

Hydrousa

Hydro 1 & 2

Demonstration of water loops with innovative regenerative business models for the Mediterranean region

NTUA - National Technical University of Athens
Greece
-
Simos Malamis



MEDWAYCAP



WHAT

From sewage to **fruits/crops**

HYDRO1 is a **circular wastewater treatment system** applied in decentralised areas with high seasonal loads.

It combines **anaerobic processes** with **constructed wetlands** and disinfection to treat domestic wastewater as a **completely circular solution** where water, nutrients and the produced sludge are reused.

CIRCULAR WASTEWATER TREATMENT
MUNICIPAL WASTEWATER
ANAEROBIC TREATMENT
CONSTRUCTED WETLANDS
COMPOST
BIOGAS
RECLAIMED WATER FOR FERTIGATION
AGROFORESTRY



HOW

The anaerobic treatment takes place in two UASB (Up-flow Anaerobic Sludge Blanket) reactors, leading to the production of biogas and a small amount of sludge.

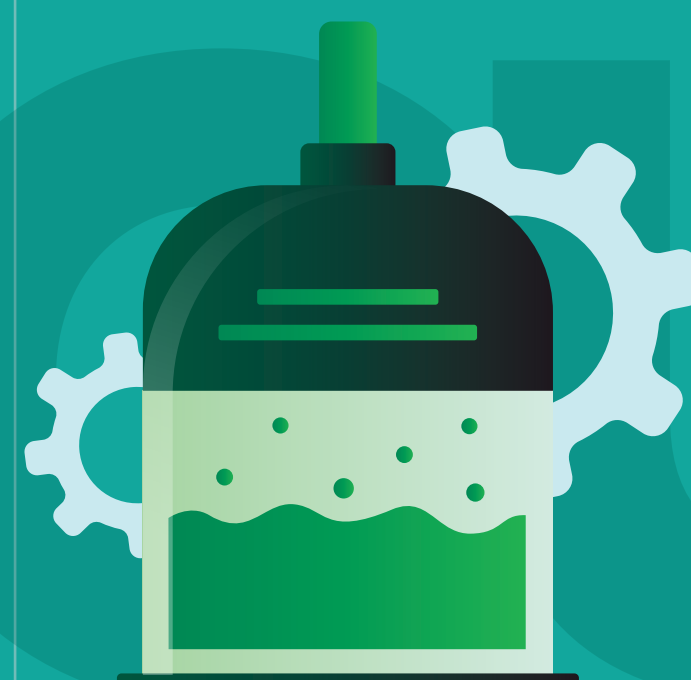
The process recovers energy in the form of biogas, has low operating expenses and low footprint. The biogas produced is collected in a gasometer and is being upgraded in order to produce **pure biomethane** which is used as fuel, while the sludge is treated in a sequence of a sludge drying reed bed, a composting unit and a biofilter. The anaerobic treated effluent is fed in the **constructed wetlands**, which serve as a secondary treatment providing further reduction of the organic carbon content and suspended solids of wastewater.



WHY

HYDRO2 combines the regenerative capacities of agroforestry with the use of reclaimed water and nutrients.

Up to 100 m³ of reclaimed water per day (in summertime) is available for irrigation.



media link



more info



project

Hydrousa

Hydro 3 & 4

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WHAT

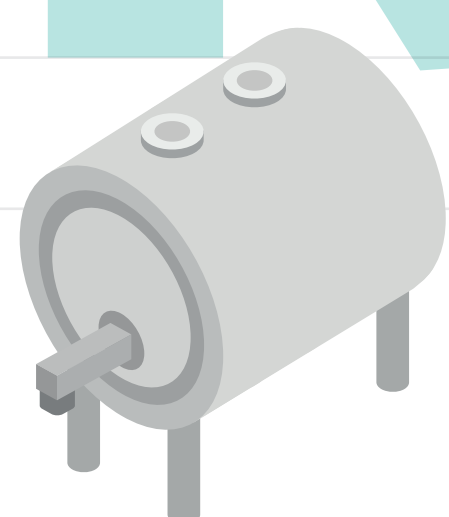
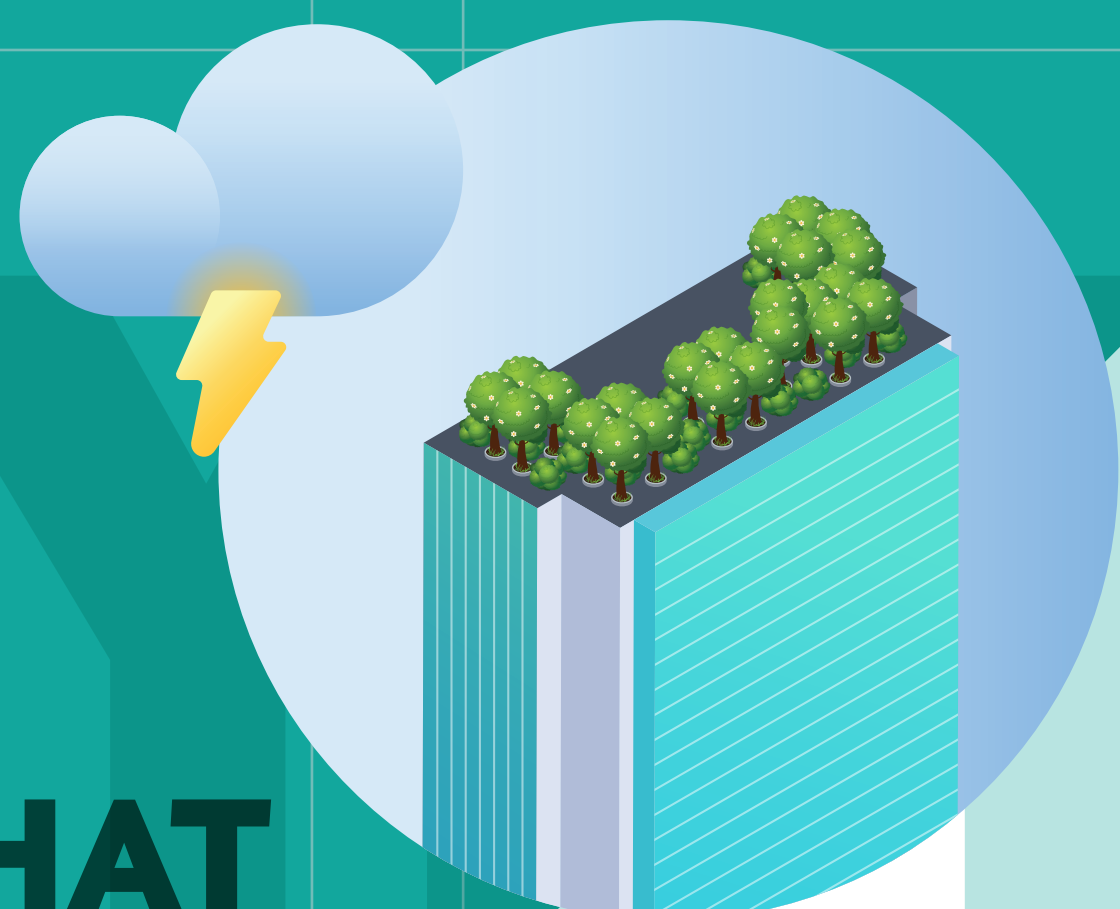
Rainwater harvesting systems First demo system

In Mykonos island, HYDROUSA project has implemented systems that recover and reuse water from non-conventional water sources.

The first one (HYDRO3) is an innovative nature inspired rainwater harvesting system.

A shallow, sub-surface rainwater collector is designed to harvest rainwater by draining, transport it into two cylindrical light structure storage tanks and eventually to irrigate a 0.4 ha oregano cultivation.

Precision irrigation of oregano and online monitoring of the water quantity and quality are implemented. The oregano yield is processed to produce essential oil giving an added value to the whole chain that will be locally exploited.



WHAT

Rainwater harvesting systems Second demo system

The second demo case (HYDRO 4) is a smart residential water management system.

In this site, rainwater, stormwater and surface runoffs are collected and stored into buffering tanks, in order to recharge the aquifer.

The system consists of three subsystems.

The first one collects the rainwater from house roofs through a piping system in a water storage tank. The water is reused for domestic non-potable purposes, e.g., washing, flushing toilets, etc.

The second refers to the Slow Sand Filter (SSF), which is a water purification system composed of a sand-bed system that purifies the water to potentially potable level.

In the last one the rainwater is collected from two sources: surface runoff and stormwater through a bioswale system. The latter is an open-channel linear drainage system with geomembrane and geotextile that collects and partially treats storm water, and prevents the lavender crop from flooding. The stored water is used during the summer period for the irrigation of 0.2 ha of lavender.

The lavender harvested is used for the production of essential oil.



NON-CONVENTIONAL WATER SOURCES

RAINWATER

STORMWATER

8 HERBS

ESSENTIAL OILS

RECLAIMED WATER FOR IRRIGATION

POTABLE WATER



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Hydro 5

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WHAT

Seawater desalination system Greenhouse

HYDRO5 is a nature-inspired, low-cost solar driven desalination system based on the principles of evaporation and condensation, which is implemented in Tinos Island.

Seawater and brine from the existing desalination plant is treated in the Mangrove Still System to produce freshwater and salt. The treated water is channeled to a 200 m² greenhouse irrigating tropical plants.

LOW-COST DESALINATION SYSTEM
FRESH WATER PRODUCTION
BIOMIMICRY TECHNOLOGY
MANGROVE STILL SYSTEM
TROPICAL FRUITS CULTIVATION
PRECISION IRRIGATION



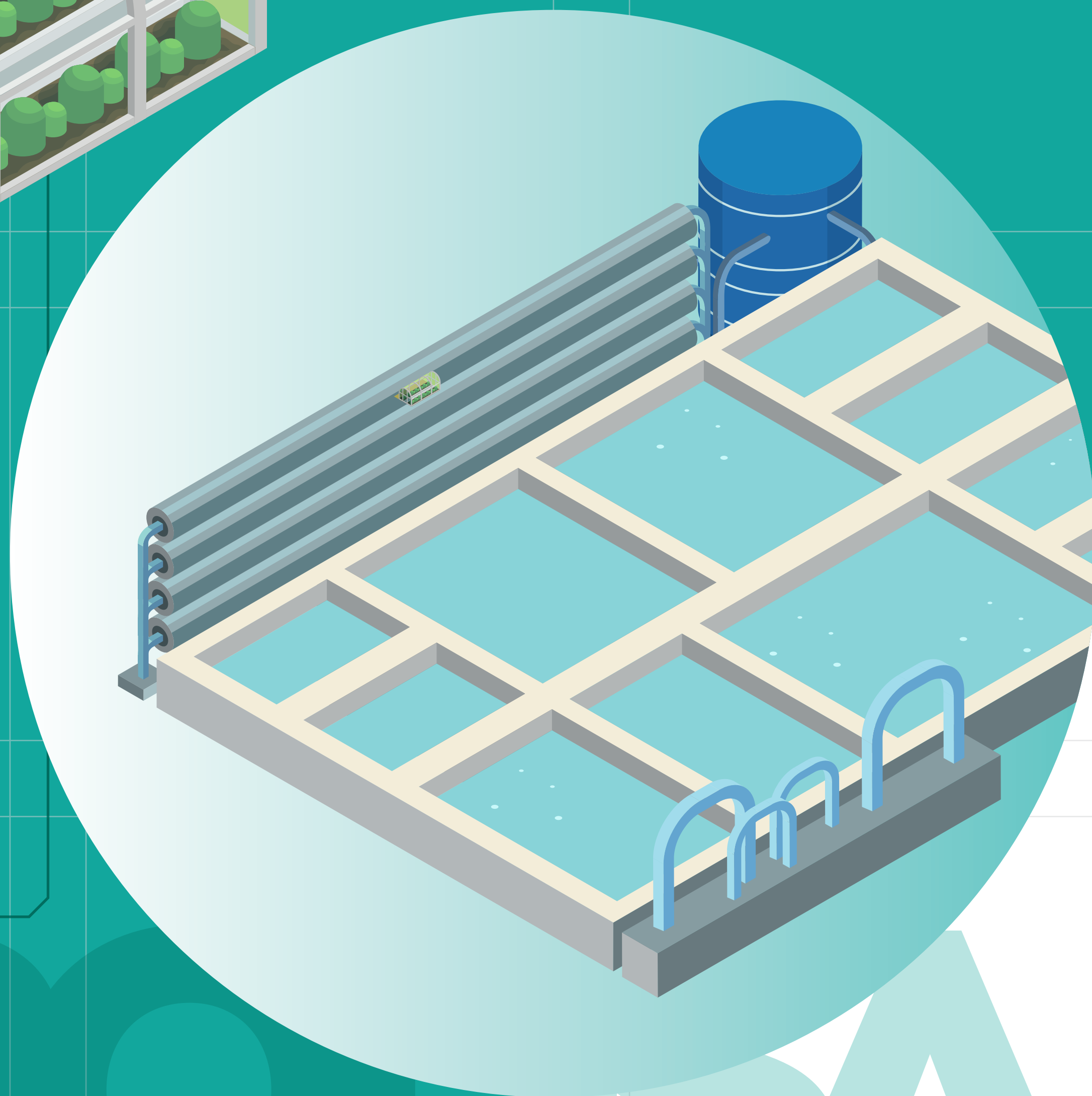
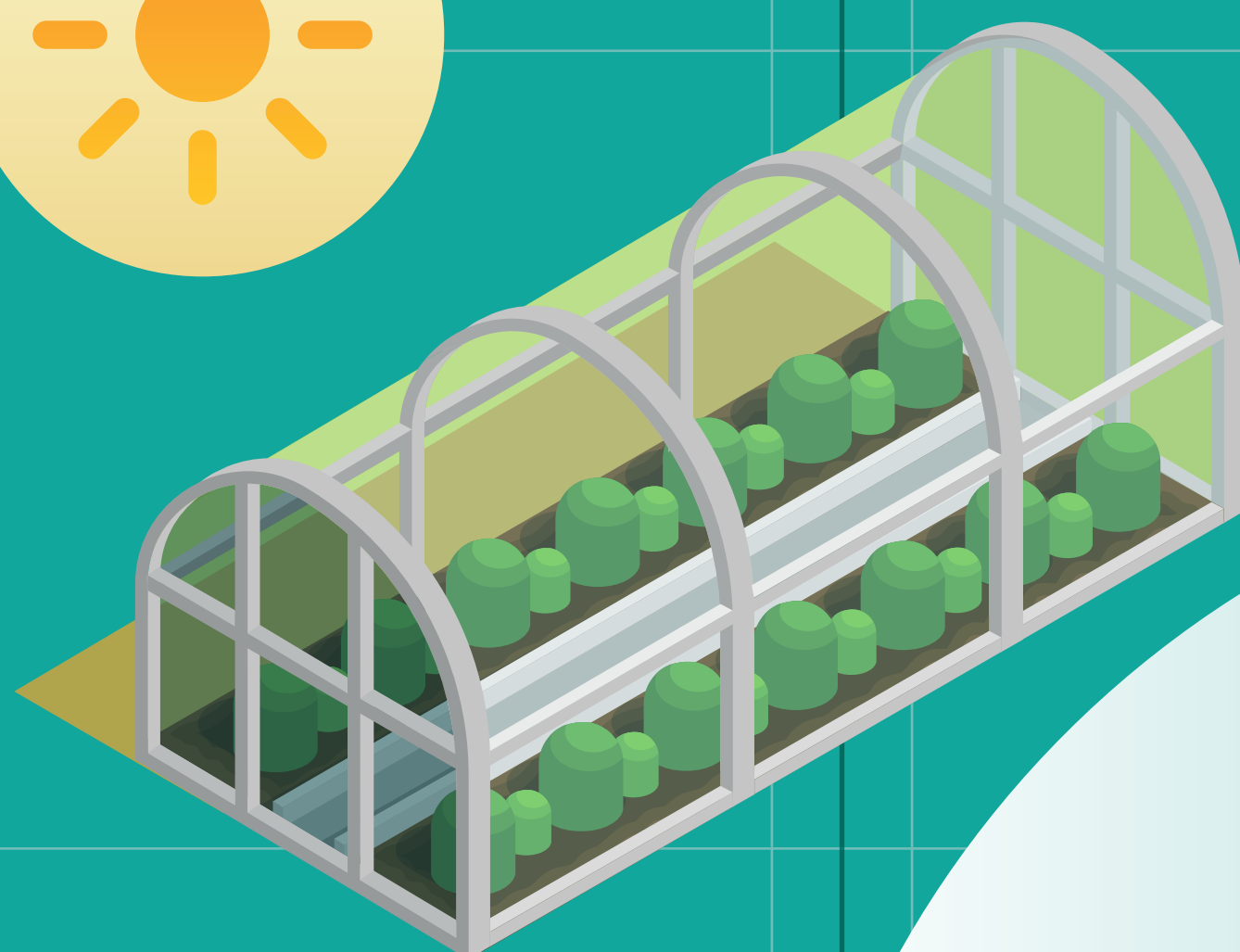
HOW

The desalination system is composed of a series of interconnected desalination panels where evaporation and condensation processes occur.

The outputs of each unit are freshwater and brine. In addition, each unit can gather occasional rainwater falling on its external surface. Once the feed water is pumped into the tank, the hydraulic circuit works by gravity.

The water produced by the panels, together with the rainwater, are collected and pumped to a cultivation greenhouse while the brine is pumped to a salt factory. In this unit salt is produced by evaporation and ventilation of the brine.

The produced water is used to irrigate a greenhouse and produce tropical fruits.



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Hydro 6

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HOW

Within an eco-tourist facility, in an off-grid area of Tinos, rainwater and vapour harvesting systems as well as wastewater reclamation systems are applied.

The rainwater harvesting systems implemented consist of two cisterns (100m³ and 80 m³) collecting rainwater from several surfaces (roofs, terraces etc. of the lodges) of approximately 500m² harvesting surface area.

The wastewater from the premises is treated by reed beds (constructed wetlands) coupled with UV disinfection to produce reclaimed water.

The reclaimed and harvested water is used for the cultivation of fruits, vegetables and herbs using precision irrigation techniques. A greenhouse was built to increase productivity for a variety of crops.

Also, solar-driven vapour condensation units, which work with absorption and condensation chambers are installed to recover drinking water from water vapour. Compost is produced using sludge from the composting toilet system and greens from the gardens in order to produce a valuable fertiliser for the cultivation of plants and crops.

The Ecolodge is completely energy autonomous, and all activities are powered by PV panels.

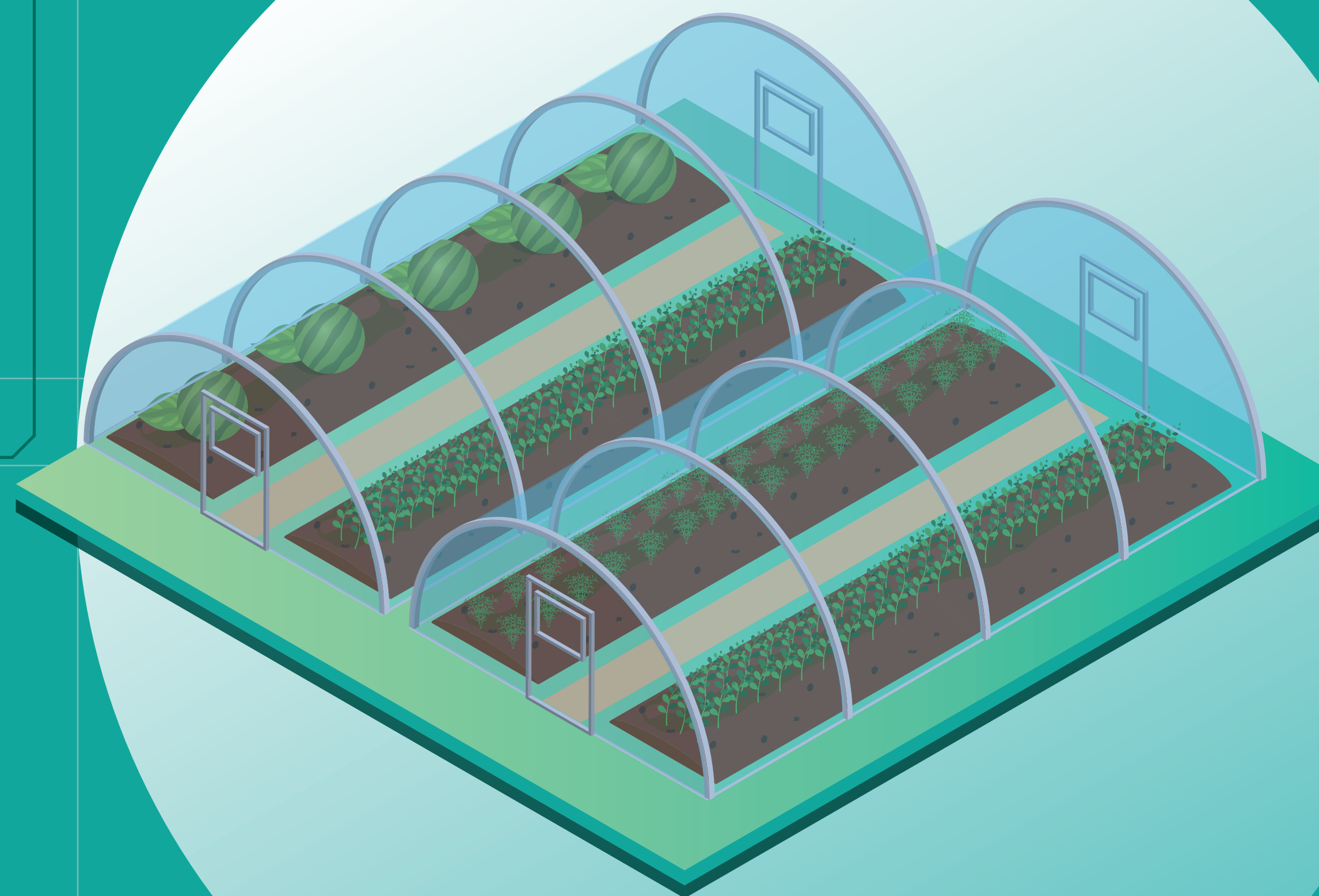


WHAT

Closing the water loop in a touristic facility

HYDRO6 is an innovative combination of water management cycles coupling agricultural and touristic activities.

It aims to demonstrate how a small touristic unit can be self-sufficient and sustainable in using their resources efficiently.



WATER MANAGEMENT CYCLES
TOURISTIC ACTIVITIES
RAINWATER GREY WATER VAPOUR
RECLAIMED WATER FOR IRRIGATION
FRUITS VEGETABLES HERBS
COMPOST ESSENTIAL OILS