Education (CNEE) in the Sidi Boughaba reserve, Mehdia commune, led by the National Agency for Water and Forests, Ibn Tofail University, the Regional Directorate of Environment Rabat-Salé-Kenitra, and SPANA, provided an in-depth overview of environmental issues and necessary actions.

This initiative aimed to mobilize the community around the preservation of wetlands, particularly the Sidi Boughaba site, emphasizing the crucial importance of restoring and protecting these ecosystems. The participation of various entities, including the National Agency for Water and Forests, strengthened the collective effort to raise awareness and take action in favor of local biodiversity.

Such events provide valuable opportunities for interdisciplinary learning and engagement with real-world environmental challenges, complementing the theoretical knowledge imparted through UIT's environmental training programs. This shows the importance of practical experiences and community involvement in fostering environmental stewardship among UIT students and graduates.



# Toward Water Autonomy: The Water Treatment Project at Ibn Tofail University

The Ibn Tofail University (UIT) has installed a wastewater treatment station for its liquid waste generated from its facilities on campus. The chosen purification process is an aerobic biological process coupled with a membrane process (BRM), offering a treatment capacity of 500 m<sup>3</sup>/day under a contract with WATEC, a specialist in water technologies since 1987. This station will make the university entirely self-sufficient in terms of waste treatment, allowing for their reuse in irrigating green spaces. The selection of the membrane bioreactor (BRM) is based on civil engineering considerations and compliance with standards for the reuse of treated water in irrigation.

## 1- Project Benefits:

The project has positive impacts on the University, the region, and the environment, particularly regarding:

- Limitation of surface and groundwater pollution.
- Protection of the environment and human health.
- Protection of the groundwater table.
- Irrigation of the university campus green spaces using treated water.
- Improvement of the environment.
- establishment of a research and training platform for teachers and students.
- Raising awareness among visitors (students, industrial actors, associations...) about water treatment and environmental protection.
- Reduction of potable water consumption by irrigating with treated water (with 80% of water reused for irrigation).



## 2- Project Impact:

Our innovation targets industrial stakeholders, academics, students, users, city/region representatives, and the economic fabric. Furthermore, to broaden the scope covered by this service and increase its efficiency, the idea will not be confined within the university's boundaries but will extend beyond to be implemented at various strategic points throughout the city.

### 2-1- Impacts already generated by the innovation

The impacts already generated by the innovation during the year 2023:

- Reduction of the pollutant load of wastewater discharged into the receiving environment (**by 91%; 93%; 97% in COD, BOD5, and TSS respectively**).
- Reuse of treated wastewater for irrigation of green spaces (**at a rate of 500m<sup>3</sup>/day**).
- Total treated volume is **130,000 m<sup>3</sup>/year**.
- **Production of sludge used as fertilizer in agriculture.**
- **Reduction of odors from effluents by 90%.**
- Reductions in potable water consumption (**with an 80% reduction in potable water consumption**).

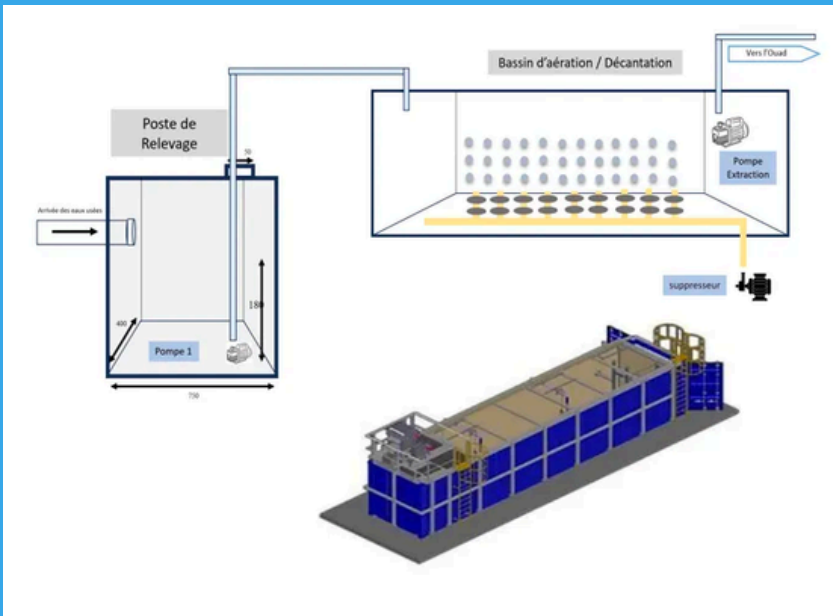
The table below presents the performance of the treatment plant for the year 2023:

Parameters	Raw water quality	Treated water quality	Total volume of treated water
DCO (mg/L)	540	31	130000 m <sup>3</sup> /ans
DBO5 (mg/L)	380	23	
MES (mg/L)	500	3,9	



## 2-2- Ibn Tofail University's Community Outreach: Building Sustainable Solutions Beyond the Campus

As part of our commitment to the community beyond the university campus, and in response to the need to rehabilitate families affected by the 2023 "Haouze" earthquake, an emergency plan has been launched to construct a village on 15 hectares. This project is being carried out in collaboration with the authorities of the provinces of Kénitra and Taroudant. In this initiative, Ibn Tofail University undertakes to design and commission a wastewater treatment station equipped with a compact mobile unit. This technology is specifically tailored to the terrain conditions and will be implemented in the village of Tafinghout, in the province of Taroudant. This station will play a crucial role in improving the living conditions of the village residents by ensuring effective wastewater treatment and thus contributing to the preservation of the local environment. Furthermore, it will serve as a model for other similar initiatives in the region, demonstrating our commitment to sustainable development and social responsibility.





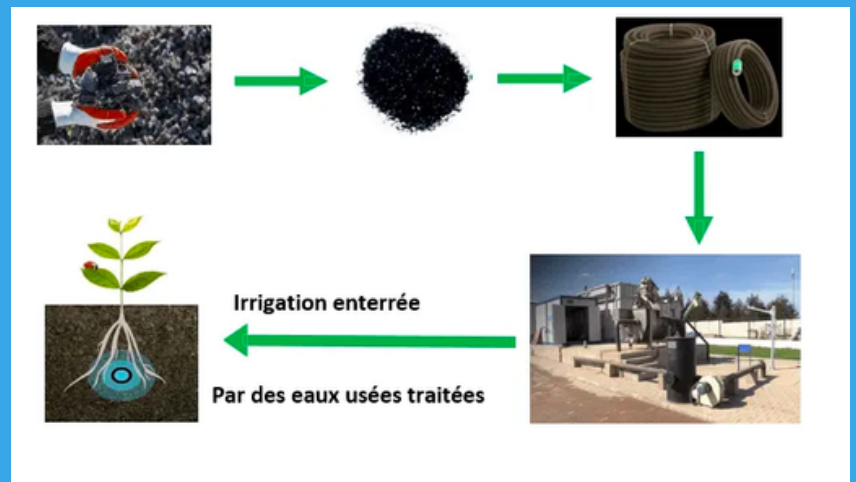
## 2-3- Innovative Water Treatment Project at Ibn Tofail University: Sustainable Irrigation Solutions with Mipotube Technology

The implementation of the water treatment project at Ibn Tofail University has highlighted our innovative choice to adopt the underground irrigation method using the "Mipotube" system. This choice has proven to be wise for several reasons:

It allows for water savings of up to **50%** of the amount typically used for irrigation, thanks to the absence of evaporation and targeted irrigation directly at the plant roots.

Additionally, Mipotube pipes are made from rubber waste from the automotive industry, significantly contributing to the valorization of recycled materials. This innovative approach is not only about water resource conservation but also aligns with a broader environmental agenda, promoting sustainability and ecological responsibility.

The use of this technology represents a step forward towards more environmentally-friendly practices, while also contributing to the reduction of industrial waste and the promotion of circular economy principles.



# Sustainable Initiatives

## Projects

### PROMEDRICE

#### Description:

PROMEDRICE aims to develop and promote the adoption of innovative and environmentally friendly agricultural practices and to produce evidence to support policymakers in making decisions regarding water resource management. The main objective of PROMEDRICE is to develop and promote the adoption of site-specific agricultural practices that reduce soil and water contamination and salinization while maintaining or improving water use efficiency and productivity in rice agro ecosystems.

#### Project Period:

October 2023 – October 2026

#### Researchers involved:

BOUABDLI Abdelhak – Geochemistry/Contamination/Pollution/ Environment – PES  
SADIKI Mohamed – Geochemistry/ Hydrology/ Environment – PH  
SAIDI Nadia – Microbiology/ Contamination/ Pollution – PES  
CHAKIRI Said – Sedimentology/ Environment – PES

#### Funding Partners:

Ministry of Higher Education, Scientific Research and Innovation Morocco (MHESRIM)  
Methodology:

PROMEDRICE will collect and harmonize data regarding both the quality of surface and groundwater in the vast majority of rice-producing areas in the Mediterranean, often located in river deltas and coastal wetlands.

The project will directly address the challenge of reducing salinization and contamination of water and soil in rice-based agro ecosystems. He will rely on the prior and shared knowledge of the consortium and experience to save water in rice cultivation, now focusing on optimizing water management coupled with agronomic practices that are likely to cause pollution. The specific objective is to preserve the health of rice agro ecosystems and the ecosystems with which they interact. Depending on the regions, conditions such as salinity, nutrients, pesticides, other compounds, as well as metals like As and Cd will be studied for their impacts on soils, surface waters, and groundwater. In those areas where salinization is a major issue, the salinization of aquifers and soil will be studied in relation to agricultural practices.

#### Expected Results:

The project will identify and quantify the main pollutants affecting surface water and groundwater in relation to rice production under specific soil and environmental conditions. The implementation of efficient and sustainable agricultural practices to reduce the risks of water pollution and salinization; will be developed studied/demonstrated in seven case studies across the Mediterranean region, from Turkey and Egypt in the East, to Portugal and Spain in the West.



# Sustainable Initiatives

## FUNZYbio

FFUNZYbio, an innovative project that explores the Fungal and enzymatic degradation of antibiotics, is a collaborative effort involving partners from Morocco, Tunisia, Italy, and France. The project, set to unfold between 2023 and 2026, aims to introduce groundbreaking biotechnological solutions for treating livestock residues, manure, and anaerobic digestates. These solutions are designed to:

1. Allowing safe reuse of water and organic matter for agriculture;
2. Exploiting this potential for soil health and durability;
3. Limiting their adverse environmental effect as potential sources of salinization and pollution, such as from antibiotics (ABs).

The FUNZYbio Consortium proposes technical solutions that could significantly impact “land and water sustainability” and “smart and sustainable farming.” By addressing the issue of AB pollution, which leads to the rise of AB-resistant bacteria (ARB) and AB resistance genes (ARGs), FUNZYbio could play a crucial role in preventing and limiting a significant threat to human and animal health worldwide: AB resistance.

Scientifically speaking, FUNZYbio could lead to the following impacts:

- 1) Direct contamination reduction of ABs by livestock waste reuse;
- 2) Indirect reduction of water salinization by wastewater reuse;
- 3) Development of green biotechnologies with near-zero costs to improve the two major existing and widespread processes for manure treatment: composting and anaerobic digestion.

- 4) Provide the proof of concept for obtaining safe (AB-free) water, liquid or solid fertilizers, and compost for safe use in the agri-food sector.

These impacts would be felt at the farm level, with downstream effects on the whole water basin area, considering the different sources of water contamination related to the agri-food activities.



# Sustainable Initiatives

## PRIMA: Safe- Sustainable Water reuse practices improving safety in agriculture, food and Environment”

**Project Period:** 2022-2024

### Project Description:

The project aims to improve water resource management and wastewater treatment to support sustainable agriculture in the face of growing global food security challenges. Due to pressures from population growth, climate change, and water scarcity, the goal is to find affordable and efficient solutions to preserve water resources while minimizing negative impacts on soil and agricultural production.

### Partners:

- Università degli Studi della Basilicata
- Istituto Ricerca sulle Acque – Consiglio Nazionale delle Ricerche
- Sapienza Università di Roma
- Hellenic Agricultural Organization ELGO-DIMITRA (Institute of Plant Breeding and Genetic Resources)
- The Catalan Institute for Water Research
- Université de Montpellier
- Institut Agronomique et Vétérinaire Hassan II
- Water Researches and Technologies Center
- Lebanese Development Network
- Université Djillali Liabes
- Faculty of Sciences of Sfax
- Université Ibn Tofail

### Scientific, Environmental, and Economic Impacts:

- The project addresses water scarcity, climate change, and land degradation. Its goal is to optimize water use in agriculture while minimizing environmental impact. This includes reducing micropollutants, managing soil salinity, and improving the quality of irrigation water. These efforts aim to enhance food security, protect soil biodiversity, and support microorganisms essential for sustainable agricultural production. The project will also help reduce the costs associated with wastewater management systems, benefiting farmers and local communities.



# Sustainable Initiatives

## Expertise in scaling problems

### Period of the project:

2022-2024

### Description of the project:

The aim of this applied research project, in partnership with ONEE, is to address the problem of scaling and the control and use of water with a high scaling potential by setting up a pilot treatment process and identifying and assisting in the implementation of preventive and curative measures to control the problem.

This project aims to tackle the problem of scaling in its various aspects:

- . Preventive: adapting water supply systems and their operation and equipment to water quality, particularly those with a high potential for scaling;
- . Curative: identification and assistance with the implementation of various intervention, cleaning, and regeneration techniques for clogged systems;
- . Development and implementation of appropriate specific treatments, taking into account water quality and the national context.

### Funding partner:

Office National de l'Electricité et de l'Eau Potable (ONEE – Morocco).

Scientific, environmental, and economic impact:

- . Mastery of innovative drinking water treatment technologies and assessment of the qualitative, quantitative and energetic performance of these processes;
- Design of a pilot scaling treatment unit adapted to ONEE centers and to the Moroccan context;

- ..Ensuring the efficiency and performance of drinking water supply systems, and consequently ensuring water security: sufficient drinking water flow to meet the needs of the population;
- .Producing water free of viruses and bacteria, and with mineral content in line with World Health Organization (WHO) and Moroccan drinking water standards.



# Sustainable Initiatives

## Treatment of High-Pollutant Industrial Effluents through Biomethanation

**Project Period:** 2021–2023

### Project Context:

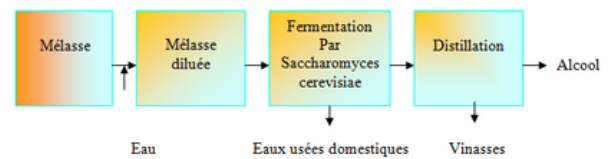
The Rabat–Salé–Kénitra (RSK) region, known for its agriculture, is experiencing continuous demographic and economic growth, and hosts numerous agro-industrial units. These industries are notorious for being major polluters. For instance, the effluents from the Société de Transformation des Mélasses du Gharb (Sotrameg) generate industrial effluents with high concentrations of Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD<sub>5</sub>), around 60,000 mg/L and 40,000 mg/L respectively. When these industrial effluents are discharged into the sewer network, they mix with domestic wastewater, negatively affecting the quality of groundwater and soil.

The goal of this project is to study the treatment and valorization of industrial effluents from a food-grade alcohol production unit using molasses, a by-product of sugar refining. The project will explore the feasibility of biomethanation to produce biogas and a biofertilizer product that can be used in agriculture.

Methanation produces ethanol through mesophilic fermentation of molasses using *Saccharomyces cerevisiae*. Sotrameg, the "Société de transformation des mélasses du Gharb," has been operating in the Gharb region of Morocco since 1975. It is involved in the production of industrial alcohols and liquefied gases. It is the only ethanol distillery in Morocco

producing ethanol from beet and sugarcane molasses. Sotrameg is unique in combining the production of ethyl alcohol with that of liquid carbon dioxide.

Ibn Tofail University, particularly the Separation Processes team of the Advanced Materials and Process Engineering Laboratory, is studying the anaerobic digestion process of vinasse...



# Sustainable Initiatives

## The project of Hybrid Biochemical and Thermochemical conversion of Slaughterhouse Biowaste for Renewable Energy production (BIOTHEREP)

**Project Period :** 2022–2024

**Funding Partners :** Leap–Re program

### **Description:**

The BIOTHEREP Circular is a project that aims to create novel and economically viable integrated processes that will help convert slaughterhouse activities into environmentally friendly sustainable practices and reduce the risk of soil, climate, and water pollution.

The project, set to unfold between 2022 and 2024, aims to develop an integrated strategy to produce bioenergy from slaughterhouse wastes and implement solutions that respond concretely to the global and regional sustainable development objectives from a circular economic perspective.

The project's primary ambition is to propose effective, optimized, and innovative multidisciplinary technological solutions to the current problems of SHW management that seriously affect climate, soil, and water resources.

### **What is the expected impact of the project?**

Among the project's primary outcomes will be the creation of an integrated waste management and energy generation system that is ideal for slaughterhouses. The slaughterhouses in Africa might employ this method directly, or it might be extended to other slaughterhouses that deal with comparable issues like improper disposal of waste heat or inadequate energy supply, particularly in remote regions.

Overall, in BIOTHEREP, several sustainable development goals are targeted. The project has an environmental and social impact on the African continent and responds to population needs. By implementing this integrated approach, the regional slaughterhouse sector can strengthen its competitiveness and growth by becoming more energy efficient. Results obtained could be used beyond this project for investigation in further R&D or international development projects.



# Sustainable Initiatives

## Expertise on Scaling Issue

"This collaborative project, conducted in partnership with the National Office of Electricity and Drinking Water (ONEE), focuses on the critical scaling issue. The main objective is to provide solutions for managing and operating water with high scaling potential from 2021 to 2023. To this end, the project plans to establish a pilot treatment process and identify and assist in implementing preventive and corrective measures."

The project revolves around two essential components. First, the preventive component aims to adapt drinking water supply systems, their operations, and equipment to the characteristics of the water, particularly those with high scaling potential. Second, the corrective component identifies and implements various intervention techniques for descaling and regenerating clogged facilities.

In a broader perspective, the project aims to develop specific treatments tailored to water quality and the national context.

This project will generate significant impacts at several levels from 2021 to 2023. It will enable the mastery of innovative drinking water treatment technologies through a rigorous assessment of their qualitative, quantitative, and energy performance.

The design of a pilot scaling treatment unit tailored to the centers under ONEE and the Moroccan context represents a significant advancement.

Operationally, the project aims to improve the efficiency and yield of drinking water supply systems, thereby ensuring water security by providing a sufficient flow of potable water to meet the population's needs.

Additionally, the production of virus- and bacteria-free water, while adhering to the standards of the World Health Organization (WHO) and Moroccan drinking water regulations regarding mineral content, will contribute to public health and environmental sustainability.



# Sustainable Initiatives

## Safe and Sustainable Water Reuse Practices Enhance Agriculture, Food, and Environmental Security

Due to the growth of the global population, farmers face increasing pressure to boost their productivity and ensure food security. However, climate variability, climate change, water scarcity, and land degradation complicate agriculture.

Practical and affordable management of wastewater use and treatment is crucial for addressing water scarcity and reducing the operational costs of sanitation systems. However, this management can lead to the introduction of organic micropollutants, high nutrient content, and salinity in wastewater, which can have a negative impact on agricultural production, product quality, and soil health.

Thus, improving irrigation water quality is crucial for ensuring food security, preserving biodiversity and soil microorganisms, and increasing the crop yields of small farmers.

SAFE addresses these challenges by examining decentralized wastewater treatment through natural solutions (NBS), assessing water reuse for crop irrigation, promoting environmentally friendly practices, and evaluating local biodiversity and co-benefits.

The major challenge is to support farmers in improving yields through high-quality wastewater effluents for irrigation, soil and pest management, and access to better-quality salt-resistant plants with enhanced agricultural practices.

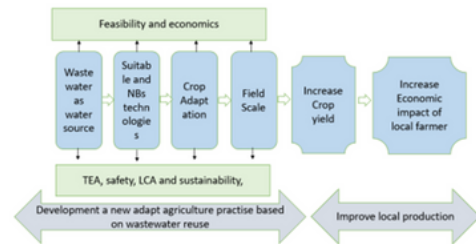


Figure 1 Overall Methodology of the SAFE project

# Sustainable Initiatives

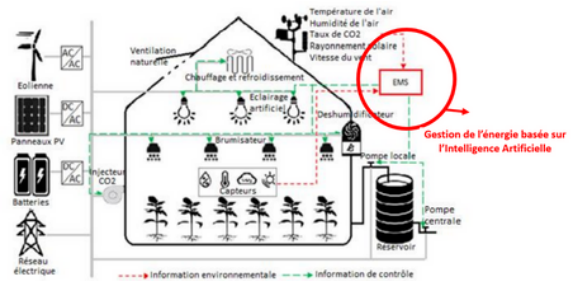
## Advanced Control System for intelligent and Sustainable Management of Connected Agricultural Greenhouses Linked to Hybrid Microgrids

Among the 61 projects selected as part of the Multidisciplinary Research Project Call (APRD), jointly initiated by the Ministry of Higher Education, Scientific Research and Innovation, the OCP Foundation, Mohammed VI Polytechnic University, and the National Center for Scientific and Technical Research, stands out the project from the Advanced Systems Engineering Laboratory (LISA). From 2022 to 2024, this project is titled 'Advanced Control System for Intelligent and Sustainable Management of Connected Agricultural Greenhouses Linked to Hybrid Microgrids.

The main objective of this project is to design and validate an intelligent management product for a network of greenhouses connected to a hybrid microgrid. This objective will be achieved by implementing an innovative centralized predictive control algorithm that considers stochastic production models and advanced predictions based on artificial intelligence.

A management platform for the system, utilizing Machine Learning, will enable real-time monitoring of the greenhouses' bioclimatic indicators.

The system will be equipped with optimized control and decision-making modules for heterogeneous energy systems that host various renewable energy sources, smart greenhouses, energy storage devices, pumps, water tanks, smart meters, and sensors. The main objective is to facilitate the transition to precision and smart agriculture by developing integrated information and control technologies based on consistent data analysis and high-performance control systems.



# Sustainable Initiatives

## Biological Agri-Food Systems as Models for Sustainable Food Systems in Europe and North Africa

Current food systems are neither ecologically nor socio-economically sustainable. We face significant health issues related to food, including hunger on one side and overweight and obesity on the other.

Intensive agricultural production is one of the leading causes of biodiversity loss and is one of the largest consumers of freshwater in the world. According to the FAO, one-third of our food is now wasted throughout the value chain.

The primary cause-and-effect relationships are well understood, but there is a need to enhance the motivation of stakeholders in food systems to promote more sustainable production and consumption. We believe that there are common starting points for transitions, despite significant variations in food systems across regions. Identifying these points is crucial for developing recommendations to enhance their sustainability. Organic food systems can provide a useful model in this regard.

The project addresses the following questions from four perspectives: transition, food, organic food and agriculture, and food waste.

- What understanding of sustainability is needed to drive the transition to sustainable food systems?
- How can we successfully design pathways to increase sustainable food production and consumption across the system?
- What are the reasons, motivations, incentives, or barriers that encourage stakeholders to adopt more sustainable solutions?
- What are the promising entry points to develop, strengthen, and promote organic food and agriculture, reduce waste, and shift towards sustainable diets?
- What are the critical points for integrating these perspectives into a systemic approach?



# Sustainable Initiatives

## UNIMED Food and Water

Food and water are critical issues in the Mediterranean, particularly in agricultural production facing climate change. Sustainable water management, monitoring of degraded areas, and integrating bioenergy and agro-industrial sectors are major concerns. These issues impact rural development, the fight against desertification, and socio-economic challenges.

The University of Évora, through UNIMED, has established a sub-network on food and water, bringing together research centers and academics. The aim is to promote scientific cooperation, the exchange of experiences, and the establishment of collaborations. The relevant disciplines include agricultural, environmental, natural, and soil sciences, hydrology, geology, biotechnology, economics, geography, demography, sociology, anthropology, spatial analysis, remote sensing, and land management.

The sub-network supports Euro-Mediterranean economic and social cohesion, encouraging cross-border cooperation and local sustainable development.

### Objectives of the sub-network:

- Collaborate with initiatives such as the PRIMA program for research and innovation;

- Gather information and best practices, contributing to a dedicated database;
- Conduct studies on water management, rural development, and sustainable agriculture;
- Encourage dialogue among universities, businesses, social actors, and policymakers;
- Organize international events and promote student and faculty mobility.



# Sustainable Initiatives

## Collaboration Innovante entre l'Université Ibn Tofail et le Réseau Climate-U

The Climate-U network, a one-of-a-kind international platform, plays a crucial role in promoting climate action and sustainable development through education and research. It brings together committed universities from around the world to combat the climate crisis.

Since its inception in February 2020, the network has experienced significant growth, expanding from its origins in the original Climate-U project, Transforming Universities for a Changing Climate. This expansion was made possible by the support of the Global Challenges Research Fund.

The Climate-U network is guided by the following objectives:

- To assess existing coverage of climate change in the curricula, research, and community engagement activities of universities in the four countries;
- To contribute to theory and understanding of the impact of higher education on climate change and sustainable development;
- To build and strengthen national, regional, and global university networks and knowledge exchange on climate change.

The network aims to strengthen climate action within each institution and create new collaborative ventures through international dialogue and exchange.

It also aims to benefit communities in four low—and middle-income countries by enhancing universities' contributions to addressing climate change. Collaborating with other networks, it coordinates events with international stakeholders and policy-makers.

The collaborative efforts between UIT and the Climate-U network have significantly impacted the university's academic programs and research. This partnership has facilitated the exchange of knowledge, resources, and best practices, fostering a robust ecosystem for developing innovative solutions to combat climate change. By leveraging its international partners' diverse expertise and resources, UIT has enriched its academic programs with a strong emphasis on sustainability and environmental studies. This integration has enhanced the quality of education and equipped students with the necessary skills and perspectives to become active contributors to the global sustainability agenda.

UIT's partnership with this network is a testament to its global significance in the fight against climate change.

# Sustainable Initiatives

## Hybrid Biochemical and Thermochemical Conversion of Slaughterhouse Biowaste for Renewable Energy Production

The BIOTHEREP Circular is a project that aims to create novel and economically viable integrated processes that will help convert slaughterhouse activities into environmentally friendly sustainable practices and reduce the risk of soil, climate, and water pollution.

The project, set to unfold between 2022 and 2024, aims to develop an integrated strategy to produce bioenergy from slaughterhouse wastes and implement solutions that respond concretely to the global and regional sustainable development objectives from a circular economic perspective.

Context: Why is this action necessary?

Slaughterhouses produce large amounts of solid and liquid waste containing a high organic load, which threatens ecosystems and risks human health. Slaughterhouse management is becoming more challenging as population growth drives up local demand for food and energy resources. This negatively impacts ecosystems due to waste accumulation and greenhouse gas emissions. In addition, the overconsumption of water complicates the overall negative impacts.

What concrete actions will be implemented?

The project will be executed by implementing a fully circular process of converting waste streams into energy and other valuable by-products.

What is the expected impact of the project?

One of the project's main results will be the development of an optimal integrated system of waste management and energy production adapted to slaughterhouses. This system could be implemented directly in slaughterhouses in Africa or transferred to other slaughterhouses that face similar problems related to SHW disposal or inefficient energy supply, mainly in rural areas.

Overall, in BIOTHEREP, several sustainable development goals are targeted. The project has an environmental and social impact on the African continent and responds to population needs.

By implementing this integrated approach, the regional slaughterhouse sector can strengthen its competitiveness and growth by becoming more energy efficient.

Results obtained could be used beyond this project for investigation in further R&D or international development projects.



## LEAP-RE

# Sustainable Initiatives

## Projects

### The Ghayt Caravan: A Transformative Act of Solidarity by the Lions Club Espoir of ENCG Kenitra

In February 2023, the Lions Club Espoir of the ENCG at Ibn Tofail University in Kenitra carried out a commendable act by organizing a caravan named Ghayt, aimed at providing aid and support to the Douar Kharbat Oulad Ali in the vicinity of the cities of Taounat and Tissa. This humanitarian initiative allowed for the distribution of 30 food baskets and blankets to 30 families in need. Additionally, the club undertook the task of setting up a complete football field with all the necessary equipment, thereby offering a recreational and entertainment space for the residents. A medical team composed of five specialized doctors was dispatched to conduct medical examinations and distribute medicines for free, addressing the urgent health needs of the community. Furthermore, repair work and equipment installation were carried out at the mosque, thus providing an improved place of worship for the faithful. Finally, our club contributed to the setup and equipping of a local school, thereby offering children a more conducive educational environment for their development. This Ghayt caravan demonstrated the commitment and compassion of the Lions Club Espoir towards the well-being and development of the local community.



# Sustainable Initiatives

## World Water Day: Conferences on the Theme: Ecosystem Services and the Economic Value of Water

The Natural Resources and Sustainable Development Laboratory of the Faculty of Sciences at Ibn Tofail University actively celebrated World Water Day by organizing a series of captivating conferences under the theme "Ecosystem Services and the Economic Value of Water," a topic of immense and immediate importance in today's world.

The event, set up on Wednesday, March 22, 2023, took on a crucial dimension by addressing the urgent need to resolve the global water and sanitation crisis, a challenge that requires the collective efforts of all. In a context where the dysfunction of the water cycle hinders progress in various areas, they focused on developing tools for systematically analyzing water resources, essential for integrated water governance and sustainable water balance management. The event featured a rich program, starting with welcome speeches by the President of Ibn Tofail University, the Dean of the Faculty of Sciences, and the Director of the RN2D Laboratory. Renowned speakers delivered key presentations on crucial topics, such as Prof. C. Benqlilou from the National School of Mines of Rabat's presentation on the

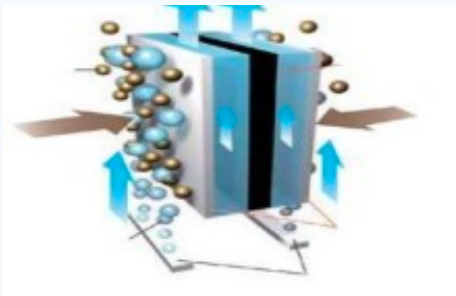
quantification and integration of ecosystem services into water management and Prof. A. Hadri from Mohamed VI Polytechnic University in Benguerir's presentation on water accounting and auditing in Morocco..

The event concluded with constructive debates and recommendations to raise awareness and illuminate the critical challenges surrounding water resource management in Morocco.



# Water Conservation

In addition to the previously mentioned projects, Ibn Tofail University has also committed to a series of initiatives to optimize water use and promote clean alternative sources. These efforts include the implementation of projects such as:



Construction of a Wastewater Treatment Station.

Using advanced technologies to enable their reuse to irrigate the university's green spaces.



## Water Treatment Station Through Coupling

Powered by photovoltaic and wind energy at Al Anouar High School in Sidi Taibi. This station improves the school's water quality while also contributing to the electricity supply.



## Implementation of an Automatic Irrigation System

Promoting more efficient water usage and minimizing waste for the campus' green spaces.

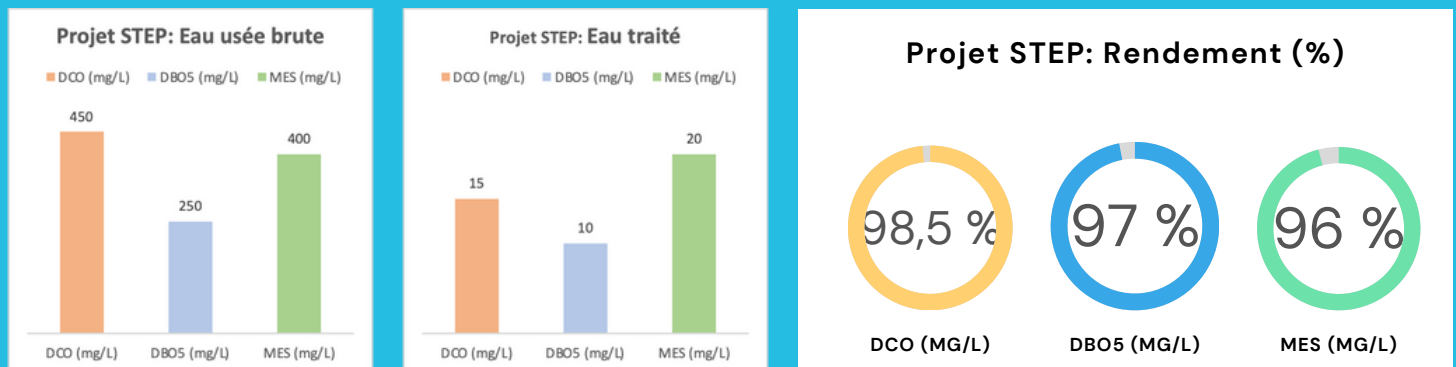
These concrete and operational projects reflect Ibn Tofail University's strong commitment to environmental protection and promoting a sustainable approach on its campus. The university has achieved significant savings through these initiatives, reducing its electricity consumption by approximately 61% in 2022. This responsible approach illustrates the institution's desire to actively contribute to preserving natural resources and building a more environmentally friendly future.

# Measuring Progress

## ESTABLISHMENT OF A WASTEWATER TREATMENT, PURIFICATION, AND RECYCLING STATION FOR IRRIGATING GREEN SPACES AT IBN TOFAIL UNIVERSITY

University Water: Biodegradable Wastewater.

Treatment Capacity: 200 m<sup>3</sup>/day



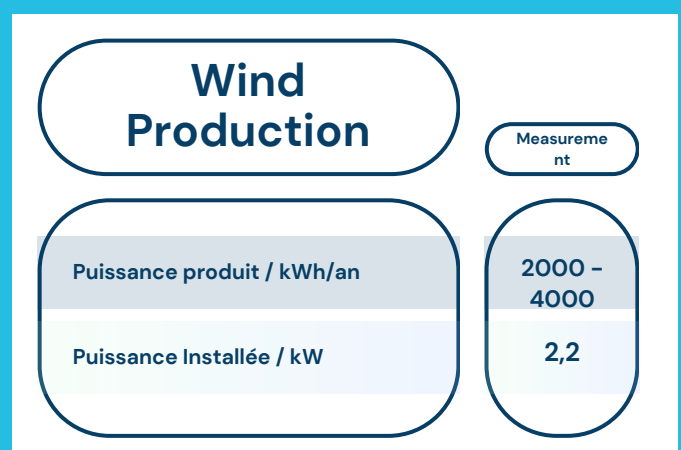
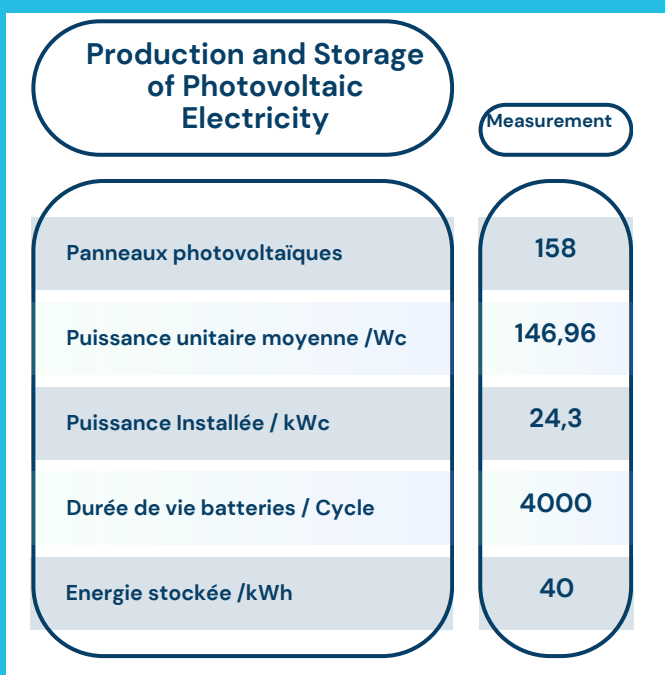
## WATER TREATMENT STATION THROUGH COUPLING: MEMBRANE TECHNOLOGY AND RENEWABLE ENERGIES

Capacity : 2000 Students

Capacity: 3 liters/day

School Water: Nitrated and Relatively Saline

Energy Consumption: 0.2 kWh/m<sup>3</sup>



In 2022, the Sidi Taibi station provided drinking water to approximately 4,000 students instead of 2,000.

# Conclusion

In conclusion, the activities carried out by Ibn Tofail University in 2023 in support of SDG 6 demonstrate our steadfast commitment to sustainable water and sanitation management. Research projects, awareness initiatives, and concrete actions have enhanced environmental consciousness within the university community and beyond. By continuing on this path, our university aims not only to preserve water resources but also to educate citizens and professionals on the importance of water for life and to promote responsible use of this vital resource.

## 6 EAU PROPRE ET ASSAINISSEMENT



# SAFE DRINKING WATER FOR HEALTHY COMMUNITIES



SUSTAINABLE  
DEVELOPMENT  
IBN TOFAIL UNIVERSITY