SUSTAINABLE WATER MANAGEMENT PLAN FOR **PRIVATE** TOURIST ESTABLISHMENTS

FINAL DOCUMENT

LIFE19 GIE/FR/001013

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PRESENTATION

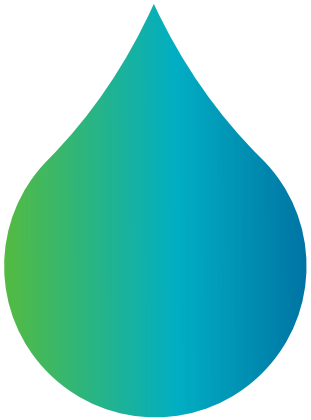
Water is a limiting resource in the Mediterranean, which combined with the climate crisis, will increase water scarcity and droughts in the coming years. Tourism is a very important sector in the region and, at the same time, it is also a major consumer of water. Furthermore, there is a strong link between tourism and ecosystem-based services, many of which depend on the good quality of the water environment (e.g., the scenic value of the natural landscapes in tourist destinations). Adopting water-saving, reuse, and sustainable water use measures is essential to have this resource at a sufficient quantity and quality.

Currently, the tourism sector is faced with a complex situation, due to the crisis from the COVID-19 pandemic, which affects the availability of resources available to take on new investments, but it is also an incentive for anything that may involve optimizing costs and reducing consumption. This document provides a holistic view of water services within the tourism sector, in order to encourage a paradigm shift that promotes water saving, efficiency, and it's sustainable use overall. It is aimed primarily at private agents in the sector, summarizing the key aspects that directly impact competitiveness. Therefore, many of these elements must make it possible not only to identify the latest trends or to know the most effective ways of saving and investing, but also to know those aspects that are gaining more and more weight in the decision-making of potential clients and clients.

All these tools and reflections should facilitate adopting good practices in the tourism sector in order to move towards sustainable development and achieving the 2030 Agenda, in a Mediterranean context.

2. WATER, A STRATEGIC RESOURCE FOR TOURISM IN THE MEDITERRANEAN

WATER, AN ESSENTIAL ELEMENT FOR TOURISM AS WELL



Water is an essential resource for ecosystems and human societies, and it is becoming an increasingly more scarce resource everywhere. The Mediterranean region is also considered an area particularly susceptible to climate change: among other consequences of this phenomenon, it is expected that before the end of the century we will witness a 20% reduction in rainfall, which will exacerbate the water deficit situation which is already affecting these countries today [1].

In addition, extreme weather events (droughts, floods, etc.) could become more frequent, intense, and hard to predict in the context of climate change [2]. All in all, it is estimated that by 2050, more than half of the world's population (57%) will live in places with water scarcity during at least one month per year, and some authors believe these estimates are even too optimistic [3]. Together with water demand, water resources available, and pollution, these factors are very closely related to population growth and economic growth.

Tourism is one of the main economic drivers in the Mediterranean countries, representing 10% of the Gross Domestic Product (GDP) in France and 15% for Spain [4, 5]. And water is also a major part of tourism activities, which are often linked to the aesthetic value of natural landscapes with a high-quality aquatic environment, which in turn may suffer from the water scarcity caused, among other things, by tourism itself [6].

Improvements in the science and technology of water treatment, water management, and clean water supply, and awareness of water saving and sustainable water use, as Nature-Based Solutions (NBS) is developed, they are the way to alleviate the shortage of clean water in the future [4].

HOW MUCH WATER IS USED BY...?

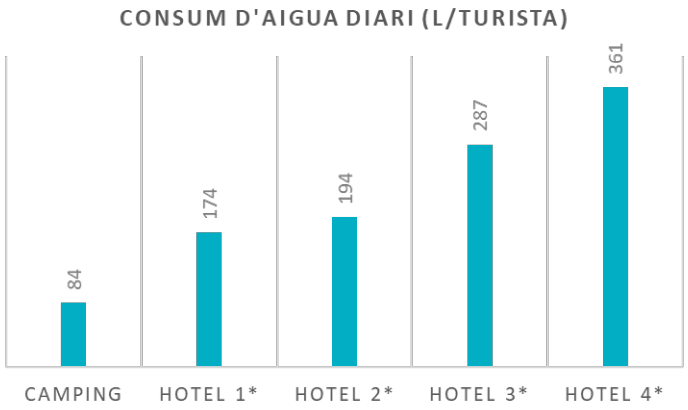


Figure 1: Water consumption in various categories of establishments, based on data from Rico-Amorós *et al.* 2019 [11].

- **TOURISTS:** In fact, the water consumption by tourists is remarkable and can be both direct, in terms of accommodation and recreational activities, as well as indirect (derived from food production, building infrastructures, etc.). The average direct consumption of a visitor to Europe is 300 L/day, but can exceed 3000 L/day, whereas a resident usually uses about 150 L/day [7, 8, 9, 10].

Given the fact that in many Mediterranean tourist areas, during the peak season, the number of visitors exceeds the resident popular, and that summer in the Mediterranean is the season with least rainfall, it is clear that this model of exploitation of the water resource is not sustainable.

However, there is significant room for savings in the tourism sector and, in fact, for this reason, a large number of studies have been carried on the sustainability of water consumption in tourist establishments.

The main objective has been to identify the types of hotels most susceptible to waste [5] and where the room for savings may be more important. The results (Figure 1) show a clear correlation between hotel category and water consumption.

A RESOURCE WITH MANY USES

In more detail, the estimated water consumption for a 100-room hotel, where there are no water-saving measures in place, is 565 L/tourist a day [12].

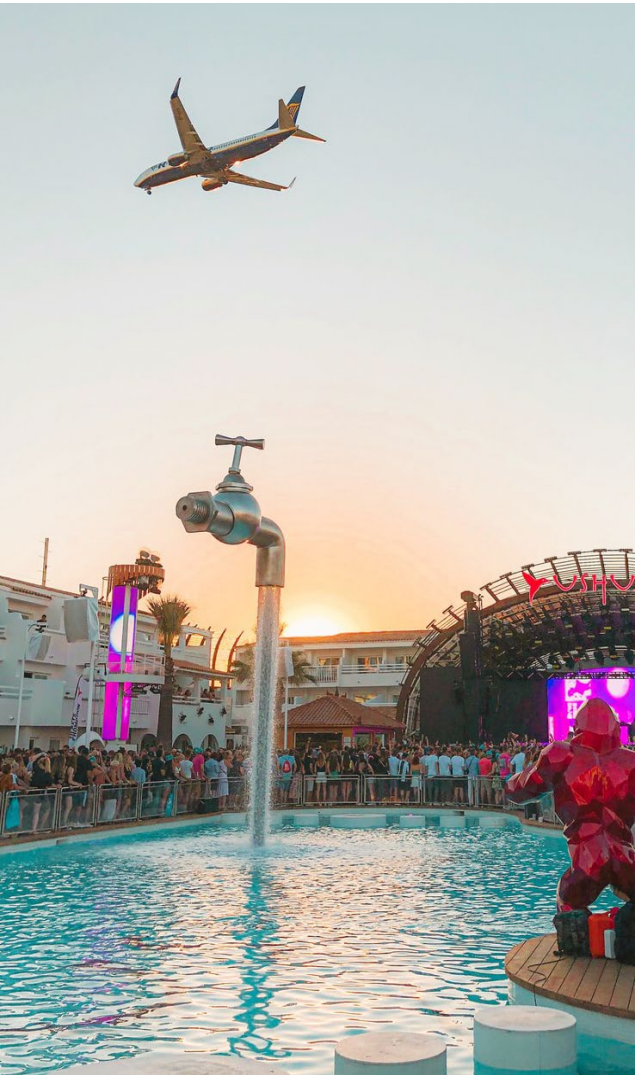
It is generally observed that the highest volumes of water are consumed in establishments equipped with services such as swimming pools (+60 L/tourist a day) [13], green spaces and large gardens (+61 L/tourist a day) [14] and laundry services (up to +100 L/tourist a day) [12].

In bathrooms, a simple dripping faucet can lose up to 70 L of water a day, and for a toilet tank, up to 750 L.

Losses, as a whole, can account for up to 5% of the total water consumption of a 100-room hotel [14, 16].

However, high-end hotels are not the only private facilities that are worth making an intervention to save water.

BUT NOT ONLY HOTEL ESTABLISHMENTS



Smaller establishments, in addition to campsites, golf courses, water and theme parks, spas, restaurants, bars, and nightclubs also have ample room for improvement in terms of water use. Likewise, all of these make up the vast majority of the tourism offer, so taking action in the majority of these establishments would result in big savings overall.

- PARKS, GARDENS, AND GOLF COURSES: A green space in the Mediterranean climate can need an average of about 0.77 m^3/m^2 of water per year. [17]. In addition, it has been estimated that the volume of water needed to irrigate a golf course in the Mediterranean region can reach 500 million (Portugal) and even 1 billion liters per year (Cyprus) [18].

- SWIMMING POOLS, WATER PARKS, AND SPAS: Data from hotel pools indicate an average water consumption of 52 L/tourist a day [12]. Consumption is mainly owed to filter washing, chlorine disinfection, the presence of showers, evaporation, and other various different (Fig. 4) [19].

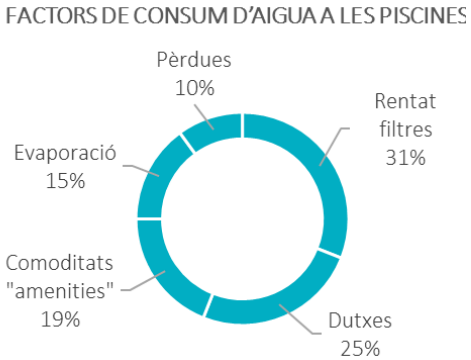


Figure 2: Distribution of water consumption in swimming pools, from Styles *et al*. 2015 [12].

WHY A WATER MANAGEMENT PLAN?

Water management plans are a tool that can be used for implementing technical measures to reduce the water footprint of an establishment. They make it possible to detect leaks and losses and to identify key points in the water cycle where action can be taken to reduce the costs, both environmental and economic, of water consumption.

There are many water-savings measures that can be put in place, and a lot of them can be implemented with a minimal initial investment, which can be recovered in the short or medium term [1]. On one hand, these are basic mechanisms to be applied to the sanitation facilities at hotels, campgrounds, and any structure that includes toilets and showers. We can also save water by improving the efficiency of irrigation of gardens and golf courses, reducing evaporation and improving the filtration systems of swimming pools and spas, machinery and habits in the kitchens of hotels and restaurants, and finally, establishing management measures such as consumption thresholds, and also investing in information and awareness of establishment staff and guests or visitors.

Thanks to the studies carried out, it been possible to set reference standards on water consumption in the tourism area, based on good practices, which provide estimates of the possible margins for sustainable water use.

SOME ESTIMATES OF SUSTAINABLE WATER USE IN THE TOURISM SECTOR

- **HOTELS:** Checking for and fixing leaks, along with the installation of low-flow devices (Figure 3) are just a few examples of modest investments that provide an immediate return. The reference standard calculated for a hotel with 100 rooms, in the event that good practices are implemented, is a daily consumption of 139 L/tourist, which is a savings of 75.4%, with a further reduction of up to 111 L/tourist a day, if they use solutions for the recycling greywater. The total water savings would be between 15,543 and 16,573 m^3/year [12].

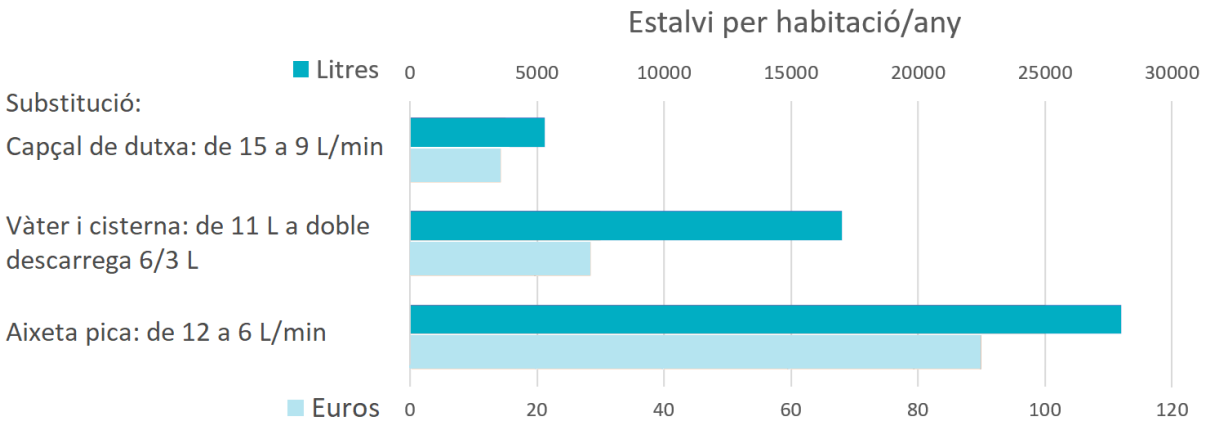


Figure 3: Distribution of possible savings of water and monetary in hotel rooms, with the adoption of good practices based on simple solutions (Data from Gössling et al. 2012 [6]).

SOME ESTIMATES OF SUSTAINABLE WATER USE IN THE TOURISM SECTOR

- PARKS, GARDENS, AND GOLF COURSES: The margins for water saving improvement in the irrigation of green spaces are vast and apply to the reception structures, which can constitute 22.5% of consumption [9], and other facilities such as golf courses and sports complexes. In this sense, some solutions for saving within irrigation include, to begin with, the use of drought-resistant vegetation and grass (for example, native Mediterranean plants), using greywater and rainwater, the modernization of irrigation equipment, modification to the existing vegetation and weather conditions, remote management, good practices in management of water bodies, etc., and of course, installing meters to monitor the consumption. In this way, the best practices available make it possible to eliminate the use of drinking water.

- SWIMMING POOLS, WATER PARKS, AND SPAS: The installation of meters is the first necessary measure to be adopted in order to quantify consumption and possible savings in swimming pools and other facilities like water parks and spas. With the adoption of good practices, such as implementing alternative water treatment systems to chlorine, or using a roof to limit evaporation, the savings for a 100-room hotel would reach up to 836 m^3/year [12].

3. WATER-RELATED CHALLENGES FOR THE PRIVATE TOURISM SECTOR

THE 2030 AGENDA AND THE SDGs, KEY TO THE TOURISM SECTOR

Among the 17 Sustainable Development Goals (SDGs) that make up the United Nations 2030 Agenda, the one that stands out in particular is number 6. This is the SDG dedicated to clean water and sanitation, but it is also one of the most far-reaching targets and connections with other SDGs, for everything that water represents for people, our societies and ecosystems.

Therefore, the main goal is to ensure access to good quality drinking water, as well as sanitation and other basic services, especially at the global level. But more specifically, the Agenda 2030 also sets targets that are most relevant to the tourism sector in the Mediterranean:

6.3. By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

One of the challenges for tourism to align with the 2030 Agenda is internalizing the possible effects and impacts of the activity has on the water environment, minimizing its negative consequences. Also important are all the measures aimed at reducing the use of resources in general and hazardous chemical compounds in particular, favoring the use of alternative treatment systems. Likewise, preventing untreated wastewater from reaching ecosystems, by surface water, groundwater, and coastal water, is also in line with the 2030 Agenda.

WATER, KEY TO THE 2030 AGENDA AND REACHING THE SDGs

6.4. By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

In this context, it requires reinforcing the measures for water-saving and efficiency use, which is especially important as it will become an increasingly scarce resource in the Mediterranean. Therefore, incorporating technologies and innovations into the sector that enable us to use other sources of water, such as reclaimed water and stormwater, would also be in compliance with the 2030 Agenda.

6.5. By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

In addition, the Mediterranean tourism sector will have to find a special way to confront water stress and periods of drought, which in the context of climate change, may increase in frequency and intensity. In order to deal with these periods, the use of unconventional water sources (regenerated and desalinated water) could be possible, managing the resources in an integrated, co-responsible way.

ECOSYSTEMS AND THEIR SERVICES, CRUCIAL FOR THE PRESENT AND THE FUTURE

6.6. By 2030, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers, and lakes.

Protecting ecosystems is crucial both for their intrinsic value and for maintaining all the ecosystem services we enjoy when they are in good condition. In the case of aquatic ecosystems, we need to be proactive in advancing the healthy ecological state of bodies of water and ensuring the maintenance of ecological flows in rivers. That will only be possible by considering an integrated vision of water management that includes the ecosystem's requirements, both in terms of its structure and the functions and processes that take place in it.

Adopting measures to align with all these targets related to SDG 6 will not only help those in the tourism comply with the 2030 Agenda, but it will also ensure more sustainability of water and the associated ecosystems, as a vital resource for the sector. All this can have a big positive impact, which would extend to various aspects related to the tourism business model, from greater resilience to periods of drought, to the reduction of operating costs or the possibility of benefiting from the services generated by the aquatic ecosystems of our environment, key to both the specific tourist establishments and for the attractiveness, value, and quality of the destinations in general.

4. SUSTAINABLE WATER USE AS A COMPETITIVE ADVANTAGE

WATSAVEREUSE

REDUCE THE IMPACT OF THE ACTIVITY AND OPERATING COSTS	ENSURE REGULATORY COMPLIANCE	BE MORE RESILIENT WHEN FACING DROUGHT EVENTS AND CLIMATE CHANGE
MAINTAIN OPERATIONS DURING TIMES OF DROUGHT RESTRICTIONS	STAND OUT FROM THE COMPETITION	HAVE A GREATER ACCEPTANCE AMONG THE ESTABLISHMENT'S LOCAL COMMUNITY
IMPROVING REPUTATION AND MARKETING	ALIGNMENT WITH THE CORPORATE SOCIAL RESPONSIBILITY STRATEGY (CSR)	ADVANCES IN THE CONTINUOUS IMPROVEMENT PROCESSES IMPLEMENTED
CREATE MORE SHARED VALUE IN THE AREA OF OPERATION (AND GLOBALLY)	EARN NEW CERTIFICATIONS TO SHOWCASE THE EFFORT MADE	IMPROVE THE FEELING OF BELONGING TO THE ORGANIZATION

SUSTAINABILITY AS A COMPETITIVE ADVANTAGE

The tourism sector can encourage water-saving, reuse, and sustainable water use by taking various different actions.

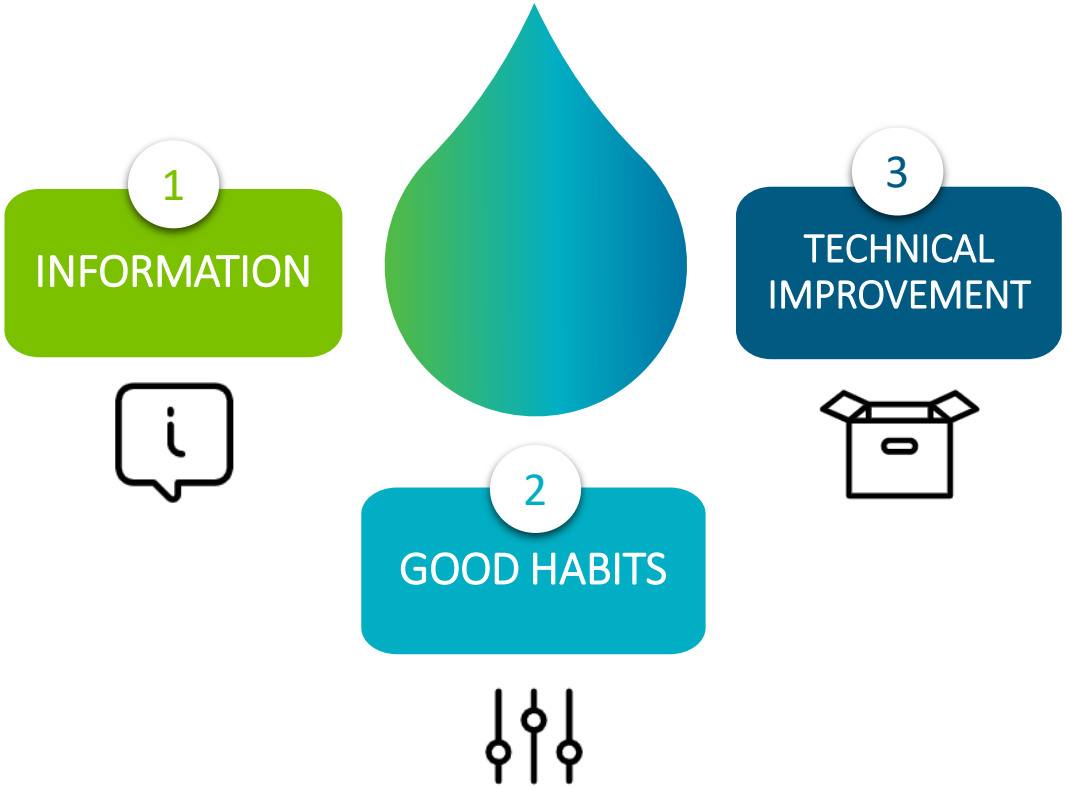
Many of these actions require a minimal investment that is recovered in the short or medium term and do not cause any inconvenience to customers when it comes time to implement them.

On the contrary, putting sustainable water-use measures in place at an establishment can also mean a significant competitive advantage for the establishment.

Sharing our goals and objectives with customers and users will encourage them to get involved and publicize our efforts, as well as with staff at the establishment. In this sense, it is important that our team is trained in order to be able to correctly understand and participate in all the actions to be implemented.

AREAS OF ACTION TO ACHIEVE A SUSTAINABLE USE OF WATER

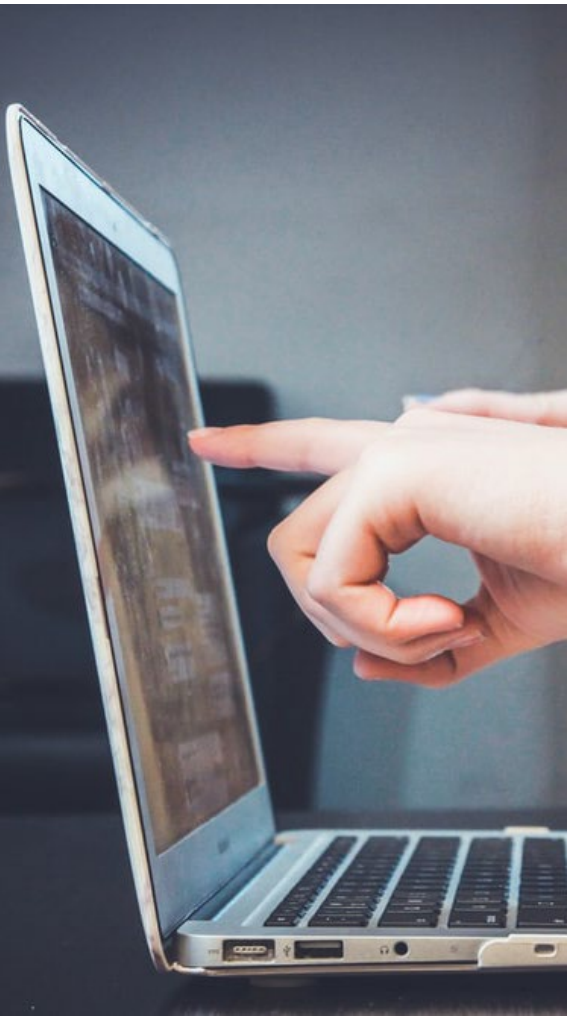
They are introduced below, grouped into three major categories: information, good habits, and technical improvement.



1

INFORMATION

STARTING POINT AND OBJECTIVES



Adequate, sustainable water management must be based on an integrated and holistic approach to this resource, based on its assessment. This will enables us to have real information, the most up-to-date as possible, as the basis for the decisions we make about water, making it easier to define specific objectives and to draft a practical strategy that guides us.

- CONSUMPTION: The first step towards sustainable water use **is to identify how much water we are consuming** in our establishment. From a practical point of view, the first resource we have for analyzing consumption is the water bill. However, in order to have a more realistic picture that takes into account the various points in our installation, it will probably be necessary to **install meters**. Regular readings (or in real time, if we opt for remote management systems) will allow us to **identify areas where we are consuming more water.** By knowing the pricing and billing schemes, this consumption data can be **transferred to the costs**, so that we can **contextualize the efforts** we make to save water in terms of investment (with specific return periods that we can define)

- DEFINE A WATER MANAGEMENT PLAN FOR THE ESTABLISHMENT: Once we have identified the associated consumption and costs, we will be able to **define our own goals** we would like to reach. These must be as specific and tangible as possible, and be measurable in a standardized way using a series of indicators calculated at a certain frequency, having established the actors responsible for monitoring them and applying the necessary measures. It requires defining **specific objectives and roadmaps for the various areas of activity** or facilities within the establishment, and thus be able to control in detail the consumption and success of the measures implemented.

2

GOOD HABITS

RAISING PEOPLE'S AWARENESS

- **GUESTS AND CUSTOMERS**: The close interaction that takes place with people during their stay at tourist facilities, makes it an optimal environment for public awareness. In addition, actions for raising awareness have many positive effects:
    - They can **help you achieve your own savings goals** and **spread** them among your customers. For example, by installing flow measurement systems and using digital tools that make customers aware of their consumption in real time.
    - They can **help to change the habits** of customers and clients during their stay, which can **reduce their overall water and resource consumption** and, in turn, **reduce the operating costs** for the establishment.
    - Incorporating innovations for the sustainable use of water also makes it possible **to highlight the investments made** by the establishment and portray an **image of modernity and professionalism**.
    - **Awareness-building activities themselves** reinforce the **good perception customers and guests have towards the establishment**, showing the establishment's commitment to sustainability and the common good, which can **improve its reputation**.
    - In some cases, if the water-saving, reuse, and sustainability measures can cause small inconveniences to users, spreading awareness will enable them **to have a better acceptance** of goals that may a challenge to them (e.g. using flow regulators on faucets may be annoying to some users, but if we post signs to explain the purpose of these measures, it can be easier to understand).
    - Finally, raising awareness can lead to a certain **change in the guests' habits in their day-to-day** lives after their stay at the establishment. In a study carried out as part of the LIFE-WAT'SAVEREUSE project [20], it was shown that approximately half of the tourists surveyed (56%) acknowledged having awareness about sustainable habits, but for various reasons, they had not adopted them regularly.

2

GOOD HABITS

USE OF THE FACILITIES

- **GUESTS AND CUSTOMERS**: Some examples of how to raise guests' awareness, many of which are already well established in the hotel industry, would be:
    - **Turning off taps and faucets** when not in use (in the event they are not automatic)
    - Using **dual-flush mechanisms** on toilet cisterns
    - The importance of **not flushing waste down the toilet**, such as personal care items or medicines. In addition, it is especially necessary to be reminded of the problems that can happen in the plumbing system of the establishments and the sewage system if wet wipes, paper products, toilet rolls, condoms, feminine hygiene products, cardboard, etc. are flushed down the toilet. It is also very important to have waste bins (conventional or hygienic) in all public bathrooms and bedrooms.
    - **Reuse towels** longer than one day if they are in good condition, placing them in various different spots in the bathroom to indicate if a change is required.
    - Recommend **prioritizing showers over baths** and/or reporting the water consumption associated with the various options.
    - Offer the possibility to **drinking tap water by** setting glasses in the room prepared for this purpose.

3

TECHNICAL IMPROVEMENT

ADAPT THE DESIGN TO SUSTAINABILITY

In accordance with the internal objectives set, the establishment may have identified needs for improvement that require new solutions be acquired for saving, reusing, and sustainably using water. The main axes of intervention in technical improvements in the tourism sector are presented below. For more details, see the Repository of water-saving, reuse, and sustainable use technologies for the tourism sector, also developed as part of the LIFE WAT'SAVEREUSE project.

- **HOTELS AND TOURIST ACCOMMODATIONS:** The technological solutions selected can have a very important impact on water consumption, the most common being:
  - **Dual-flush mechanisms** (usually between 3 and 6 L) or volume reduction in toilet cisterns (up to 35-40% savings).
  - **Faucet aerators**, which can achieve a savings of around 30-50%.
  - **Water flow restrictors/regulators** in the main network, in order to reduce the output flow. In these cases, the initial outlet pressure of the water must be considered in order to properly size the reduction without affecting the quality of service for users. Similar devices can also be installed to limit the outflow on faucets.
  - **Faucets with timers or electronic mechanisms** that adjust the length of operation, allowing them to be regulated automatically in the case of the most advanced devices.
  - **Thermostatic faucets** (up to 50% savings) and smart control devices for showers, adjusting the temperature and flow even to the various stages of use.
  - Selecting the most efficient **appliances**, especially in kitchens, laundries, and air conditioning systems.
  - Installation of **purification systems** that enable reuse of greywater and rainwater, according to its quality and the uses provided for in the legislation.

3

TECHNICAL IMPROVEMENT

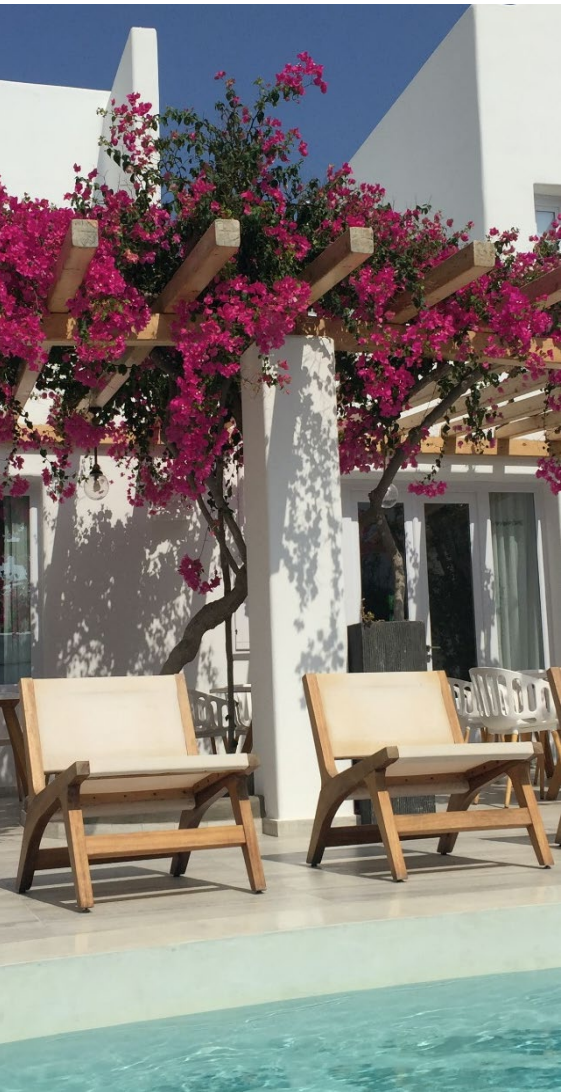
ADAPT THE DESIGN TO SUSTAINABILITY

- MAINTENANCE ACTIVITIES:
  - Optimize the design of the entire system in order to avoid excessive water pressure (and also heat loss).
  - Check that the internal water supply pipes (especially in large hotel facilities) are in good condition so as to minimize leaks.
- EFFICIENT CLEANING:
  - Implement systems to reuse bed linens and towels, encouraging guests to join in, so as to reduce the amount of clothing that needs washing (drying and ironing) in the laundry.
  - From a sustainability perspective, it is generally recommended to opt for environmentally-friendly textiles with a lower ecological footprint.
  - Train cleaning staff to reduce the use of water and chemicals.
  - Avoid cleaning systems in which a sheet of water is used to remove dirt. Use systems that minimize water use.
  - Opt for ecological and/or biodegradable cleaning products whenever possible.
- LAUNDRY:
  - Set washing machines to optimal settings so as to reduce the use of water, energy, and chemicals.
  - Opt for programs that allow you to reuse water for laundry.
  - Optimize the sorting of laundry to be washed and adjust the washing machine load size.
- KITCHENS:
  - Optimize pre-wash operations for dishes.
  - Use equipment that allows water to be reused (and heat recovery also).
  - Implement efficient cooking techniques.

3

TECHNICAL IMPROVEMENT

ADAPT THE DESIGN TO SUSTAINABILITY



- **IN SWIMMING POOLS AND GARDEN AREAS:** Aside from the specific technological solutions that can be applied in these spaces, there are other actions that can be implemented to achieve greater efficiency in the use of resources:
  - **Adjust the temperature** of swimming pools and **minimize the use of products** for cleaning and disinfecting.
  - Promote the use of swimming pools equipped with a water **recirculation system**.
  - **Design swimming pools that are as shallow as possible** (e.g. 1.50-1.80m), as long as there are no diving boards, **or** areas of varying depth, so as to **minimize the total volume of water** used.
  - In the case of outdoor pools, a significant amount of water is lost because of evaporation. During periods when the pool is not in use, it can be **covered** in order to prevent water loss.
  - Avoid using ornamental features in which **water is used as an aesthetic element** (fountains, artificial ponds, etc.)
  - Adopt **systems to optimize irrigation**, such as making sure to water during off-peak hours, using sensors to avoid watering when it rains, and creating a watering schedule that alternates between different irrigation zones within the hotel facilities.
  - **Design garden areas with a focus on water-saving and biodiversity protection**. Support using species that are native and/or adapted to drought, either locally or in all facilities, to help reduce water consumption. At the same time, it will minimize the possible impacts of invasive species to adjacent ecosystems (e.g. some species such as Pampas Plume (*Cortaderia selloana*) are highly appreciated in landscaping and gardening but can easily disperse through the wind up to several kilometers).
  - The **spread of exotic species** in ponds or artificial ponds should also be avoided, as species of amphibians, fish, gastropods, algae or aquatic plants can invade nearby aquatic ecosystems.
  - Consider the **distribution of vegetation in the space** according to criteria such as the orientation or exposure, having the most efficient irrigation techniques possible, and **minimizing the use of pesticides and artificial herbicides** that may contaminate the environment.

ACTIONS AND THEIR USES WITHIN ESTABLISHMENTS

Some examples of measures to be implemented according to their level of complexity from a technological standpoint. In blue, the simplest solutions are indicated, which require a minimal investment that can be recovered in less time, and, at the same time, can achieve sustainable use while maintaining the quality of the service and the satisfaction of clients (modified from Gössling, *et al.* 2012 [6]).

GARDENS, PARKS, AND GOLF COURSES

- Selecting drought-resistant plants and grass
- Mulch gardens in order to reduce evaporation
- Reduce the playing surface
- Installation of meters
- Installation of drip irrigation systems
- Electronically controlled irrigation
- Use of rainwater (and/or treated wastewater) for irrigation

SWIMMING POOLS, SPAS, AND WATER PARKS

- Adjust the use of heating, fans, and air conditioning.
- Minimize the use of cooling towers and laundry services
- Disinfect with UV light instead of using chemicals
- Avoid streams, waterfalls, etc.
- Use seawater for swimming pools and coastal recreation areas
- Reduction of the dimensions (in project phase)

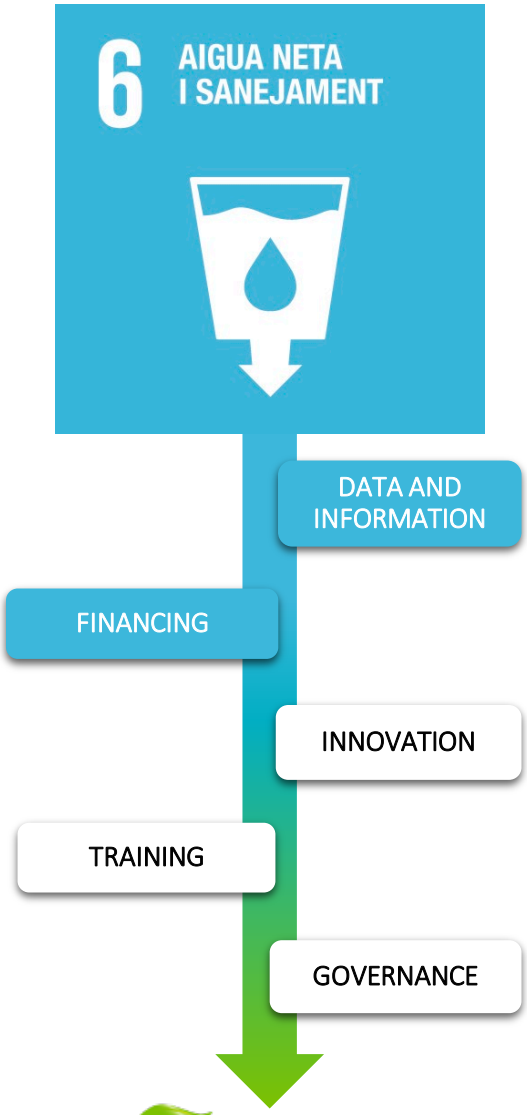
BATHROOMS IN ROOMS, CAMPGROUNDS, RESTAURANTS, ETC.

- Faucet aerators
- Faucets activated by infrared
- Dual-flush toilets
- Low-flow shower heads
- Reusing sheets and towels by the same guest
- Reduction of water pressure

KITCHENS AND LAUNDRY

- Changes in culinary practices
- Choosing efficient appliances (e.g. washing machines, dishwashers, coffee makers, car washes, etc.)
- Pre-rinse spray valves
- Efficient ice machines
- Flow-control regulators on faucets

5. TRENDS AND OPPORTUNITIES IN A CONTEXT OF CHANGE

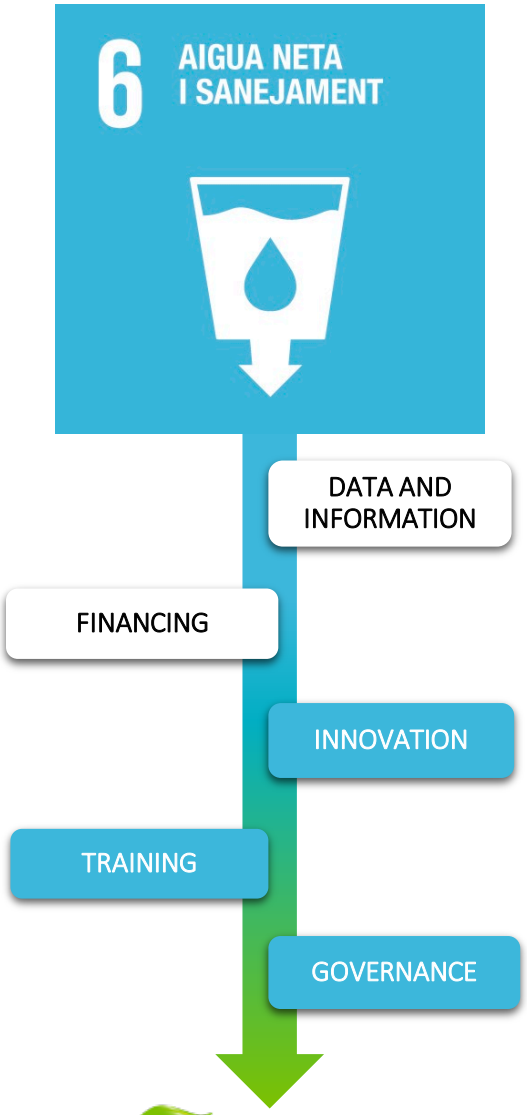


ACCELERATING CHANGE

Again, the 2030 Agenda and the paradigm shift suggested by the New European Green Deal can provide opportunities to move towards sustainable water use in the sector. The **United Nations has defined a framework** at the global level to stimulate international support for the deployment of SDG 6, with a series of acceleration strategies aimed at governments and the main international stakeholders. However, in the present project, these factors have been **adapted to the context of the tourism sector** as they may facilitate the achievement of SDG 6:

- **IMPROVING ACCESS TO DATA AND INFORMATION:** Having solid, validated, standardized data that can be exchanged will build trust so that establishments can make informed decisions and increase water accountability. Example: So that the establishment has quality information related to the indicators associated with water and SDG 6. In addition, enable digital tools to share information, both with decision-makers and with facility users, to engage them in consumption-savings policies.

- **OPTIMIZED FINANCING:** Improve the allocation and use of existing resources, mobilizing additional resources (internally and from other sources), in order to move towards better implementation. Example: Internal plans setting out objectives and actions for achieving SDG 6 should also include a definition of the associated costs and suggest sources of funding needed to implement them.



ACCELERATING CHANGE

- INCORPORATING INNOVATION: Be able to take advantage of innovations from the water sector, both in terms of technologies and practices that can be implemented in many different areas contained in the water cycle of a hotel facility. Example: if a pilot study is successful, it will need to be integrated and replicated on the largest scale possible, in order to optimize water resource management and sanitation in the establishment.

- IMPROVING TRAINING: Develop peoples' skills and the establishment as an institution at all levels, in order to improve service delivery, use of technologies, and better maintenance, linked with the retention of talent and the creation of specialized jobs associated with water and sustainability. Example: Having more qualified staff will boost implementation of the SDG in the establishment.

- CO-RESPONSIBILITY AND GOVERNANCE: Encourage collaboration on the establishment team, identifying the various functions in relation to ODS 6. At the same time, promote cooperation at a more global level, between the various sectors and regions, seeking synergies with various territorial agents and institutions to jointly address the challenges and opportunities associated with water. Example: Define specific objectives in relation to various sectors to advance towards SDG 6, improving coordination in the establishment. Also establish contacts and synergies with other agents in the territory with whom they share challenges and opportunities associated with water.

A VIEW OF THE SECTOR CONNECTED WITH THE AGENTS IN THE TERRITORY

NEWS AND MEDIA

The media plays a important role in various key issues for raising awareness and disseminating actions to citizens, tourists, companies, or administrations, as well as in presenting it to the community.

PUBLIC ADMINISTRATIONS

All public administrations have a role to play in promoting the water-saving, reuse, and sustainable use of water, from the European level as well as the water agencies or local community. **City councils** and local entities also play an important role in terms of the public tourism offer and the public management of water resources.

NGOs AND THE THIRD SECTOR

Civil society organizations and some NGOs play a very important role in social cohesion, nature conservation, heritage, and/or culture, which are fundamental aspects of sustainable development.

COMPANIES AND BUSINESS ASSOCIATIONS

The economy and productive sectors play a major role in the new sustainable development model. In this case, the **companies in the tourism sector** stand out on the one hand, and those **in the water sector**, **providers of services and solutions**, **operators in the integrated water cycle** and **business associations**, such as the CWP itself, CLIQiB, or Aqua Valley on the other.

EDUCATION AND TRAINING CENTERS, UNIVERSITIES AND RESEARCH

The field of education and training plays an important role in raising awareness. Moreover, the **research centers** and the **university community** are developing R+D+I projects which, once passed on, provide the business and tourism sector with new solutions for water saving and reuse.

COMMUNITY

Of particular note are **tourists** in terms of the sustainable use of water in the Mediterranean context. It is also necessary to focus on the level of awareness and empowerment of the general public.

SUCCESS STORIES

Below are a series of success stories of applying measures to save, reuse and use water in private tourist establishments. For more details on the technologies used in the various experiences, see the *Repository of water-saving, reuse, and sustainable use technologies for the tourism sector,* also developed as part of the LIFE WAT'SAVEREUSE project.

SUCCESS STORIES

WATER SAVING

WATER REUSE

INSTALLATION OF A WATER NETWORK CONTROL SYSTEM AT THE ROBINSON CLUB HOTEL CALA SERENA HOTEL (MALLORCA)

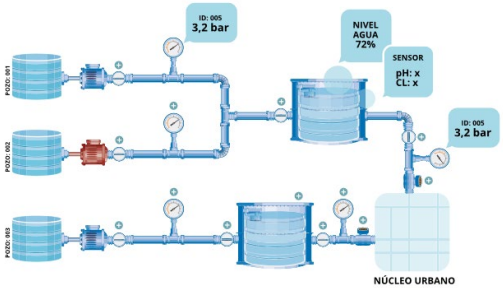
DESCRIPTION

In September 2020, a Bitaqua system for remote monitoring of water consumption was implemented at the Hotel Robinson Club Cala Serena in Mallorca, to meet the needs of the technical services department.

The hotel's technicians have a fully graphical control panel that allows them to interact directly with the distribution network.
In addition, they have remote meter readings to check the effectiveness of consumption reduction campaigns and, at the same time, control possible water leaks at any time.

THE SOLUTIONS IN DETAIL

- ✓ Bitaqua technology was applied, which uses the LoRa network for communication between IoT devices (counters, etc.).
- ✓ The system is centralized on the Bitaqua technology platform.



LOCATION

Hotel Robinson Club Cala Serena, Cala d'Or, Balearic Islands

PARTICIPATING ORGANIZATIONS

bitaqua WDNA

ROBINSON

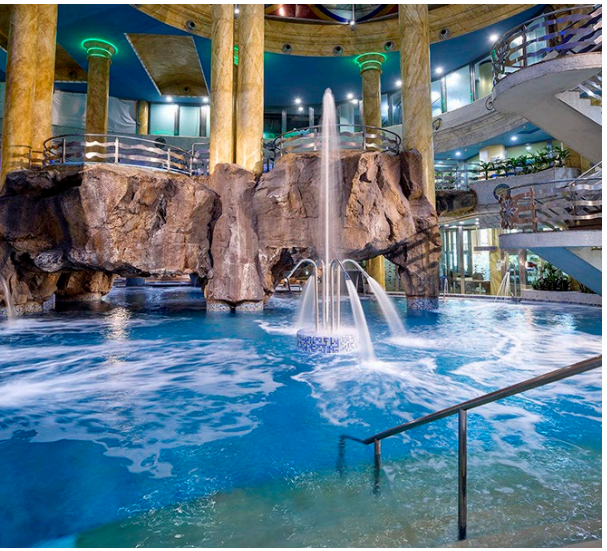
TOOLS AND RESOURCES

This action is related to page
WATER NETWORK CONTROL SYSTEMS
from the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER SAVING

RECREATIONAL WATER TREATMENT AT THE MARINA D'OR TOURIST COMPLEX,



DESCRIPTION

A recreational water disinfection treatment with radiation has been in operation since 2001 at this resort on the Mediterranean coast.

The adoption of this solution achieves greater safety and comfort for bathers, minimizing the addition of chlorine needed for water disinfection. In addition, it also allows you to have:

- Energy savings, due to the increase in cycles using conditioned water.
- Water saving, thanks to the reduced volume to refill.

THE SOLUTIONS IN DETAIL

- ✓ Application of the Trojan™ multi-barrier disinfection technology to captured seawater for supplying swimming pool and recreational waters in the complex.
- ✓ Flows of 160 and 400 m^3/h are treated respectively

LOCATION

Oropesa and Torre de la Sal (Castellón de la Plana, VALENCIAN COMMUNITY)

PARTICIPATING ORGANIZATIONS

TOOLS AND RESOURCES

This action is related to the file SWIMMING POOL TREATMENT (UV) of the *Repository of technologies for saving, reuse and sustainable use of water for the tourism sector of the WAT'SAVEREUSE project*

SUCCESS STORY

WATER SAVING

REUSE OF WATER FROM WWTP TO IRRIGATE A GOLF COURSE IN BONIFACIO

DESCRIPTION

The Sperone Golf Course has been reusing water from the Bonifacio Municipal WWTP for years to irrigate the greens, along a coastal area of Corsica where water has never been an abundant resource.

This solution avoids both the extraction of fresh water from the environment, and the energy and economic costs of the desalination of sea water.

THE SOLUTIONS IN DETAIL

- ✓ The Bonifacio WWTP has treatment systems based on membrane ultrafiltration.
- ✓ To transport the water from the WWTP to the golf course, a 6.5 km aqueduct was built and a UV treatment system was installed for the disinfection.

LOCATION

Bonifacio, Corsica (France)

PARTICIPATING ORGANIZATIONS

BIO UV Group

SPERONE GOLF CLUB

TOOLS AND RESOURCES

This action is related to pages ULTRAFILTRATION SYSTEMS and DOMESTIC WASTEWATER TREATMENT: UV from the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER SAVING

IRRIGATION OF AGDE GOLF COURSE WITH ULTRA-FILTERED WATER FROM WWTP

DESCRIPTION

As of 2020, Agde International Golf Course has begun using 75% ultra-filtered wastewater for irrigation.

This practice eases some of the pressure on the area's water resources during the summer. Since the waters from the WWTP are very high in nutrients, this also helps save fertilizer and at the same time, helps dispose of it in a totally sustainable way.

THE SOLUTIONS IN DETAIL

- ✓ The Agde WWTP has treatment systems based on ultrafiltration membranes.

LOCATION

Agde (France)

PARTICIPATING ORGANIZATIONS

suez

LE CAP D'AGDE GOLF INTERNATIONAL

TOOLS AND RESOURCES

This action is related to pages ULTRAFILTRATION SYSTEMS and DOMESTIC WASTEWATER TREATMENT: UV from the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER REUSE

PILOT STUDY ON THE USE OF REGENERATED WATER AT THE SAMBA HOTEL IN LLORET DE MAR

DESCRIPTION

In 2020, the Samba Hotel, which has ISO14001 and EMAS certifications, implemented an internal regeneration system for greywater (13,500 - 15,000 m^3/year) based on various technologies.

The hotel has participated in several initiatives in the area of European and national projects: **demEAUmed** (FP7, 2014-2017), **CLEaN-TOUR** (CHALLENGES, 2018-2021) + **ReUseMP3** (CHALLENGES, 2021-2024) and **Suggereix** (ACA).

THE SOLUTIONS IN DETAIL

- ✓ Test of 8 different technologies for wastewater regeneration and pool disinfection
- ✓ Greywater treatment and reuse *in situ* by means of an osmotic membrane bioreactor and a hydroponic system with tropical plants for the removal of emerging contaminants and pathogens
- ✓ Validation of the decision support system and practical reuse guide, developed within the framework of the **Suggereix** project, in the hotel's decentralized greywater treatment system and in its application for irrigation and water for toilets.

LOCATION

Hotel Samba
Lloret de Mar, Catalonia

PARTICIPATING ORGANIZATIONS

Hotel Samba, eurecat, CETAQUA, CWP, UPC, ICRA

TOOLS AND RESOURCES

This action is related to page wastewater treatment and regeneration and page VERTICAL GREEN WALLS of the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER REUSE

PILOT STUDY ON SMART AND SUSTAINABLE WATER CYCLE MANAGEMENT AT THE VILAR RURAL OF ST. HILARI SACALM (1)

DESCRIPTION

Since 2020, the Vilar Rural complex in St. Hilari Sacalm has been implementing a strategy to research and apply advanced innovative solutions in the area of wastewater treatment and recreational water management. The initiative is part of a pilot study within the WATERTUR project, by the Ris3Cat Aigua community.

The first solution adopted was the design and integration of an advanced treatment system of greywater that come from the hotel establishment itself and its reuse.

THE SOLUTIONS IN DETAIL

Used:

- ✓ a UASB (Upflow Anaerobic Sludge Bed) reactor for the removal of organic matter and biogas production
- ✓ an ultrafiltration membrane module for solids removal.

LOCATION

Rural village of St. Hilari Sacalm, Catalonia

PARTICIPATING ORGANIZATIONS

SERHS hotels, soriguē, aeris, lavola Anthesis, LEITAT Technological Center, CWP, FLUIDRA, WATERTUR

TOOLS AND RESOURCES

This action is related to pages wastewater treatment and regeneration from the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER REUSE

PILOT STUDY ON SMART AND SUSTAINABLE WATER CYCLE MANAGEMENT AT THE VILAR RURAL OF ST. HILARI SACALM (2)

DESCRIPTION

Since 2020, the Vilar Rural complex in St. Hilari Sacalm has been implementing a strategy to research and apply advanced innovative solutions in the area of wastewater treatment and recreational water management. The initiative is part of a pilot study within the WATERTUR project, by the Ris3Cat Aigua community.

The second solution adopted was the construction of a vertical wall to reduce the load of organic matter contained in wastewater, integrated with a bio-electrochemical system to generate a small amount of electrical energy to power environmental sensors or small LED lights.

THE SOLUTIONS IN DETAIL

- ✓ A Vertical Green Wall was designed for the treatment of hotel wastewater using natural purification systems. On the Wall, a bio-electrochemical system (based on Microbial Fuel Cells, MFC) was integrated to generate electricity from the degradation of organic matter.

LOCATION

Rural village of St. Hilari Sacalm, Catalonia

PARTICIPATING ORGANIZATIONS

SERHS hotels, soriguē, aeris, lavola Anthesis, LEITAT Technological Center, CWP, FLUIDRA, WATERTUR

TOOLS AND RESOURCES

This action is related to page
VERTICAL GREEN WALLS
from the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER REUSE

PILOT STUDY ON SMART AND SUSTAINABLE WATER CYCLE MANAGEMENT AT THE VILAR RURAL OF ST. HILARI SACALM (3)

DESCRIPTION

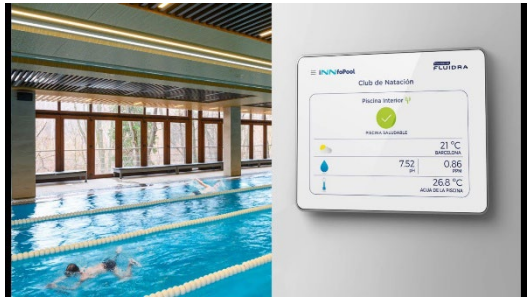
Since 2020, the Vilar Rural complex in St. Hilari Sacalm has been implementing a strategy to research and apply advanced innovative solutions in the area of wastewater treatment and recreational water management. The initiative is part of a pilot study within the WATERTUR project, by the Ris3Cat Aigua community.

Among other solutions, IoT and TiC systems were implemented to calculate the establishment's water footprint and to intelligently control the filtration and chemical treatment of the pool. These systems allow them to control various aspects of the water cycle remotely, optimize its management and control consumption, and finally, to improve the comfort for customers who can access real-time bathing water status.

THE SOLUTIONS IN DETAIL

They designed and integrated:

- ✓ a Smartization tool for the pool, based on the Fluidra iNNfoPool® system
- ✓ a water footprint calculation tool based on the FootprInn® system



LOCATION

Rural village of St. Hilari Sacalm, Catalonia

PARTICIPATING ORGANIZATIONS

SERHS hotels, soriguē, aeris, lavola Anthesis, LEITAT Technological Center, CWP, FLUIDRA, WATERTUR

TOOLS AND RESOURCES

This action is related to page IoT SWIMMING POOL MANAGEMENT SYSTEMS from the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

SUCCESS STORY

WATER REUSE

DISINFECTION TREATMENT OF WATER FROM THE WWTP AT THE MALLORCA GOLF CLUB

DESCRIPTION

Since 2022, a system to disinfect and reuse wastewater from the WWTP of the neighboring municipality has been implemented in order to irrigate the courses at the Golf Club of Mallorca.

This solution makes it possible to stop using water from the natural environment or drinking water to irrigate the golf course on a Mediterranean island susceptible to the water scarcity, while maintaining a healthy environment without the use of chemicals.

THE SOLUTIONS IN DETAIL

- ✓ Application of Trojan™ technology for UV disinfection of wastewater for reuse in irrigation
- ✓ Flows of 90 m^3/h are treated

TROJAN technologies™

LOCATION

Club de golf, Mallorca, Balearic Islands

PARTICIPATING ORGANIZATIONS

AQUABONA

TOOLS AND RESOURCES

This action is related to page DOMESTIC WASTEWATER TREATMENT: UV of the *Repository of water-saving, reuse, and sustainable-use technologies for the tourism sector, from the WAT'SAVEREUSE project*

INSTALLATION OF WATERPROOF LINING IN SWIMMING POOLS AND ORNAMENTAL LAKES

DESCRIPTION

- Installation of **geomembranes for waterproofing** the ornamental lake at **La Manga golf course (Murcia)**. These solutions prevent water loss due to infiltration, thus saving water and making more sustainable use of the resource:
  - Applicable to golf courses, garden ponds, etc.
  - Flexible and chemical-resistant
  - Suitable for any type of substrate
  - Waterproof lining and protection against substructure contamination

- Renovation of the **Axarquia-Costa del Sol Water Park** with **reinforced membranes for swimming pools.** In public swimming pools (hotels, campgrounds, wellness centers, etc.), unlike private ones, greater reliability is required in their construction elements due to their intensive use.

THE SOLUTIONS IN DETAIL

- ✓ Temporary closures due to unexpected maintenance are minimized
- ✓ They prevent water loss despite their intensive use
- ✓ Systems suitable for new works or renovations
- ✓ Products used: RENOLIT ALKORPLAN in different finishes

LOCATION

Golf course
La Manga (Murcia)
-
Aquavelis
Torre del Mar (Málaga)

PARTICIPATING ORGANIZATIONS

RENOLIT
Rely on it.

SUCCESS STORY

WATER REUSE

PILOT STUDY ON THE USE OF RECLAIMED WATER AT THE SAMBA HOTEL IN LLORET DE MAR

DESCRIPTION

The Samba Hotel, which is ISO 14001 and EMAS certified, implements an internal greywater reuse system (13,500-15,000 m^3/year) and has participated in several innovation initiatives in the area of European and national research projects:

- **demEAUmed** (FP7, 2014-2017): Pilot program using 8 different technologies for the regeneration of wastewater and greywater from the hotel and the disinfection of pool water
- **CLEaN-TOUR** (RETOS, 2018-2021) + **ReUseMP3** (RETOS, 2021-2024): Greywater treatment and reuse *in situ* by means of an osmotic membrane bioreactor and a hydroponic system with tropical plants for the removal of emerging contaminants and pathogens
- **Suggereix** (ACA): Validation of the DSS and application of the practical reuse guide, developed within the framework of the project on the decentralized treatment system for the hotel's greywater and its application for irrigation and water for toilets.

LOCATION

Hotel Samba
Lloret de Mar, Catalonia

SUCCESS STORY

WATER DESALINATION

INSTALLATION OF A DESALINATION SYSTEM AT CALVIÀ MARINA (MALLORCA)

DESCRIPTION

Port Adriano, the marina of Calvià, has a high consumption of internal water as it provides a water supply to boaters.

In 2018, a pre-assembled desalination system with energy recovery was installed, capable of providing a major part of the daily drinking water supply.

- 80% reduction of energy consumption
- Reduction of water cost
- Capacity for regenerating 2,000 l/h of fresh water
- Automated plant with remote control (intranet and Wi-Fi)

THE SOLUTIONS IN DETAIL

- ✓ Application of the Efficient T2000 desalination system with energy recovery
- ✓ Possibility of extension with connectable compact modules

LOCATION

Calvià
(Mallorca, BALEARIC ISLANDS)

PARTICIPATING ORGANIZATIONS

EcoSistems energy recovery watermakers

PORT ADRIANO

TOOLS AND RESOURCES

This action is related to the file POTABILIZATION OF SEA WATER of the *Repository of water-saving, reuse, and sustainable use technologies for the tourism sector* from the WAT'SAVEREUSE project

SUCCESS STORY

WATER DESALINATION

INSTALLATION OF A DESALINATOR IN A 4* HOTEL ON THE COSTA DEL SOL

DESCRIPTION

In 2019, a water desalinator was installed in a 4-star hotel with a thalassotherapy center, located between Puerto Banús and Estepona. The hotel has 93 rooms and more than 2,000 m^2 of spa and outdoor pool, with a significant consumption of drinking water.

Thanks to the thalassotherapy center, the infrastructure already had the seawater intake and return, which facilitated the installation of the desalination system.

- 80% reduction of energy consumption
- Reduction of water cost
- Guaranteed water supply during periods of drought or restrictions
- Capacity for generating 1,000 l/h of fresh water
- Automated plant with remote control (intranet and Wi-Fi)

THE SOLUTIONS IN DETAIL

- ✓ Application of the Efficient T1000 desalination system with patented energy recovery system
- ✓ Possibility of extension (modular system)

LOCATION

Estepona
(Málaga, SPAIN)

PARTICIPATING ORGANIZATIONS

EcoSistems energy recovery watermakers

exe HOTELS

TOOLS AND RESOURCES

This action is related to the file POTABILIZATION OF SEA WATER of the *Repository of water-saving, reuse, and sustainable use technologies for the tourism sector* from the WAT'SAVEREUSE project

7. TOOLS AND RESOURCES

GLOSSARY

Biological oxidation. A set of chemical reactions used in various types of microorganisms to carry out the degradation of organic matter in the presence of oxygen. This process is used during the secondary treatment of wastewater, using activated sludge (which contains these microorganisms) or bacterial beds.

BOD (Biological Oxygen Demand). An index that quantifies the amount of biodegradable organic pollutants in water. It corresponds to the amount of oxygen that microorganisms in the environment would need to decompose the biodegradable organic matter present in the water.

COD (Chemical Oxygen Demand). A quantification of the total amount of organic pollutants present in water (both biodegradable and non-biodegradable). It is a measure that includes BOD and corresponds to the amount of total oxygen needed to degrade all the organic matter present in the water.

Desalination. Process of obtaining fresh water from seawater, for example using distillation or reverse osmosis techniques. It is an expensive solution, both from an economic and energy perspective, but it can be an option that provides access to water.

Filtration membranes. These are selective porous barriers used in water filtration and purification systems. By applying hydrostatic pressure, water crosses the membrane, thereby trapping inside the suspended particles and/or dissolved substances, which vary in size depending on the type of membrane (microfiltration, ultrafiltration, nanofiltration, reverse osmosis, etc.). In this way, two streams are generated: the permeate, i.e. the purified water, and the concentrate, i.e. the fluid that collects the particles that have not crossed the membrane

Greywater. Household wastewater from washing utensils, clothes, and personal hygiene use. It has lower levels of impurities than sewage, since the latter comes from flushing the toilet and therefore, has fecal contamination.

Interest groups (Stakeholders). These are the actors or parties who have an interest in a given sector. They include companies, public administrations, local communities, third-sector associations, research centers, and potentially any type of entity that should be considered in decision-making.

GLOSSARY

IoT (Internet of Things). A concept that represents an evolution in the use of the Internet applied to objects or things, such as appliances, clocks, water meters, etc. These objects can play an active role and provide information about themselves via connection to the internet, and can even learn from experience through artificial intelligence.

Nutrients. Chemicals substances used by living things for organic metabolism, present in both water, air, and soil. These are mineral salts, especially nitrogen and phosphorus, necessary for the life and growth of plants and algae, which can be of synthetic or natural origin (e.g. manure from animals and people). They are used in agriculture and gardening as fertilizers. Their excessive presence in drinking water can be toxic, while in the aquatic environment they can cause problems with eutrophication (massive growth of algae that leads to a decrease in oxygen concentration).

Recreational water. Water used for recreational purposes such as swimming pools, spas, theme parks, and water parks, etc.

Resilience. It is the ability of a system (whether a person, company, ecosystem, etc.) to respond to an unfavorable situation successfully, and to recover, be able to adapt positively.

Reverse osmosis. Water purification system that uses semi-permeable membranes, in order to remove dissolved and suspended substances. It is used, among other things, for the desalination of seawater.

SDI. Stands for “Silt Density Index”. It is used to quantify the abundance of clay material and other substances that could soil the filter membranes. It is calculated before subjecting the water to a nanofiltration or reverse osmosis treatment.

Smart irrigation. These are sensor-based irrigation systems, IoT systems and artificial intelligence that allow the water and fertilizer use to be optimized according to specific needs, saving resources and increasing production.

TDS (Total Dissolved Solids). Indicates the amount of salts or ions dissolved in the water. It is a measure that is strictly correlated with the conductivity. In the area of reverse osmosis treatments, the higher the TSD value, the more pressure will be required to purify the water through the membranes.

Ultrafiltration. System to separate the solids suspended in the water. It is a membrane-based pre-treatment system, which is used before subjecting water to demineralization processes such as nanofiltration and reverse osmosis.

GLOSSARY

UV Radiation. A form of electromagnetic radiation with a wavelength shorter than that of visible light. Short-wavelength UV-C radiation is ionizing radiation that can cause chemical reactions with photolytic action and can alter the DNA and RNA of organisms. For these reasons, UV radiation is used as a germicide and for the removal of certain pollutants in various water treatment techniques.

Wastewater. Water polluted by anthropogenic activities such as domestic, urban, and industrial uses. It needs adequate treatment before being reused or returned to the natural environment.

Water deficit. A condition of water scarcity that occurs when water demand exceeds the effective availability of water resources.

Water demand. The volume of water that citizens and users are willing to purchase or wish to receive from a supplying entity to meet a production or consumption objective. The quantification of this volume is based on factors such as the price of services, the level of income, the type of activity, etc.

Water footprint. An indicator of fresh water used, defined as the volume consumed by a person, a company, a population, etc. after a year. It includes both direct uses (domestic uses, irrigation, etc.) and indirect ones (water spent on the production of goods and services used).

Water regeneration. Set of methods of water treatment from a secondary treatment, which through filtration and disinfection mechanisms, provides “pre-potable” water, i.e. non-potable, but can be reused for a variety of applications in agriculture, industry, urban cleaning, and for domestic purposes (toilet water). Current Community regulations do not allow regenerated water to be sent directly to drinking water treatment plants, so if it cannot be reused for its intended use, it must be reintroduced into the natural environment (river, sea, aquifers).

Water treatment. Set of processes for purifying water that has been contaminated by the presence of various substances harmful to human health or the environment. Various treatment techniques are applied to recreational waters to ensure their safety for users. In contrast, domestic wastewater needs to be treated before it can be reused or added back to the natural environment: there is a primary treatment phase, which serves to remove suspended solids; a secondary treatment to remove or reduce the organic matter content, and finally a tertiary treatment (regeneration), to sterilize the water and reduce the amount of nutrients and other dissolved substances.

WWTP. The acronym for Wastewater Treatment Plant.

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WATSAVEREUSE

EUROREGIO Pirineus Mediterrània Pyrénées Méditerranée Pirineos Mediterráneo

Generalitat de Catalunya · GOVERN ILLES BALEARS · La région Occitanie

AD'OCC Région Occitanie – Agence de Développement Économique

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