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FACTSHEET | DEMO1 GREEK ISLANDS

NON-CONVENTIONAL WATER LOOPS ON AEGEAN ISLANDS

The DEMO1

DEMO 1 is structured in sub-DEMOs that are implemented in three Greek Islands (Lesvos, Mykonos & Slfnos) and aims to examplify.

sub-DEMO1.1

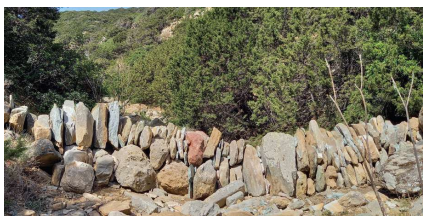
Demonstrates the integration of water reuse, nutrients recycling and energy production, offering a model for efficient resource management.

sub-DEMO1.2

In sub-DEMOs 1.2a and 1.2b, advanced rainwater harvesting systems improve irrigation, conserve freshwater, and help recharge local aquifers.

sub-DEMO1.3

It features a network of traditional stone weirs that blend ancient practices with modern conservation techniques—preserving ecosystems and supporting small-scale agriculture.



Spanning natural and rural areas on both public and private lands, this DEMO offers scalable, sustainable solutions tailored to the unique challenges of the Greek islands, embodying innovation, sustainability, and ecological stewardship.

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A Sustainable Circular System Promoting Wastewater Valorization Through NbS

What does this system highlights?

This system supports advanced ecological treatment of domestic wastewater, production of organic soil amendments and food production through sustainable farming practices. It aims to the least intervention and the preservation of the environment through circular management of natural resources.

The raw sewage treatment of the adjacent settlement of Antissa is a pivotal point that enables four different NbS types to produce various results:

TWO-STAGE CW SYSTEM:

Sewage pollutants are treated with a two-staged constructed wetland (CW) after appropriate pre-treatment with a UASB reactor. The combination of anaerobic conditions in the first stage and aerobic conditions on the second stage allows for a high treatment level of organic matter, suspended solids, nitrogen and pathogens with the advantages of low energy requirement and low maintenance. UV disinfection is the last step for the treated water to be safely stored in detention vaults and tank and be used in the agroforestry system (up to 100 m3/d).

SLUDGE TREATMENT WETLAND:

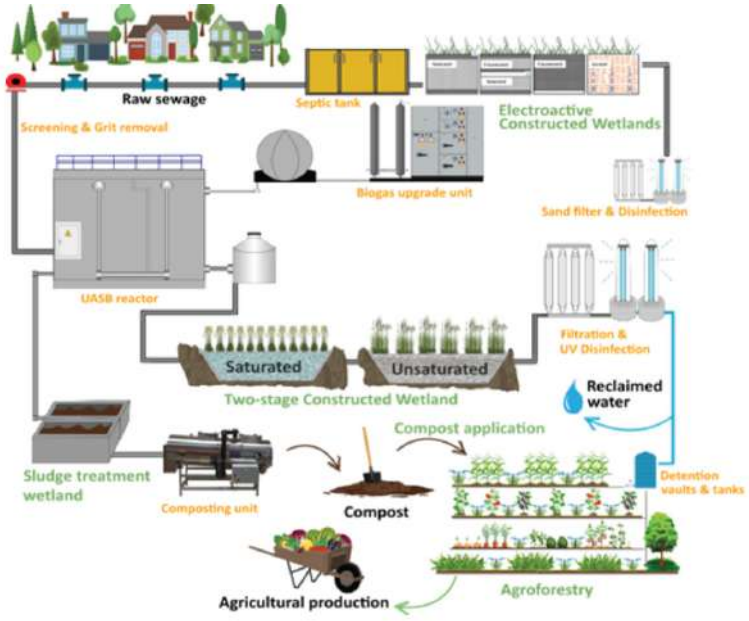
A sludge treatment wetland is used to dewater and sanitize sludge from the pretreatment unit (UASB reactor). This aims in the reduction of water content, the stabilization of organic matter through aerobic and anaerobic microbial activity, the reduction in pathogens and minimization of sludge volume for further utilization. Finally, a composting unit transforms the sanitized sludge into nutrient-rich compost through aerobic processes. At the end, filtration and UV disinfection is the last step to get reclaimed water, then stored in detention vaults and tanks. This water is then used in the agroforestry system.

AGROFORESTRY FOR COMPOST APPLICATION:

The reclaimed nutrient-rich water as well as the reclaimed compost are utilized through precision agriculture techniques in the nurturing of a 1-hectare agroforestry system with more than 60 different varieties of plants. It includes trees like fig or apple trees, shrubs like aronia berries, aromatic plants like lavender and seasonal vegetables or fruits like zucchinis and watermelons.

PILOT-SCALE ELECTROACTIVE CWS:

An experimental series of novel constructed wetlands (filled with electroactive material or mechanically aerated) in various configurations is implemented in parallel to further optimize the treatment efficiency of the sewage after suitable pre-treatmet (septic tank in this case). The use of electroactive filling materials or mechanical aeration boosts the biochemical processes enabling the increase of treatment efficiency of multiple pollutants and the reduction of the land requirements. UV disinfection is applied to remove pathogens in the reclaimed water.



Identified Nature-based Solutions

The identified Nature-based Solutions are those mentioned above, specifically:

- Two-stage vertical subsurface flow constructed wetland
- Electroactive constructed wetland
- Sludge treatment wetland
- Agroforestry
- Compost application

Co-benefits

The holistic approach of the system delivers multiple co-benefits that enhance its environmental and economic value. The water provision for agriculture from non- conventional streams is supplemented by nutrients recycling in the agroforestry and reduces artificial fertilizer needs by 90% compared with conventional cultivation irrigated with freshwater. The low energy input enhances the sustainable wastewater treatment along with sustainable food production, while the produced compost improves the agroforestry soil fertility. The system promotes biomass generation and creates habitats for birds, reptiles and insects, thus supporting the biodiversity enhancement and re-naturalization. Overall, material reuse and integration with food production contribute to a circular economy and more sustainable agricultural practices.

Sustainable Development Goals

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The Rainwater Harvesting when Nature Inspires: A novel decentralised rainwater harvesting system for water scarce areas

What is this sub-DEMO about?

This sub-DEMO combines ancient techniques with technological innovation with the purpose of increasing water collection in water scarce areas, or, as in this case, in Mykonos Island.

It involves two main pillars, which are collecting water and irrigation systems, in two locations, here described:

LOCATION A

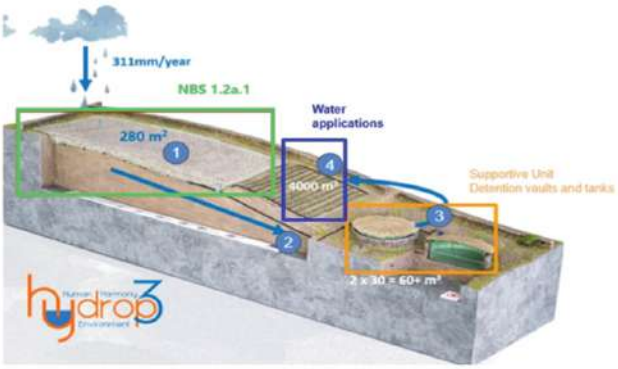
A sub-surface rainwater collection system is installed to capture, treat and store rainwater for agricultural reuse. The system collects rainwater via a shallow filter drain and directs it to two detention vaults and tanks. The water is then used for a smart irrigation system of a 0,4-hectare lavender field, with remote sensing in place to optimise water use.

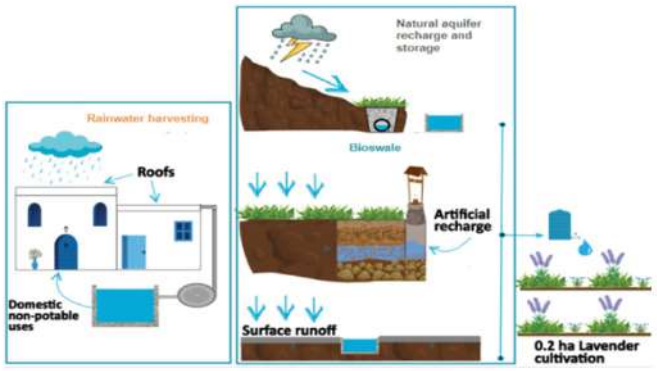
LOCATION B

A rainwater harvesting system incorporates a bioswale that captures stormwater runoff from rooftops and residential yards. This water is stored in detention vaults and tanks, primarily for non-potable domestic uses, while some is used to irrigate a 0.2-hectare lavender field. Smart irrigation systems, monitored online, ensure water efficiency for the irrigation of lavender fields. Additionally, the system replenishes the aquifer during wet seasons and provides a water source for dry periods. Smart sensors for online monitoring, ensure optimal resource use.

Beyond the immediate benefits of water collection and reuse, this project serves as a scalable model for sustainable water management in arid and semi-arid regions. By integrating nature-based solutions with digital monitoring, it demonstrates how decentralised infrastructure can reduce dependence on centralized water systems, enhance climate resilience, and promote agroecological practices.

Moreover, the project contributes to the revitalisation of local biodiversity through the cultivation of native aromatic plants and the creation of microhabitats. It also raises awareness about the value of traditional knowledge when paired with modern innovation, fostering a renewed appreciation for local heritage in water stewardship.





Identified Nature-based Solutions

The identified Nature-based Solutions are those mentioned above, specifically:

- Bioswale: to capture stormwater runoff.
- Filter drain: for rainwater to be collected and stored in detention vaults and tanks.

Co-benefits

As for the co-benefits which enhances its environmental and economic value, this project supports Sustainable Development Goal 6, promoting clean water access and sustainable water management—both essential for climate change adaptation. It also reflects the priorities of the National Circular Economy Strategy (NCES, 2018) by advancing sustainable resource use, circular business models, and responsible consumption, contributing to a more resilient and regenerative system.

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Dry-stone check dams in ephemeral streams of Sifnos: a Nature-based Solution (NbS) for water and climate resilience

What does this system highlights?

This NbS system revitalises the traditional practice of dry-stone check dams to mitigate flood risk, support aquifer recharge, and contribute to biodiversity conservation and sustainable water management in an arid island environment.

The intervention involves the construction of 120 small dry-stone check dams in two ephemeral streams (90 at Taxiarchis Skafis and 30 at Tris Piges), within the Kamares catchment, where both environmental and social vulnerabilities converge.

The dry-stone technique uses locally sourced stones, manually assembled without concrete, following traditional knowledge. These structures slow down surface runoff, enhance water infiltration, and help prevent soil erosion.

The system is supported by sensors (monitoring water level and soil moisture) and an online weather station to track hydrological and climate conditions. The monitoring phase will begin in mid-2025. Expected impacts:

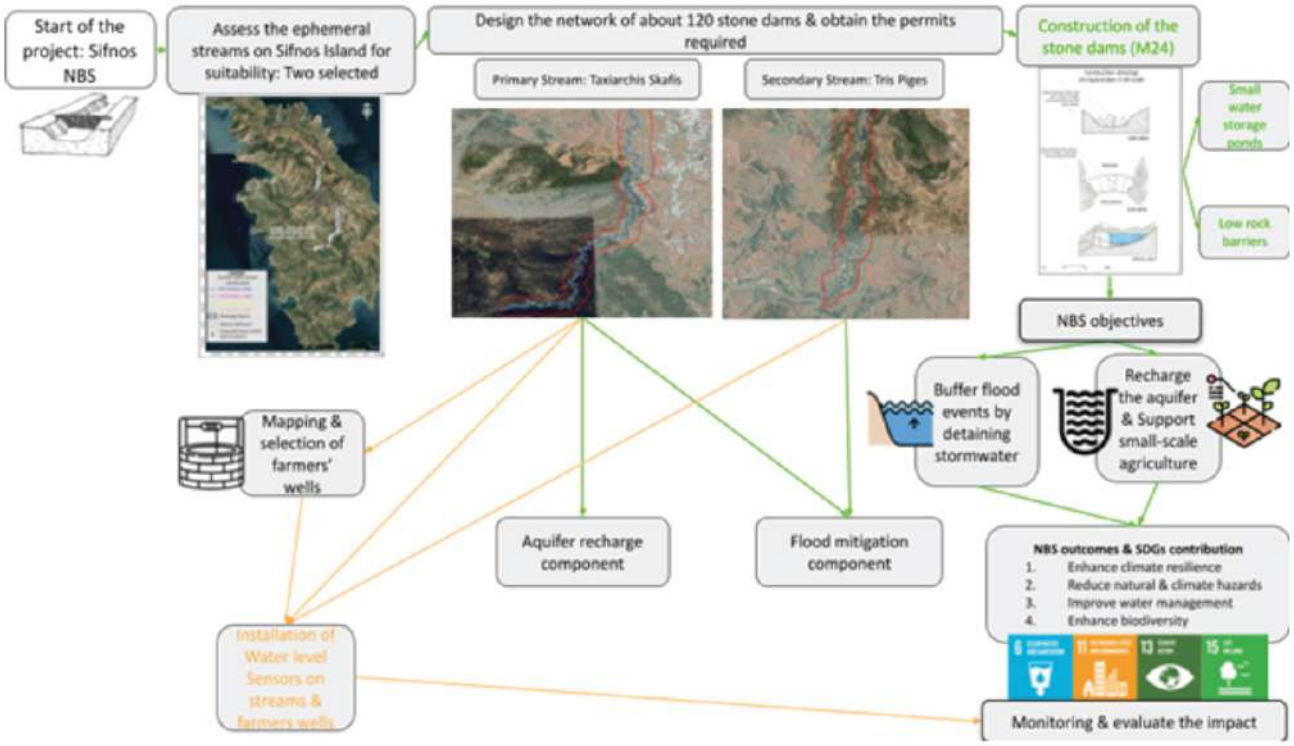
· Increased water infiltration and aquifer recharge

· Reduced peak flows and erosion during heavy rainfall

· Enhanced biodiversity and ecosystem services

· Revitalisation of traditional knowledge

· Strengthened community engagement (through workshops, presentations, and site visits with the local community)



Identified Nature-based Solutions

The identified Nature-based Solutions are those mentioned above, specifically:

- Dams
- Small water storage ponds
- Low rock barriers

Co-benefits

The implementation of stone dams on Sifnos provides scalable, Nature-based Strategies that feed & align with local flood risk management & drought resilience plans. These interventions serve as pilot models for other Cycladic islands, integrating into broader regional (Region of South Aegean) climate adaptation frameworks and aligning with regional climate governance priorities.

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