



AQUAMAN PROJECT

Smart Water Solutions for Sustainable Tourism in Mediterranean Islands and Coasts

October, 2025

BLUE HORIZONS: INNOVATIVE WATER SOLUTIONS FOR TOURISM AND CLIMATE-RESILIENT REGIONS

Summarized Version for the Transfer of Best Practices in Support of the Sustainable Development Goals

AQUAMAN PROJECT - Ready-to-use strategies for sustainable water management in coastal areas & islands and policy recommendations

PROJECT PARTNERS



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Abbreviations

ADENE: Agência para a Energia (Portugal)
AQUAMAN: AQUAtic system's evaluation of the Mitigation of wATER scarcity in Mediterranean and coastal tourist destinations under severe pressure.
CAPEX: Capital Expenditure
CARDIMED: Climate Adaptation and Resilience Demonstrated In the MEDiterranean region
CF: Cohesion Funds
CLD: Causal Loop Diagram
DEMOS: Demonstration Sites
DMO: Destination Management Organization
DSS: Decision Support System
EAFRD: European Agricultural Funds for Rural Development
EDAR: Wastewater Treatment Plant (WWTP)
EMFAF: European Maritime, Fisheries and Aquaculture Fund
ERDF: European Regional Development Fund
GDPR: General Data Protection Regulation
GIS: Geographic Information System
HSSF: Horizontal Subsurface Flow
HYDROUSA: Demonstration of water loops with innovative regenerative business models for the Mediterranean Region
ISOS: Interreg Project for Sustainable Islands
ISTAC: Canary Islands Statistics Institute
LIFE IP: LIFE Integrated Projects
MED-GIAHS: Globally Important Agricultural Heritage Systems
NAWAMED: Nature Based Solutions for Domestic Water Reuse in Mediterranean Countries
NBS: Nature-Based Solutions
NCWR: Non-Conventional Water Resources
NGEU: Next Generation European Union
NNS: Nexus-Ness Service
OPEX: Operational Expenditure
PREH: Regional Water Efficiency Plans
PRIMA: Partnership for Research and Innovation in the Mediterranean Area
RBMP: River Basin Management Plan
RO: Reverse Osmosis
SDG: Sustainable Development Goal
SSF CW: Subsurface Flow Constructed Wetlands
TRL: Technology Readiness Level
TWWR: Treated Wastewater Reuse
UASB: Upflow Anaerobic Sludge Blanket
ULPGC: University of Las Palmas de Gran Canaria
UNIBO: Università di Bologna
UNICT: Università di Catania
UV: Ultraviolet
VSSF: Vertical Subsurface Flow
WEFE: Water, Energy, Food and Ecosystems
WRRMP: Water Reuse Risk Management plan

Sustainable Development Goals



The purpose of the UN Sustainable Development Goals is to end poverty and hunger, improve health and education, make cities more sustainable, combat climate change, protect the world and oceans from environmental degradation and foster prosperous, peaceful, just and inclusive societies.

Tourism, specifically mentioned in three SDGs ([#8](#), [#12](#), [#14](#)), actually has the potential to contribute, directly or indirectly, to all of the goals, in more ways than most industries. It's one of the top GDP earners for countries, especially the Least Developed Countries of the world, it can reach into all corners of a country (not just in focused areas like extractive industries) and can offer great benefits to a country's people at many levels.

Protection of environments, species and cultural heritage, appreciation and understanding of the inherent values of different cultures and societies are just some of the positive impacts tourism can actually create when managed in the right way. As described by the UN World Tourism Organisation UNWTO

Introduction

“Blue Horizons: Innovative water solutions for tourism and climate-resilient regions”, a document produced by the Interreg Euro-MED AQUAMAN Project (AQUAtic systems’ evaluation for the Mitigation of wAtEr scarcity in mediterranean islaNdS and coastal tourist destinations under severe pressure) serves as a comprehensive and strategic repository designed to advance sustainable water management in Mediterranean regions, particularly in tourism-driven and climate-vulnerable territories. **It consolidates a portfolio of “ready-to-use” and adaptable solutions comprising technical interventions, holistic resource management plans, and, with a strong focus on policy recommendations aimed at overcoming institutional, regulatory, and societal barriers.**

Its primary purpose is to enable the valorization of non-conventional water sources, the reduction of water consumption, and the minimization of distribution losses through integrated, site-specific strategies. By aligning innovative technologies with supportive governance frameworks, the catalogue facilitates both immediate implementation and long-term policy transformation. This document has been coordinated by the partner National Technical University of Athens supported by the El legado andalusí Andalusian Public Foundation (Regional Ministry of Culture and Sport of Spain, LP) with the solutions provided by all partners and Associated Partners of Interreg Euro-MED AQUAMAN Project: European Law Organisation (EPLO, Greece), Small Islands Organisation (France), University of La Laguna - Department of Applied Economics and Quantitative Methods (Spain), University of Rome Tor Vergata - Department of Civil Engineering and Computer Science (Italy), Energy and Water Agency (Malta), Tourism of Portugal and Ponza Municipality (Italy). Last, with the involvement of the Regional Ministry of Tourism and Andalucía Exterior (Andalusia, Spain), Associated Partner.

A key feature is its extensive section on **nature-based and hybrid interventions**, including constructed wetlands for wastewater treatment and reuse (from the projects HYDROUSA and CARDIMED, Horizon Programme), rainwater harvesting systems for agriculture and residential use (HYDROUSA and CARDIMED, Horizon Programme), and green roofs for stormwater management and urban cooling (Interreg Italia-Malta). These solutions deliver technical efficiency and environmental co-benefits, such as biodiversity enhancement, carbon sequestration, and improved climate resilience.

The document contains another section devoted to the **Holistic Resource Management Plans**, which provide structured approaches to water scarcity mitigation and cross-sectoral resource governance based on the WEF E Nexus principles. These plans create a framework for local authorities and stakeholders to manage water resources in a balanced and sustainable manner.

However, what sets this catalogue apart is its strong policy dimension. It includes carefully **crafted policy recommendations** derived from tools such as the White Paper on Governance and Climate Adaptation by Dialogue4Tourism Project (Interreg Euro-MED Program) or towards a zero-impact island. The ISOS project (Interreg Italy-France Maritime Program) provides a strategic framework for improving water management on small islands through policy recommendations and technical guidelines including an analysis of water challenges (quality, availability, wastewater), case studies, examples and exchanges among island territories and practical guidance for rainwater collection, wastewater reuse and decentralized water treatment systems. All these documents act as enablers for systemic change by proposing regulatory reforms, economic incentives, and institutional

collaborations that facilitate the transition from conventional, centralized water management models to decentralized, circular approaches.

To finish, includes a section on **Training & engagement programme** highlighting here the NEXUSSHARE Platform, a digital and methodological platform designed to foster collaborative learning, knowledge sharing, and co-production among diverse stakeholders involved in water, energy, food, and ecosystem (WEFE) resource management. Includes to the water scarcity mitigation plan collected in Water Rethink project (Green Fund, Hellenic Ministry of Environment and Energy, Natural Environment Programme). Another key tool for the engagement of stakeholders is Interreg Euro-MED Academy.

This catalogue will be followed by a transfer feasibility study that further will support this process by mapping adoption pathways, identifying responsible authorities, and proposing policy-driven mechanisms to ensure effective knowledge transfer and practical implementation across diverse Mediterranean contexts.

This document brings together, therefore, a wide range of strategies, projects, and initiatives that collectively aim to foster sustainable water management across the Mediterranean region. It compiles actions funded under major European frameworks, such as **Interreg Euro-MED Program, Interreg Italia-Malta Program, Interreg Italy-France Maritime Program, Horizon 2020, Horizon Europe, PRIMA Programme, LIFE integrated Projects**, together with other national initiatives and locally driven measures.

Each of these projects contributes unique expertise, tools, and financial mechanisms that complement one another. For instance, innovative research projects like **FIT4REUSE** and **NEXUS-NESS** provide technical knowledge, while operational projects such as Remedies (**Horizon 2020 Program**) enable large-scale implementation of water efficiency and circular management strategies.

The document put a particular emphasis on the **Interreg Euro-MED Programme (2021–2027)**, which plays a pivotal role in promoting transnational cooperation across Mediterranean countries. Through this programme, diverse regions are supported in adopting innovative, nature-based, and resource-efficient solutions that address water

scarcity, enhance resilience, and reduce environmental pressures in tourism-driven and climate-sensitive areas.

Its alignment with the **Sustainable Development Goals (SDGs)** – including Clean Water and Sanitation, Climate Action, Sustainable Cities and Communities, and Responsible Consumption and Production – underscores its role as both a technical and a governance-oriented instrument.

Last, this Catalogue is not merely a technical compendium but wants to be a policy-influencing framework, designed to shape the conditions under which nature-based and hybrid water solutions can thrive. By bridging science, technology, and policy, it provides a pathway towards circular, climate-resilient, and equitable water management systems across the Mediterranean.

Thematic cluster:

Nature-based and hybrid interventions

Constructed wetlands for wastewater treatment (subsurface flow). HYDROUSA / CARDIMED Projects. Horizon 2020 Programme.

Subsurface Flow Constructed Wetlands (SSF CWs) are engineered systems that replicate the natural purification functions of wetlands to provide efficient, low-cost and sustainable wastewater treatment. Wastewater passes through a porous medium (sand or gravel) beneath the surface, where it is treated through physical filtration, microbial processes and plant-root interactions. This subsurface configuration prevents odours, avoids mosquito breeding and improves treatment performance.

There are two main designs: **Horizontal Subsurface Flow (HSSF)** systems, where water moves laterally through a permanently saturated bed under mainly anoxic or anaerobic conditions and **Vertical Subsurface Flow (VSSF)** systems, which are intermittently loaded from above, allowing aeration and promoting aerobic biodegradation and nitrification. Key processes include organic matter oxidation, nutrient removal via nitrification-denitrification and plant uptake and filtration of solids and emerging pollutants.

SSF CWs require proper design, pretreatment and trained personnel for operation, with moderate land use and costs (CAPEX: 80–200 €/m²; OPEX: 2–5 €/m²·year). They treat municipal, industrial and stormwater while enhancing water quality for reuse, supporting biodiversity, mitigating floods and providing decentralized solutions for rural, island or tourism-intensive areas.

Developed in projects like **HYDROUSA** (Lesvos Island, Greece), SSF CWs demonstrate key advantages: reduced water stress through reuse, circularity via nutrient recovery and biomass reuse and increased climate resilience through low-energy operation. They support several **UN Sustainable Development Goals (SDGs)**—notably SDG 6, 11, 12, 13 and 15—while creating multifunctional, aesthetically pleasing landscapes that enhance eco-tourism. Main challenges include initial investment, land demand, limited awareness of nature-based solutions and the need for proper maintenance to prevent clogging.

Saturated	Unsaturated
Construction	Operational

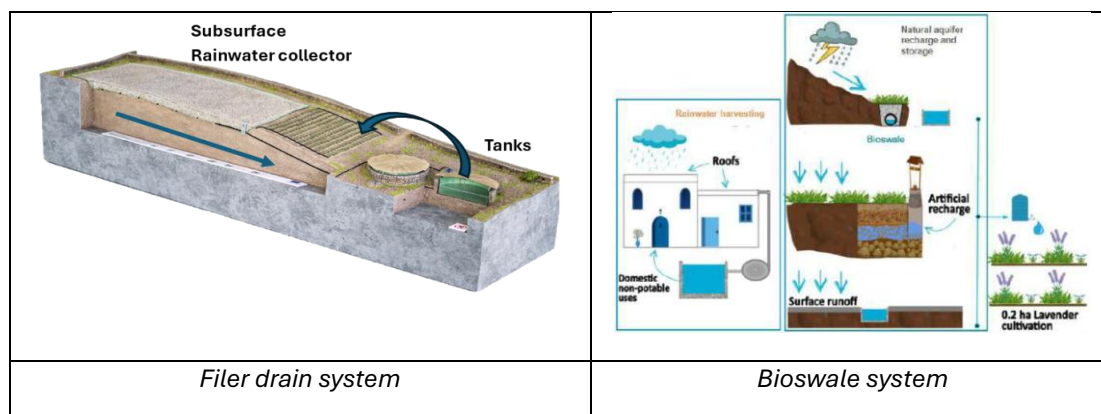
Rainwater collection systems for agricultural and residential use.

HYDROUSA Project (Demonstration of Water Loops with innovative regenerative business models for the Mediterranean Région) / CARDIMED Project. Horizon 2020 Research and Innovation Program.

This rainwater harvesting solution combines two **nature-based systems**—a **Filter Drain System** and a **Bioswale System**—to promote decentralised and sustainable water management in arid and rural areas. The **Filter Drain System** consists of a shallow sub-surface drain that captures and channels rainwater into underground storage tanks without energy input, enabling reuse for irrigation and enhancing groundwater recharge. The **Bioswale System** collects stormwater from rooftops and yards, directing it to buffer tanks for intermediate storage and reuse in non-potable domestic applications such as toilet flushing or small-scale irrigation. During rainy periods, excess water also supports aquifer replenishment and landscape resilience.

Both systems feature **low-impact, modular designs** built with local materials and ecological engineering principles, ensuring adaptability, scalability and community involvement. With moderate investment needs (CAPEX: 100–600 €/m²; OPEX: 15–90 €/m²·year), they provide practical, low-energy alternatives for regions facing seasonal water scarcity and lacking centralised infrastructure.

These solutions aim to **reduce water stress, increase climate and community resilience and enhance circularity** through local water reuse and nutrient return. Additional benefits include aquifer recharge, flood mitigation, reduced runoff and improved microclimate regulation, while also contributing to education and public awareness. They support multiple **UN Sustainable Development Goals (SDGs)**—notably SDG 6, 11, 12, 13 and 15—by improving water security, promoting responsible resource use and enhancing ecosystem services. Implementation challenges include upfront costs, maintenance needs, limited awareness and administrative barriers, but their ecological, economic and cultural value make them ideal for **Mediterranean islands, rural communities and tourism-intensive regions**.



Green roofs for stormwater management and urban cooling.

GiFLUID Project. Interreg Italia-Malta Programme.

Green roofs are **vegetated roofing systems** that integrate layers of waterproofing, drainage, substrate and plant cover to manage rainwater and enhance urban environments. By retaining and delaying runoff, they reduce flooding risks while promoting evapotranspiration, improving thermal insulation, air quality and urban biodiversity. Two main types exist: **extensive green roofs**, which are lightweight, low-maintenance and ideal for large surfaces and **intensive green roofs**, which have deeper substrates and diverse vegetation, often forming accessible green spaces. Their performance depends on substrate depth, vegetation, climate and rainfall intensity and they can be adapted for flat or slightly sloped roofs using modular technologies.

Green roofs require sufficient **roof load capacity**, effective **waterproofing**, **drainage** and **growing substrates**, along with suitable plant selection and periodic maintenance. Typical costs range from **25–130 €/m²** for extensive and **130–300 €/m²** for intensive systems, with maintenance around **55 €/m² per intervention**.

These systems aim to **reduce stormwater runoff**, **mitigate flood risks**, **improve energy efficiency**, **combat the urban heat island effect** and **enhance biodiversity** and livability. They also filter pollutants, reduce noise and provide aesthetic and recreational value, supporting **climate adaptation** and **urban resilience**. Green roofs contribute to multiple **Sustainable Development Goals (SDGs)**, including SDG 3, 6, 11, 12, 13 and 15.

In **Mediterranean contexts**, they are well-suited for dense urban areas, tourism-intensive coastal zones and public or residential buildings, helping regulate runoff and temperature during long dry summers and intense rain events. Main challenges include high installation costs, structural limitations of existing buildings, irrigation needs and limited public awareness, but their environmental and social benefits make them key tools for **sustainable urban transformation**.



Dehumidifier drinking water solution (H2Oasis).

Remedies Project: Horizon Europe Programme (2021 - 2027)

This **atmospheric water generation system**—commonly known as a **dehumidifier**—captures humidity from the air and transforms it into clean, drinkable water. By drawing in moist air and cooling it below the dew point, it condenses water vapour, which is then purified through multi-stage filtration and UV disinfection before being stored for use. The device provides both cold and hot water on demand via a simple control panel that monitors performance and water availability. Compact, modular and easy to install, it operates without external piping, making it suitable for **remote, urban, or off-grid areas** with limited or unreliable water supply.

The system requires a **stable power source**, moderate humidity (over 30%) and regular maintenance (filter and UV checks). It can also integrate **renewable energy** for off-grid applications. The water produced meets **EU drinking water standards**, offering a high-quality, sustainable alternative to bottled or transported water which often relies on fossil fuels and generates plastic waste.

This technology directly addresses **water scarcity** and supports **decentralized, low-impact water production** in arid, drought-prone, or isolated regions. It reduces environmental impact, enhances resilience and lowers costs compared to conventional water delivery systems. Applications range from **households and public spaces** to **emergency relief** and **tourism-intensive zones**.



By producing water independently from ambient air, the system supports **UN Sustainable Development Goals (SDGs)**—particularly **SDG 6 (Clean Water)**, **SDG 11 (Sustainable Cities)**, **SDG 12 (Responsible Consumption)** and **SDG 13 (Climate Action)**. Main challenges include upfront costs, energy requirements and dependency on ambient humidity, yet its efficiency, portability and sustainability make it a promising solution for **Mediterranean and water-stressed environments**.

Reverse osmosis drinking water stations - from schools to sustainable tourism - No more plastic in Kerkennah (Tunisia)

Remedies Project (Horizon Europe Programme (2021 - 2027) – Subproject “No More Plastic in Kerkennah”



This solution, piloted on Tunisia’s **Kerkennah Islands** through the *No More Plastic in Kerkennah* project (2024–2025), addresses the heavy reliance on single-use bottled water in island communities disconnected from mainland water networks. Despite existing artesian wells and a desalination plant, most residents and institutions depend on transported bottled water, generating environmental, logistical and economic challenges. The initiative introduces a **plastic-free, decentralized water system** that combines traditional rainwater harvesting with **HydroPro reverse osmosis (RO) technology**. Rainwater collected in existing cisterns is purified to potable standards, eliminating salts, pathogens and contaminants. Initially

implemented in schools, the system serves over 2,600 pupils and staff across primary and secondary schools and has distributed 1,000 stainless steel reusable bottles to promote sustainable habits. Its modular, decentralized design makes it scalable for other high-consumption contexts such as hotels, guesthouses and eco-lodges in water-scarce and tourist-intensive areas.

The project tackles environmental, infrastructural and behavioral challenges, reducing plastic waste and marine pollution while supporting climate adaptation and sustainable consumption. Key benefits include safe drinking water provision, restoration of traditional rainwater infrastructure, awareness-raising of circular water and waste practices and strengthened local technical capacity. The solution aligns with multiple **Sustainable Development Goals** (SDGs 4, 6, 11, 12, 13 and 14) and is transferable to Mediterranean islands and coastal areas. Challenges include initial investment, regular maintenance, rain dependency and the need for community engagement to ensure lasting plastic-free practices.

Rehabilitation of Chadwick lakes (Malta) – Nature-based restoration for water retention and ecosystem recover.

Rehabilitation of Chadwick Lakes. Operational Programme I - European structural and investment funds 2014-2020 “Fostering a competitive and sustainable economy to meet our challenges”.

The **Chadwick Lakes rehabilitation project** in Malta is a nature-based initiative aimed at restoring the valley watercourse system in the Fiddien and Chadwick Lakes area. It combines **ecological restoration, heritage conservation and improved water retention** to enhance local biodiversity, climate resilience and community engagement. Key interventions include the removal of invasive species, planting of native vegetation, desilting and reconstruction of historical dams and weirs, slope stabilization and upgrading of footpaths and public amenities. The restored system supports natural water infiltration, reduces surface runoff and promotes groundwater recharge, while also providing recreational and educational opportunities.



The project addresses environmental degradation, flood risks and biodiversity loss in **semi-arid Mediterranean landscapes**. It requires **engineering and ecological expertise**, skilled labor, specialized equipment and monitoring systems for water levels, biodiversity and public use. Core objectives include reversing siltation, rehabilitating degraded habitats, enhancing groundwater recharge, increasing public access to green spaces and preserving historic water-management heritage.

Key benefits include **reduced water stress, increased climate resilience, habitat restoration, heritage preservation, groundwater provisioning for agriculture and strengthened community engagement**. The initiative aligns with **SDGs 6, 11, 13 and 15** and is highly transferable to semi-arid valleys, small catchments, tourism-prone regions and other island or coastal areas requiring low-cost, ecosystem-based water management. Challenges include high initial costs, complex permitting, ongoing maintenance, invasive species management and the need to control foot traffic to prevent ecological disturbance.

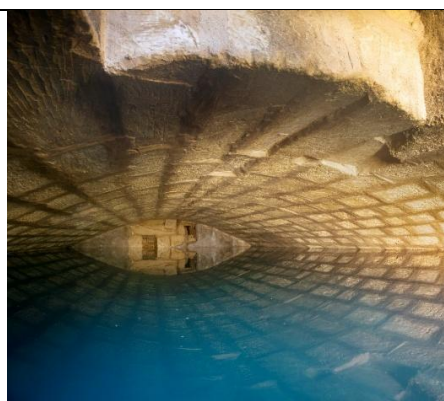
Reviving heritage cisterns for sustainable and climate-resilient water management.

ALTERAQUA Project implemented by a Global Water Partnership with the involvement of the Energy Water Agency of Malta and private companies.

This solution focuses on the **restoration and reuse of ancient rainwater harvesting cisterns** as a nature-based approach to sustainable water management in arid Mediterranean environments, such as the Kerkennah Islands (Tunisia). Traditionally constructed from local materials, these underground stone reservoirs were once vital for domestic and agricultural water supply but fell into disuse with the expansion of centralized systems.



The Victory Square Reservoir following restoration



The Victory Square Reservoir filled up with rainwater following the start of the wet season.

Rehabilitating these cisterns revives a low-cost, culturally significant and climate-adapted water practice, collecting rainwater from rooftops or courtyards for non-potable uses such as irrigation and household

cleaning. Restoration typically involves structural repairs, sediment filters, sealing for water quality and repair of catchment surfaces.

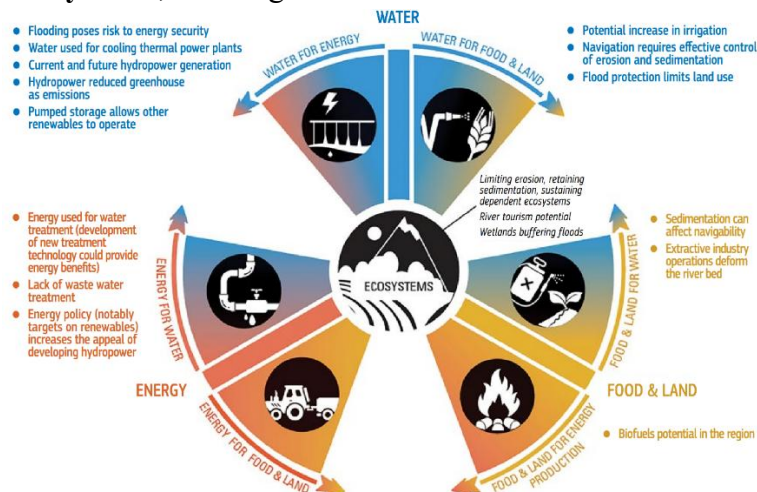
Key requirements include masonry and engineering expertise, excavation and waterproofing, installation of gutters or channels, water extraction mechanisms, community engagement and regulatory permits. Optional monitoring tools can track water levels and overflow. The solution addresses **freshwater scarcity, overexploitation of aquifers and decentralized water storage needs**, while enhancing climate resilience, promoting local water self-sufficiency and preserving cultural heritage.

Benefits include **reduced freshwater demand, circular water use, low operational costs, minimal environmental footprint, enhanced community awareness of traditional practices and strengthened local identity**. It supports several SDGs (6, 11, 12, 13, 15) and is suitable for **water-scarce islands, semi-arid rural areas, heritage sites and tourism-influenced regions**. Challenges include degraded cistern structures, limited restoration expertise, absence of supportive legal frameworks, low community awareness and the need for ongoing maintenance to ensure water quality and structural integrity.

2-Thematic Cluster: Holistic resource management plans

WEFE Nexus management plans NEXUS-NESS (PRIMA programme)

This solution, developed under the **CARDIMED project**, establishes a structured and adaptable **WEFE Nexus framework** to assess the impact of **Nature-based Solutions (NBS)** across diverse demonstration sites (urban, peri-urban, rural and wilderness). It combines **qualitative system mapping** and **data-driven, equation-free quantification** to understand interlinkages between **Water, Energy, Food/Farming and Ecosystems**, enabling the evaluation of NBS in relation to **climate resilience and resource efficiency**.



Through **participatory Causal Loop Diagrams (CLDs)**, local stakeholders co-develop system maps that reflect real-world complexities, local knowledge and socio-environmental dynamics. These qualitative insights are then translated into quantitative analyses measuring flows of water, energy, nutrients and ecosystem services. The results are integrated into a **Decision Support System (DSS)** that allows users to test different climate, policy or economic scenarios—helping optimize NBS design, improve circular resource use and support long-term planning.

The framework's main advantages include **flexibility, scalability and systemic integration** of environmental, social and economic data, allowing for cross-comparison between Mediterranean sites and the upscaling of sustainable practices. It promotes **circular economy principles**, enhances decision-making for local authorities and ensures that NBS contribute effectively to multiple **Sustainable Development Goals (SDGs 2, 6, 7, 8, 15)**.

While offering a powerful tool for evidence-based planning, challenges include **data heterogeneity, differing temporal records and the need for user-friendly interfaces** for non-technical stakeholders. Nonetheless,

the approach is highly relevant for **Mediterranean regions**—particularly small islands, water-scarce areas, and urban or peri-urban zones facing climate-related pressures.

Circular tourism-water-agriculture pilot plans.

SureNexus Project (Ensure Fair Nexus Transition for Climate Change, Adaptation and Sustainable Development - Horizon 2020 (PRIMA Partnership for Research & Innovation in the Mediterranean Area))

This solution showcases a **circular, nature-based model** that integrates water, energy, food and ecosystem management to promote sustainability and resilience in **semi-arid rural areas**. Designed in harmony with the local landscape and architecture, it combines **rainwater harvesting, renewable energy use, wastewater treatment and regenerative agriculture** to support both ecological balance and human well-being.

Water from rainfall is collected for **toilet flushing and irrigation**, while **wastewater is treated through constructed wetlands** for reuse, reducing freshwater demand. **Solar and biomass energy** power and heat the facilities, ensuring energy self-sufficiency. **Food is produced locally** through organic, regenerative cultivation in greenhouses and open fields, with surpluses sold to local markets and restaurants. Around **30% of the land is dedicated to wildlife**, enhancing biodiversity and creating a sustainable coexistence between people and nature.



This integrated approach demonstrates how **circular resource use** and **permaculture principles** can foster sustainable tourism, local food production and environmental stewardship. It directly contributes to **climate adaptation** and **rural regeneration**, offering a replicable model for Mediterranean regions with **seasonal water scarcity** or **eco-tourism potential**.

Challenges include **high initial investment** for renewable and water systems, **drought-related limitations** to rainwater harvesting, **seasonal variability** in solar power and **maintenance demands** for natural wastewater systems such as constructed wetlands.

Guidelines for sustainable and risk-safe irrigation and agronomic practices

Fit4Reuse Project. PRIMA Programme

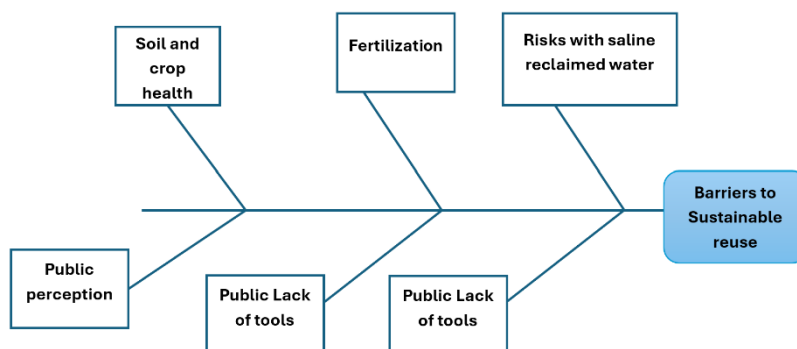
The solution provides comprehensive guidelines for sustainable irrigation and agronomic practices using reclaimed and saline water in the Mediterranean region. It tackles sanitary, environmental and agronomic risks through field trials and monitoring at three demonstration sites in France, Italy and Tunisia. A common irrigation protocol was developed to ensure consistency under diverse conditions, focusing on five key issues: dripper clogging, sanitary hazards (including pathogens and micropollutants), salinity and sodicity, fertilizer leaching and microbial regrowth in water storage systems.

These guidelines equip farmers with practical, risk-informed methods to safely and effectively use non-conventional water sources, promoting water reuse, climate-resilient agriculture and compliance with EU Water Reuse Regulation (2020/741). The solution offers clear benefits: it enhances sanitary safety, provides monitoring protocols for micropollutants, salinity and fertilizer value, and supports a circular economy by

reducing dependence on synthetic fertilizers. The results are transferable to other Mediterranean and European areas with similar environmental conditions, optimizing irrigation system performance.

The initiative supports multiple UN Sustainable Development Goals (SDGs), including Zero Hunger (SDG 2), Clean Water and Sanitation (SDG 6), Climate Action (SDG 13), Life on

Land (SDG 15) and Partnerships for the Goals (SDG 17). It targets farmers, water infrastructure managers and consumers, particularly in water-scarce Mediterranean contexts such as small islands, peri-urban areas and rural zones lacking centralized wastewater treatment. However, key challenges remain, including the effects of saline water on soil and crops, insufficient farmer maintenance and monitoring practices and negative public perceptions about food safety linked to wastewater irrigation.



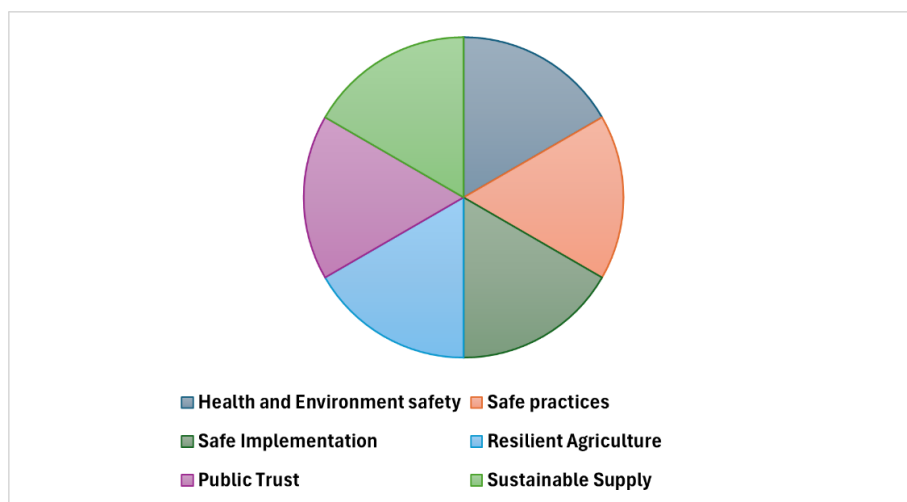
Guidelines to structure Water reuse safety (risk management) plans in Mediterranean countries and focus EU and Tunisia.

Fit4Reuse Project. PRIMA Programme

The solution provides a structured guide for developing Risk Management Plans (WRRMPs) for water reuse in Mediterranean countries, based on the Fit4Reuse project's best practices and technological results. It evaluates the efficiency of wastewater treatment and recovery systems, recommending optimal technology combinations to manage specific risks and ensure safe water reuse. The approach integrates international guidelines and the EU Water Reuse Regulation (2020/741), which establishes mandatory water quality standards and irrigation risk management plans. Additionally, national standards in Mediterranean countries have been mapped to support consistent implementation.

The WRRMP framework includes key components such as system description, identification of at-risk groups and exposure routes, hazard identification, health and

environmental risk assessment, preventive and corrective actions, quality control, environmental monitoring, emergency planning and coordination measures. These user-oriented guidelines include real case examples and provide both semi-quantitative and quantitative microbial risk assessment methods, focusing particularly on microbial health risks.



This solution strengthens the safety, sustainability and social acceptance of water reuse in agriculture, promoting resilient practices in water-scarce Mediterranean contexts such as small islands and peri-urban regions. It contributes to achieving several UN Sustainable Development Goals (SDGs), including Zero Hunger (SDG 2), Good Health and Well-being (SDG 3), Clean Water and Sanitation (SDG 6), Responsible Consumption and Production (SDG 12) and Climate Action (SDG 13). Key challenges include limited regulatory enforcement, lack of harmonized national frameworks, insufficient real-time monitoring and incomplete consideration of environmental risks such as micropollutant or heavy metal accumulation.

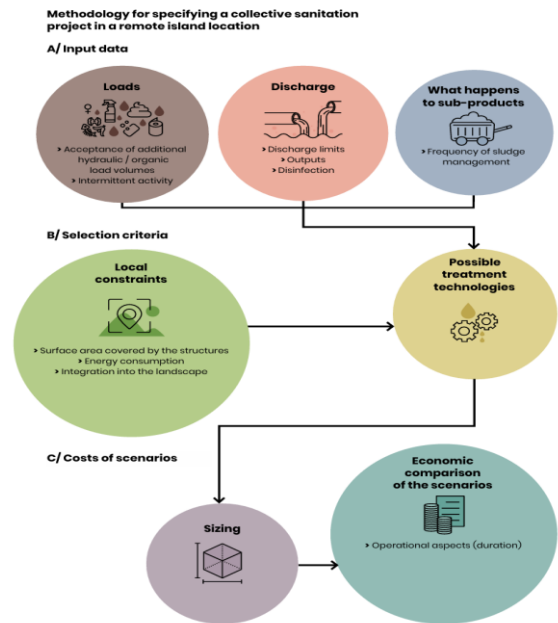
Wastewater treatment in island locations.

Lérins Islands Marine habitat improvement and sustainable island strategy development.

This guide targets small islands (under 150 km² and not connected to the mainland) that currently discharge untreated wastewater into the ocean, posing serious risks to human health and the environment. Aimed at island managers facing energy and water challenges, it provides practical recommendations for implementing or improving wastewater treatment systems under conditions of limited space, funding and technical capacity. The guide addresses both the creation of new treatment networks and the modernization of existing ones, emphasizing that proper wastewater management is essential for preserving fragile island ecosystems while supporting sustainable human activities.

It promotes wastewater reuse (TWWR) and sludge recycling as key strategies aligned with circular economy principles, helping islands recover valuable resources such as water and organic matter. By improving water quality, the guide also supports fishing, tourism and overall environmental health. It highlights the importance of renewable energy (solar, wind, marine) to reduce dependence on expensive, polluting oil-based energy systems and suggests energy-efficient technologies such as Upflow Anaerobic Sludge Reactors (UASBs), which can generate biogas. Additionally, it encourages the reuse of treated wastewater for irrigation, firefighting and green space maintenance, and the use of rainwater as a complementary resource.

The guide contributes to multiple UN Sustainable Development Goals (SDGs), including Good Health and Well-being (SDG 3), Clean Water and Sanitation (SDG 6), Affordable and Clean Energy (SDG 7), Sustainable Cities and Communities (SDG 11), Responsible Consumption and Production (SDG 12), Climate Action (SDG 13) and Life Below Water (SDG 14). Key challenges include gaining public acceptance, ensuring system maintenance, managing visual and noise impacts, high transport costs for materials and limited space for infrastructure—all of which must be carefully managed to ensure the feasibility and sustainability of wastewater systems in small island contexts.



AQUA+ Certification system for buildings: empowering building owners and designers with an agile water efficiency auditing and decision support tool.

Sustainable Tourism Plan 2020-2023 / National Energy and Climate Plan 2030 / Regional Water Efficiency Plans (PREH). Algarve and Alentejo Regions, Portugal.

AQUA+ is a voluntary water performance certification system that evaluates and improves water use efficiency in buildings—both indoors and outdoors—through an infrastructure-based assessment. It helps identify opportunities to save water and energy, reduce losses and promote reuse systems such as rainwater harvesting and greywater recycling. Buildings are rated from F (least efficient) to A+ (most efficient) and the certification can demonstrate alignment with the EU Taxonomy Regulation.



Certified AQUA+ Auditors provide tailored guidance on efficient equipment and quantify potential savings in water, energy and costs. Since its launch, three schemes have been developed—Residential (2020), Hotels (2022) and Office Buildings (2024)—supported by a growing network of trained professionals: 321 AQUA+ Managers and 1,045 Auditors.

Water plays a vital role in tourism and is increasingly threatened by climate change impacts such as droughts and floods,

especially in Portugal and the Mediterranean region. AQUA+ directly addresses this by improving water efficiency at the building level, with potential savings of 30–50%, fostering sustainable and resilient use.

Key innovations include: infrastructure-based rating (rather than behavioural), integration of water-energy savings, reuse systems, creation of green jobs and measurable user benefits in litres and euros saved. The methodology has proven highly replicable, validated through pilots in Malta and other European cities under the B-WaterSmart project and has earned multiple awards, including the National Tourism Award for Sustainable Tourism (2023). Recognized by the European Commission’s WaterWise EU campaign (2024), AQUA+ contributes to SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action).

Aimed at building owners, developers, auditors and tourism infrastructures, AQUA+ is adaptable to different contexts—small islands, rural zones and coastal areas—and applicable throughout a building’s life cycle. While its voluntary nature may require incentives for wider uptake, increased awareness and training can drive adoption, positioning AQUA+ as a key tool for sustainable water management in the Mediterranean and beyond.

Island water management toolkit (LIFE IP RBMP - Malta)

LIFE IP RBMP Malta Programme

The LIFE IP RBMP Malta Project is testing and evaluating diverse water management measures at the island scale to design solutions tailored to the specific environmental and socio-economic conditions of Mediterranean islands. Focusing on Malta, a densely populated small island state, the project addresses critical challenges such as water scarcity, droughts, saline intrusion, contamination and the vulnerability of coastal waters.

The outcome will be a Water Management Toolbox — a catalogue of tested measures that highlight key bottlenecks, benefits and practical guidance to support future adoption in Malta and other Mediterranean islands facing similar issues. This toolbox integrates both technical and governance-related actions, including stakeholder engagement, data monitoring and policy coordination, as well as technical interventions like non-conventional water resource development, network loss management and nature-based solutions.

Among its main measure typologies are: Managed Aquifer Recharge in coastal areas, management plans for dry valleys, sustainable use of deep saline aquifers, restoration of coastal wetlands, management of desalination brine discharge and increasing circularity in wastewater reuse. The project also emphasizes stakeholder participation, establishing multi-stakeholder platforms and public awareness campaigns to promote shared responsibility in water management.

Key expected benefits include improved water efficiency, enhanced sustainability of groundwater and rainwater use, increased reliance on non-conventional water resources and optimized protection of surface and coastal water bodies. Beyond SDG 6 (Clean Water and Sanitation), the project also contributes to SDGs 2, 7, 11, 13, 14 and 15, linking water management with food, energy, climate and ecosystem resilience.

While the toolbox is tailored to the semi-arid, high-density context of Malta, its flexible and adaptable approach makes it a valuable reference for other Mediterranean islands, provided that measures are adjusted to local conditions.



Smart water benchmarking and behavioural nudges for hotels. Tourism Water Efficiency Research – Canary Islands Smart Meter Study

This solution introduces a smart metering-based dashboard designed to promote water conservation in hotels through custom benchmarking indicators and behavioural nudges. By combining anonymized real-time consumption data with information on hotel typology and operations, the tool generates tailored indicators (e.g., water use per bed, room, or overnight stay) and enables peer comparisons by category, size and location.

Behavioural nudges—such as visual alerts (“You use more water than similar hotels nearby”), trend comparisons and water-saving tips—encourage awareness and action without being intrusive. Tested through interviews with hotel environmental managers across the Canary Islands, the solution was praised for its local relevance, data protection safeguards and ease of integration into existing utility platforms.

To function effectively, it requires smart water meters, digital infrastructure, access to tourism performance data and a trusted host agency (e.g., ISTAC) to manage analytics and ensure anonymity. Collaboration between utilities, hotels and tourism bodies is essential, with potential integration into existing utility apps or customer portals.



The tool aims to make water data actionable, addressing overconsumption in tourism by providing clear, contextual metrics that go beyond abstract pricing signals. It supports public-private partnerships and strengthens evidence-based water policies, particularly in tourism-intensive coastal and island regions such as the Balearics, Malta and Cyprus.

Key benefits include reduced water stress, enhanced resilience in tourism hotspots, low-cost circular economy measures and improved stakeholder engagement through transparency. It directly supports SDGs 6, 11, 12 and 13.

Validated with data from 213 hotels in the Canary Islands (2011–2018), the solution has reached TRL 7 (ready for demonstration), with interest from ISTAC as a hosting body and future pilots planned in Arona (Tenerife) and Fuerteventura. While integration, GDPR compliance and behavioural inertia remain challenges, the dashboard offers a scalable and replicable model for data-driven water management in Mediterranean tourism.

3- Policy recommendations

Policy recommendations addressing barriers of wider NBS (Nature based solutions) adoption.

HYDROUSA Project. HORIZON 2020 Programme.

Nature-Based Solutions (NBS) offer cost-efficient, low-energy wastewater treatment methods that enable the direct reuse of treated water and nutrients while delivering multiple environmental and social co-benefits. Beyond water treatment, NBS contributes to temperature regulation, improved air quality, carbon sequestration, biodiversity enhancement and the greening of urban areas. This policy brief compiles best practices, demonstration cases and strategies to overcome barriers, aiming to promote NBS as sustainable tools for closing water loops and supporting climate resilience, biodiversity and human well-being.



An evidence matrix of 157 innovative water recovery projects highlights key technologies and actions to mainstream NBS. These include updating and harmonizing technical design standards across the EU, developing green public procurement criteria and establishing regulatory clarity for decentralized water services. The brief calls for adapting legislation to allow local water reuse, creating fiscal incentives and subsidies for NBS implementation, promoting eco-taxation and fostering innovation partnerships such as EU-

level “Green Deals.” Financial mechanisms at national, regional and municipal levels are also encouraged to support NBS integration into water and wastewater infrastructure.

Essential requirements involve updating legal and technical frameworks, simplifying bureaucratic procedures and ensuring technology-neutral wastewater standards to stimulate innovation and widespread adoption. NBS stand out for their multifunctionality, low energy demand and high efficiency in removing organic micropollutants, making them a cornerstone for sustainable water management. They directly support the UN Sustainable Development Goals (SDGs) for Clean Water and Sanitation (SDG 6), Sustainable Cities and Communities (SDG 11) and Climate Action (SDG 13).

Towards a zero-impact island.

ISOS + Project. Interreg Italy-France Maritime Programme 2014-2020

The white paper “*Towards a Zero-Impact Island*” addresses the increasing environmental pressures faced by small Mediterranean islands, particularly water scarcity and inefficient management of freshwater and wastewater. It tackles systemic governance challenges such as seasonal tourism peaks, limited infrastructure, scarce resources and inadequate treatment systems. The document proposes integrated, context-specific water strategies and offers practical recommendations for policymakers, researchers, businesses and local stakeholders.

The ISOS white paper presents a strategic framework combining policy guidance and technical tools to improve island water management. It includes analyses of water quality and availability, case studies from Mediterranean islands and recommendations for rainwater harvesting, wastewater reuse and decentralized treatment systems adapted to small-scale and low-resource contexts. The white paper serves as both a governance guide and an awareness tool to promote regulatory reform and sustainable water use.

Its implementation relies on multi-level stakeholder engagement, diagnostic tools for system assessment, technical expertise in decentralized solutions (e.g., phytoremediation) and legal frameworks supporting water reuse. It also emphasizes local capacity building and public awareness. ISOS has been successfully piloted on islands such as Porquerolles, Saint-Honorat, Sainte-Marguerite (France) and Tavolara (Italy), facilitating cross-border learning and demonstrating scalable models for integrated island resource management.

Key advantages include reducing dependence on mainland water supply, enhancing resilience to climate change, protecting biodiversity, promoting inclusive governance and supporting tourism sustainability. The initiative contributes to several UN Sustainable Development Goals (SDGs), including Clean Water and Sanitation (SDG 6), Sustainable Cities and Communities (SDG 11), Climate Action (SDG 13), Life Below Water (SDG 14) and Partnerships for the Goals (SDG 17). However, uptake challenges remain, such as limited legal frameworks for reuse, high infrastructure costs, seasonal variability in water demand and the need for ongoing technical support.

Reuse pricing and Risk analysis. Regeneration and Reuse of Wastewater with Sludge Valorization in the Canary Islands: An Opportunity for Green Industrialization Based on the Circular Economy-REGENERaGUA (2022–2025)

The solution tackles the limited adoption of reclaimed water in the Canary Islands, despite increasing water scarcity and strong policy incentives. It addresses economic, regulatory and behavioural barriers that restrict treated wastewater reuse and sludge valorization, supporting circular economy objectives through pricing reform, externality integration and assessment of green industrial uses for sludge.

REGENERaGUA leverages existing technologies to promote water reuse and circular wastewater practices. It provides a microeconomic model to estimate the costs of wastewater treatment and reuse across Canary Islands EDARs, incorporating environmental externalities such as nutrient recovery and energy production. The project also evaluates the economic viability of green sludge valorization pathways, including biogas and compost production and proposes new policy tools such as discharge levies reflecting the social costs of marine discharges.



Essential requirements include access to operational and financial data from wastewater plants, collaboration from regional utilities, economic and GIS modeling expertise, institutional support for new pricing instruments and availability of sludge treatment or transport infrastructure. The solution contributes to SDG 6 (Clean Water and Sanitation), SDG 9 (Industry, Innovation and Infrastructure), SDG 12 (Responsible Consumption and Production) and SDG 13 (Climate Action).

Designed for the Canary Islands, the approach is transferable to other island or coastal Mediterranean regions with water stress, limited freshwater resources and existing wastewater infrastructure, aligning with EU Water Reuse Regulation 2020/741. Key advantages include reducing water stress, promoting circularity through sludge valorization, supporting low-carbon industries, enhancing pricing systems with environmental externalities and informing regional policy without requiring major new technology investments. Uptake challenges involve limited regulatory discussion on pricing reform, coordination among utilities and authorities, low public engagement and the need for operationalizing valuation and cost recovery mechanisms.

Transition governance tools.

Interreg Euro-MED Dialogue4Tourism Project

The *Interreg Euro-MED White Paper on Sustainable Tourism Governance in the Euro-MED Area: Tourism and Climate Adaptation* address the urgent need to adapt the Euro-Mediterranean tourism sector to climate-related challenges, including water scarcity, biodiversity loss, altered tourist flows and coastal erosion. It identifies gaps in policy integration, public awareness and cross-border collaboration, providing a strategic framework to enhance resilience and sustainability in one of the region's most climate-sensitive economic sectors.

The White Paper offers actionable recommendations, case studies and governance models for integrating climate adaptation into tourism planning. It emphasizes nature-based solutions, circular economy practices, digital innovation and cross-sector cooperation. Practical guidance is provided for authorities, DMOs, SMEs and civil society to co-develop climate-resilient tourism strategies. Implementation guidelines include sustainable water management, aligned with broader EU water and biodiversity frameworks, tailored for municipalities and regions.

Essential requirements include climate data tools (e.g., risk atlases), local governance capacity, interregional cooperation platforms, investment in nature-based and circular solutions, digital infrastructure, skilled planners, stakeholder engagement and alignment with EU legal frameworks. The White Paper draws on lessons from over 10 Interreg Euro-MED projects, including Dialogue4Tourism, Community4Tourism, MED-GIAHS, Nature4CCchange and Cool Noons, incorporating tools such as the Network of Sustainable Tourism Observatories and the “Blueprint for Tourism Climate Action.”

Key advantages include reducing climate risks to tourism infrastructure, promoting circular and nature-based tourism, enhancing ecosystem and community resilience, supporting inclusive and gender-sensitive governance, preserving cultural and natural heritage, enabling data-driven decision-making and incentivizing SMEs and public-private partnerships to invest in low-carbon and water-efficient technologies. The framework is adaptable to tourism-intensive coastal zones, small islands, rural and natural heritage areas and urban regions facing overtourism. Uptake challenges involve fragmented governance, limited local technical capacity, resistance to behavioural change, insufficient destination-level climate data and difficulties aligning local priorities with EU frameworks.

Grant promoting water reuse and efficiency in tourism businesses.

Next Generation European Union Recovery Instrument (NGEU)

The Regional Government of Andalusia (Spain) has launched a €40 million funding program to promote water and energy sustainability in the tourism sector, addressing climate change and drought challenges. Financed through the Next Generation EU Recovery, Transformation and Resilience Plan, the grants target tourism businesses in Andalusia and support measures for water reuse, water savings and energy efficiency. Water reuse initiatives include treatment of alternative water sources such as sinks, showers, pools, rainwater, seawater and wastewater. Water-saving measures cover guest rooms, bathrooms, swimming pools, irrigation and digital monitoring systems, while infrastructure adaptations focus on mitigating heat, creating microclimates and using bioclimatic solutions, including low-water-use green roofs. Energy efficiency projects involve sensors, thermal insulation, efficient lighting and ventilation, renewable energy systems and low-consumption technologies.

11.4 Tools for Policy-Makers

Geographic Information Systems (GIS) and predictive modelling software are some tools for policymakers to support data-driven decisionmaking and streamline policy development.

Policymakers at both regional and municipal levels require access to advanced tools to support data-driven decision-making and streamline policy development. Research and the Interreg Euro-Med Sustainable Tourism project identify several key resources:

- **Geographic Information Systems (GIS):** Use spatial analysis to visualize tourism flows and plan sustainable land use. This is demonstrated by Shoal and Isaacson (2007) and incorporated into the Interreg project's planning tools.
- **Predictive modeling software:** Leverage forecasting tools to anticipate tourism trends and adjust policies proactively. This aligns with Song and Li (2008) and the Interreg project's focus on data-driven insights.
- **Stakeholder engagement platforms:** Implement digital forums or mobile apps to facilitate transparent communication and gather input. This is recommended by the OECD (2018) and central to the Interreg project's inclusive approach.
- **Data analytics dashboards:** Integrate real-time data on key performance indicators to monitor policy outcomes. This is showcased by Fuchs et al. (2014) and part of the Interreg project's monitoring toolkit.
- **Decision-support systems (DSS):** Utilize AI-powered tools to simulate policy effects and aid in strategy selection. This is explored by Gretzel et al. (2015) and relevant to the Interreg project's evidence-based policy-making.

The program includes two funding lines: accommodation and related activities and catering and hospitality, receiving 187 applications totaling over €33 million. The total estimated budget is nearly €40 million, combining new allocation and remaining funds from earlier energy efficiency initiatives. The program aligns with SDGs 6 (Clean Water and Sanitation), 7 (Affordable and Clean Energy), 11 (Sustainable Cities and Communities) and 13 (Climate Action).



The Andalusian model is transferable to other Mediterranean regions, with similar initiatives launched in Occitanie/Pyrénées-Méditerranée and Grand Est (France), offering grants and repayable advances for SMEs to implement sustainable tourism projects, including water-saving measures. Key advantages include reducing water stress, promoting circularity, enhancing climate and community resilience and strengthening tourism-environment synergies. Uptake challenges involve high upfront costs, complex administrative procedures, limited awareness among rural businesses and seasonal tourism fluctuations affecting investment feasibility.

Water efficiency seal SAVE WATER.

The ‘Save Water’ Water Efficiency Seal is a measure coordinated by the Algarve Tourism Board, in conjunction with Turismo de Portugal and ADENE - the Portuguese Energy Agency.

The SAVE WATER initiative in the Algarve region promotes water efficiency in tourism by certifying accommodations that actively reduce water consumption. The program addresses water scarcity that generates financial savings for businesses and improves sector-wide knowledge of water use to inform tailored policies. The core of the initiative is the “Save Water” Seal, awarded to companies that commit to implementing at least 30 measures from a list of 60 water efficiency actions, contributing to a 13% reduction in water use compared to previous years. Participating establishments must monitor water consumption, record progress on the Water Efficiency Platform and promote good practices among staff and customers.



The initiative supports several SDGs, including SDG 6 (Clean Water and Sanitation), SDG 12 (Sustainable Production and Consumption), SDG 13 (Climate Action) and SDG 17 (Partnerships for the Goals). It is particularly suited to tourism-intensive coastal areas and has been successfully applied in the Algarve, with plans for expansion across Portugal. Key advantages include enhanced climate resilience, reduced water stress, improved water management practices, training

for tourism companies, financial savings and better understanding of consumption patterns for more effective policymaking.

Uptake challenges include the voluntary nature of the program, limited preparedness of small and micro tourism businesses and reliance on company interest. To address this, a financial support line (‘+EFICIÊNCIA HÍDRICA ALGARVE’) provides incentives for participating businesses, promoting sustainable water management practices.

Mediterranean policy document on non-conventional water resources.

NAWAMED Project. ENI-CBC-MED Programme.

The NAWAMED Project addresses the growing water demand in Mediterranean urban areas driven by demographic growth, urban expansion and climate change, which reduces freshwater availability. It promotes Non-Conventional Water Resources (NCWR) as part of an integrated water management framework to enhance the resilience of urban water systems while protecting natural freshwater resources. Key NCWR solutions include rainwater harvesting and greywater treatment, applied alongside conventional water supply and sanitation systems.



The project identifies four essential measures for safe NCWR adoption: (1) capacity building at technical, planning and institutional levels to ensure effective management; (2) a clear regulatory framework defining authorities' roles, water quality standards and building codes; (3) financial incentives to bridge the cost gap between NCWR and conventional systems while accounting for social and environmental benefits; and (4) promotion of NCWR solutions to raise public awareness of their urban benefits. NAWAMED emphasizes that NCWR cannot be implemented in isolation but should complement broader water management strategies.

The initiative supports SDGs 6 (Clean Water and Sanitation), 11 (Sustainable Cities and Communities), 13 (Climate Action) and 15 (Life on Land), enhancing urban water-use efficiency, reducing per capita demand and providing co-benefits such as urban greening, flood risk management, temperature regulation and improved air quality. The policy framework has been presented to policymakers in Tunisia, Italy, Lebanon, Jordan and Malta, demonstrating its transferability across the Mediterranean.

Key uptake challenges include affordability and availability of NCWR technologies, building constraints, user perceptions, lack of regulatory clarity, need for separate plumbing systems, cost-effectiveness concerns and insufficient financial support schemes. Addressing these barriers is critical for scaling NCWR solutions across Mediterranean urban areas to ensure sustainable and resilient water management.

Nexus-smart Water Governance.

RETOUCH NEXUS Project. Horizon Europe Programme

Water scarcity poses significant threats to socio-economic development and environmental sustainability. The RETOUCH NEXUS project addresses this challenge through an integrated Water-Energy-Food-Ecosystems (WEFE) Nexus approach, promoting sustainable water security in the EU. The project focuses on Nexus-smart water governance, ensuring coherent, effective, and climate-resilient practices across multiple sectors and governance levels.



RETOUCH NEXUS designs and implements innovative, inclusive, and integrated governance schemes. It develops 35 water governance metrics aligned with the European Green Deal and the SDGs, six governance

schemes to improve policy coordination, and twelve engagement mechanisms to empower citizens in water management. The project directly supports SDGs 6, 11, 13, 14, and 15.

The WEF framework relies on a multidisciplinary team of water scientists, economists, policy and governance experts, and communication specialists, with additional support from energy, agriculture, and biodiversity experts. Their collective input ensures comprehensive, Nexus-informed water governance policies.

Case studies in Mediterranean countries, including Malta and Spain, demonstrate the applicability of RETOUCH NEXUS solutions across diverse socio-environmental contexts, encompassing stakeholder engagement, economic modeling, and dissemination strategies.

Although ongoing until 2027, the project promotes scalable, inclusive, and sustainable water governance practices for replication in other regions. Key advantages include monitoring with Nexus-smart indicators, designing cross-sectoral and multi-level water systems, advocating climate-resilient governance, and fostering transparency and citizen participation. Main adoption challenges remain capacity-related, including human resources, data, and monitoring infrastructure, which must be addressed through targeted capacity-building efforts.

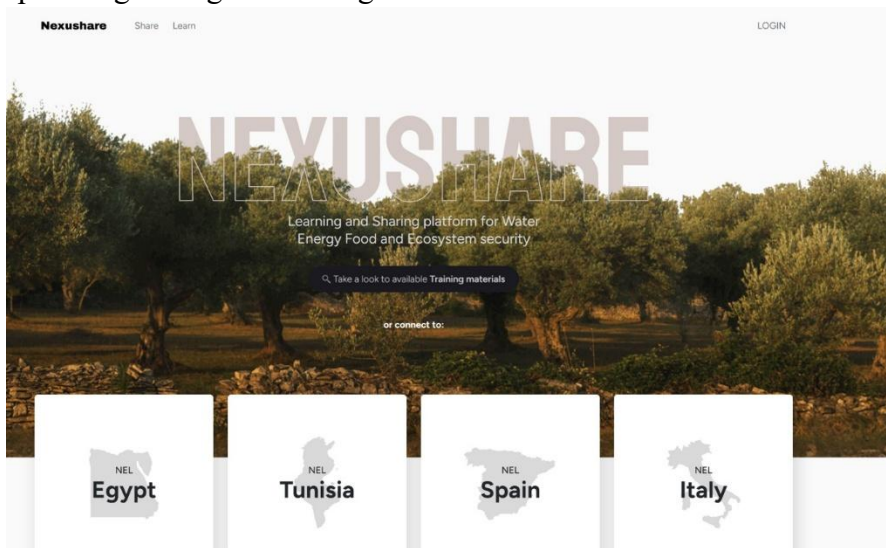
4- Training and Engagement Programme

NEXUS SHARE Platform: Multi-actor and multi-sector engagement tool.

NEXUS-NESS Project. PRIMA Programme.

NEXUSHARE is a digital and methodological platform designed to enhance collaborative learning, knowledge sharing and co-production among stakeholders managing water, energy, food and ecosystem (WEFE) resources. It facilitates structured multi-actor and multi-level dialogue, promoting transparency and inclusiveness across public institutions, private actors, civil society and research communities. The platform integrates tools for participatory scenario building, feedback collection and policy dialogue, aligning local needs with WEFE Nexus strategies. Piloted in several Mediterranean Living Labs—including tourism-impacted and seasonal-stressed areas—NEXUSHARE has effectively engaged municipalities, utility managers and local communities in joint planning processes.

The platform strengthens participatory governance, builds trust among diverse actors, supports adaptive planning through knowledge co-creation and fosters local ownership of Nexus solutions. It addresses socio-



institutional fragmentation, particularly in small islands, coastal zones and rural areas facing overtourism or overlapping resource pressures. Engaged stakeholders include municipalities, utilities, farmers, fishers, tourism operators, civil society, research institutions, regional governments and protected area managers.

NEXUSHARE contributes to SDG 6 (Clean Water and Sanitation), SDG 11 (Sustainable Cities and Communities), SDG 13 (Climate Action) and SDG 17

(Partnerships for the Goals) by promoting participatory governance, inclusive urban and coastal development, locally grounded adaptation strategies and cross-sector collaboration. Its Mediterranean application targets areas with limited institutional capacity, fragmented governance and competing resource demands.

Key uptake challenges include limited experience with participatory facilitation, the time and resources required for continuous engagement, potential conflicts among actors with divergent interests and the need for skilled local facilitation and coordination to ensure effective implementation.

Geo-information service, Nexus-Ness Service (NNS, webGIS).

NEXUS-NESS Project. PRIMA Programme

The Nexus-NESS Service (NNS) is a WebGIS-based geo-information platform designed to support integrated water, energy, food and ecosystem (WEFE) resource management at the territorial level. It enables stakeholders to visualize, analyze and interpret spatial and temporal data on Nexus interactions through interactive dashboards, maps and key indicators such as land use, irrigation demand, water availability, energy consumption and environmental risks. Piloted in Mediterranean Living Labs, including coastal areas and small islands under seasonal tourism pressure, the platform can be tailored to specific local contexts.

NNS facilitates data-informed decision-making for municipalities, planners and operators facing fluctuating demand and resource constraints, enhancing transparency and coordination across sectors. Its advantages include identifying resource bottlenecks, planning adaptive solutions, supporting preparedness for peak tourism demands, promoting participatory governance and enabling evidence-based policies for resource efficiency and resilience in sensitive coastal environments.

The platform contributes to SDGs 2 (Zero Hunger), 6 (Clean Water and Sanitation), 7 (Affordable and Clean Energy), 12 (Responsible Consumption and Production), 13 (Climate Action), 14 (Life Below Water) and 15 (Life on Land). Key stakeholders include local and regional administrations, utilities, environmental agencies, tourism operators, farmers, urban planners, researchers and civil society.



NNS is particularly suited to small islands with limited freshwater, tourist-heavy coastal municipalities, areas integrating Nexus thinking into planning and regions with data but lacking tools for strategic interpretation. Uptake challenges include limited GIS and technical capacity, need for continuous data updates, initial reluctance to move from fragmented data to integrated platforms and connectivity or digital infrastructure gaps in remote areas.

Water scarcity mitigation plan (Water Rethink)

The Water Rethink solution addresses water scarcity in Greece, focusing on the reuse of treated water for industrial and agricultural purposes. The plan provides a comprehensive analysis of water scarcity, the impacts of unreasonable water use, and the EU regulatory framework, including minimum water quality standards. It evaluates current water consumption and reuse practices in Europe, maps technological solutions, and identifies challenges related to technology, economics, and social acceptance.

The proposed mitigation strategy emphasizes increasing the low percentage of treated wastewater reuse in Greece through regulatory improvements, economic analysis, and public awareness campaigns. An extensive report detailing all 262 wastewater treatment facilities in Greece is available to policymakers, while awareness-raising activities and materials have been implemented across multiple regions. Solutions include wastewater reuse in a circular model, desalination, and other innovative approaches.

Expected impacts include raising awareness of water scarcity and its effects on food and energy systems, inventorying Greece's potential for reusable liquid waste, and proposing measures grounded in economic, social, and governance analysis. Key stakeholders include farmers, industry managers, energy companies, water facilities, and the general public. The solution is particularly applicable to Mediterranean contexts such as small islands, peri-urban agricultural areas, and urban zones with industrial complexes, especially during dry summer months or peak tourist seasons.

Barriers to adoption include the need for updated regulatory frameworks, central governance for incentivizing reuse, harmonization of national legislation with EU standards, environmental risk management, and limited awareness or acceptance among the public and industrial sectors. The project contributes to multiple SDGs, including SDG 2, 3, 6, 7, 9, 11, 12, and 13.

Conclusions

- Nature-based and non-conventional water solutions (NBS/NCWR) are cost-efficient, low-energy and multifunctional, supporting water reuse while delivering climate resilience and human wellbeing.
- Mediterranean contexts, particularly small islands, coastal regions and tourism-intensive areas, face acute water stress due to seasonal demand, scarce freshwater resources and limited infrastructure.
- Pilot projects across the MED region showcased in this catalogue of transferable solutions in the different sections: nature-based and hybrid interventions, holistic resource management plans, policy recommendations and training and engagement programs prove that decentralized, circular and participatory water models are technically feasible, economically viable and beneficial for the communities.
- Persistent barriers remain: fragmented governance, regulatory mismatches, lack of harmonized standards, limited financing mechanisms, insufficient public awareness and resistance to behavioural change.
- Strengthening cross-border cooperation, stakeholder engagement and knowledge-sharing platforms is essential to accelerate uptake and replication of successful practices.

Recommendations

1. Regulatory adaptation & harmonization

- Update and harmonize legal and technical standards for water reuse across Mediterranean countries.
- Ensure wastewater management regulations remain technology-neutral to foster innovation.
- Clarify institutional responsibilities and reduce bureaucratic hurdles to enable decentralized treatment and reuse schemes.

2. Financing & incentives

- Establish dedicated financing instruments (grants, subsidies, innovation deals) for NBS, NCWR and circular water management models in water and tourism sectors.

3. Capacity building & knowledge transfer

- Develop training programs, diagnostic tools and awareness campaigns for municipalities, SMEs and local communities to strengthen technical expertise and social acceptance.
- Promote peer learning and cross-border cooperation, especially among islands and water-stressed regions.

4. Integration into planning & governance

- Embed NBS and NCWR into regional and urban planning, tourism development strategies and climate adaptation roadmaps.
- Promote inclusive and participatory governance models that engage civil society, SMEs and communities in decision-making.

5. Digital & data tools

- Support the deployment of WebGIS platforms, participatory governance tools and digital monitoring systems for transparent decision-making and resource management.
- Encourage smart technologies (e.g., metering, predictive tools) to improve water efficiency in tourism and agriculture.

6. Mediterranean cooperation & replication

- Use tested pilot projects as scalable models, adapted to local socio-economic and ecological contexts.
- Strengthen Euro-MED and cross-border cooperation frameworks to align policies, mobilize joint financing and accelerate innovation pathways.

7. Leverage tools like the Interreg Euro-MED White Paper on Sustainable Tourism Governance in the Euro-MED area. Tourism and Climate Adaptation to guide data-driven, climate-resilient tourism planning, fostering nature-based solutions, circular practices and inclusive governance. Use its frameworks to strengthen local capacity, align policies with EU standards and facilitate cross-border collaboration. Promote adoption among municipalities, SMEs and stakeholders to enhance sustainable tourism, preserve heritage and build community and ecosystem resilience.