

# Safeguarding the livelihood of rural communities and the environment in the Mediterranean through Nature-based Solutions

## Mara-Mediterra



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## Mara-Mediterra's hotspots of land and water degradation at a glance

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with contributions from  
**AMENHYD, ECU, SWRI, UL,**  
and **DEU DESUM**  
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## Executive Summary

This booklet aims at informing about the scope, objectives and expected outcomes of the **Mara-Mediterra** project entitled '*Safeguarding the livelihood of rural communities and the environment in the Mediterranean through Nature-based Solutions*'.

Central to the project are 5 hotspots of land and water degradation around the Mediterranean. Each of these hotspots are presented in this booklet in a similarly styled manner: starting off with a more precise description of **the challenge** affecting each case study, the booklet informs about the entity or entities at the national level who 'own' the challenge, i.e. the national body vested with the mandate to monitor and address the identified challenge and defined in this booklet as **the challenge owner**. This is followed by a description of the **root cause(s)** and the **main impacts** of the identified challenge. Last but not least, this is followed by a description of **the mission** that will be pursued by the relevant partners in the Mara-Mediterra consortium to address the challenge.

Active engagement with end users, policy makers and prospective investors is foreseen through the organization of stakeholder workshops. These are foremost intended to involve local farmer associations, rural municipality representatives and environmental NGOs in their capacity to become **drivers of change**.

Furthermore, special attention will be given to involve women farmers and young farmers in the real-life testing and validating of our array of Nature-based Solutions, so they can become **champions** of promoting the uptake of agro-ecological practices around the Mediterranean.

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## Project scope, aims and expected outcomes

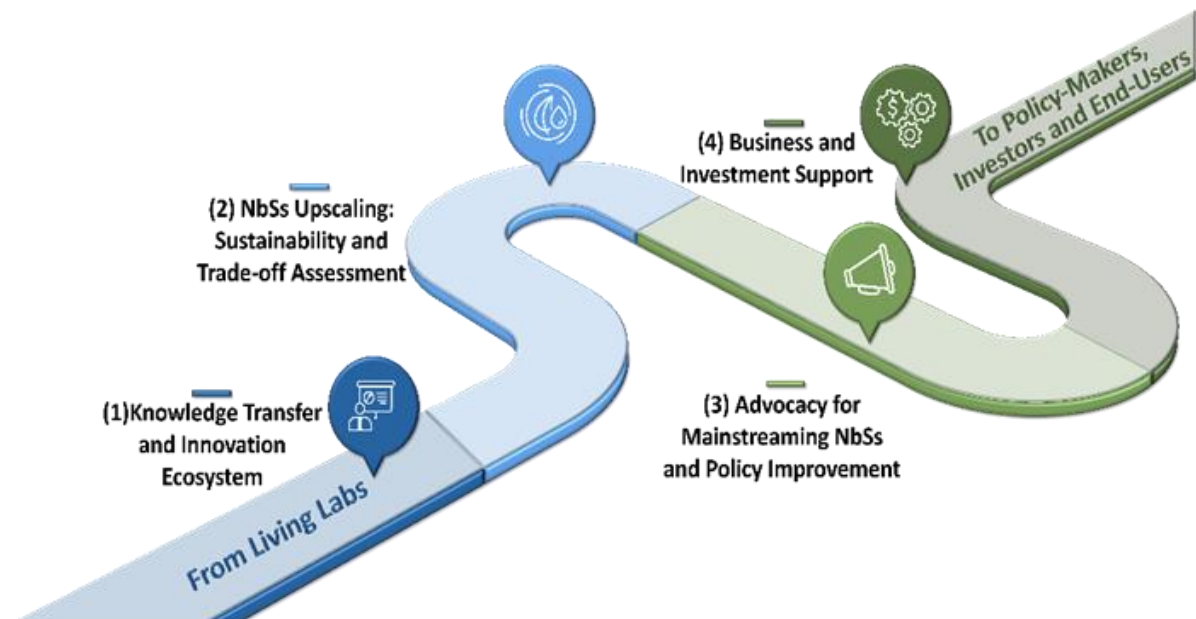
The **Mara-Mediterra research and innovation project** is aimed at addressing the hitherto low uptake of **Nature-based Solutions (NbSs)** in agro-ecosystems, with 5 ‘hotspots’ of **land and water degradation** around the Mediterranean as Case Studies.

**Our offer** consists of 9 proven, cost-effective agro-ecological practices and 4 eco-engineering solutions. A Thematic Park in Greece will bring the opportunity to showcase NbSs to key actors and the public, while acting as a knowledge transfer hub thus ensuring a project legacy.

**Our approach** adopts the concept of **Living Labs** defined as “**user-centered, open innovation ecosystems** based on a systematic **user co-creation** approach in **public-private-people partnerships**, integrating research and innovation processes in **real-life communities and settings**”. By involving multi-stakeholders around the thematic of water and land degradation in 5 Case Studies over the entire project duration, **our Living Labs will function as a demo-type environment with a cross-sector WEF (Water, Energy, Food, Ecosystem) nexus approach**. Our array of NbSs will be tested, taken up into action plans through the use of **Public Participatory GIS (PPGIS)** and ultimately integrated with new business models and policy improvement initiatives based on the value of water and land, ensuring the livelihood of rural communities and duly taking into account the well-being of the community as a whole.

**Our policy solutions** will comprise both the optimal action plans and the accompanying policy recommendations in the respective hotspots. These will then be presented to actors and stakeholders in already identified, cross-border mirror-hotspots with the purpose of gaining insight in the cross-border transferability of our solutions, thereby once again providing bottom-up input towards the drawing up of policy briefs that will be addressed to 4 overarching themes.

**Investment opportunities** for the implementation of the action plans will be explored at the local, national and international levels.





## Djelfa Gateway to Sahara, Algeria

### The Challenge: Combating desertification

To protect the country from the advancing desert, the authorities in Algeria embarked on the ambitious **Green Dam project**. Launched in 1971, this gigantic operation involved the planting of a forest strip of between 4 to 25 km wide and 1200 km long. Stretching all the way between the country's borders with Tunisia to the east and Morocco to the west, the project was designed to create 3 million hectares of woodland. However, several obstacles contributed to slowing down the success of Algeria's flagship project against the advance of the desert. In particular, soil degradation in areas dedicated to reforestation, and the growing impact of climate change, have been turning these areas into hostile environments.

The **challenge owner** is the **General Directorate of Forests (Direction General des Forets, DGF)**, within the Ministry of Agriculture in Algeria.

The **root cause** is attributed mainly to climate change which set Algeria on a course of desertification.

The **main impacts** of the ongoing desertification are of a social, economic and environmental nature. Whereas the Green Dam was intended to safeguard the country's ecological balance, the adverse effects of climate change resulted in the loss of pastoral land on which rural communities depend for their sustained livelihood. It also resulted in reduced soil fertility in agricultural areas, thereby negatively impacting on the income of farmers. Not least, the desertification resulted in a significant loss of the country's fauna and flora biodiversity.

**Our Mission:** Led by **AMENHYD**, the Living Lab in Algeria aspires to contribute to the development of novel agro-ecological solutions. The new approach will be based on the artificial creation of a micro-ecosystem at the level of each tree that will be planted in the experimental afforestation site at Djelfa, known as the Gateway to the Sahara. In addition, the approach foresees the use of renewable energies, the valorisation and reuse of by-products from wastewater treatment, as well as the use of digital monitoring tools.

Through this effort, **AMENHYD** aspires to reinstate pastoral and agricultural land productivity, thereby improving the socio-economic conditions of the population and provide fuel wood to rural communities. **AMENHYD** estimates that this effort will support Algeria's commitment to decreasing GHGs emissions by 7% by 2030.



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## Coastal area of Nile Delta, Egypt



### The Challenge: Combating water and soil salinization

The construction of the Aswan Dam has led to significantly reduced river flood flows reaching the Nile Delta. Coupled with a rising sea level over the past couple of decades, this progressively led to increased seawater intrusion in the Delta. Moreover, as the land is no longer inundated with silt-laden peak flows, the natural fertilization of the lands cultivated by the farmers in the Delta was lost. Farmers thus became dependent on the purchase of artificial fertilizers which brought a negative impact on their income. In addition to sustainable solutions to address water and soil salinization, alternative systems of primary production based on circular bio-economy principles are needed urgently, so as to minimize the pressures on the environment and restore the sustainable livelihood of farmer communities in the Delta.

The challenge owner is the **Ministry of Water Resources and Irrigation (MWRI)**, which is in charge of managing the water resources of the Arab Republic of Egypt, i.e. mainly the Nile. In addition to the monitoring of aquifers carried out by its Groundwater Sector, the Coastal Shore Protection Authority within MWRI is monitoring the sea level rise phenomenon.

The **root causes** that gave rise to the identified challenge are sea level rise, resulting in salt water intrusion in the shallow aquifer of northern Nile Delta, coupled with less water flowing to the northern part of the Nile Delta due to the construction of the Aswan Dam which regulates the Nile River flows.

The **main impacts** of the identified challenge are water and soil salinization and the resulting loss in agricultural productivity and thus farmers' income.

**Our Mission:** Led by ECU, the Living Lab in Egypt aspires to bring a solution to the water and soil salinization problematic in the Nile Delta that is based on a novel primary production system using aquaponic wetlands. Preliminary experimental trials at the lab scale have shown that combining aquaculture and hydroponics, the entire system has high potential to reach zero-liquid discharge. This is accomplished by continuously recirculating water between a plant bed and a fish farming habitat. Each component of the system will be further evaluated to reach optimum cost-efficiency, including the use of solar energy to run the system. In addition to this Nature-based Solution, **AMENHYD** and **DEU DESUM** bring their expert knowledge in hydrological modeling to simulate the cost-effectiveness of creating a hydraulic barrier to halt the seawater intrusion in the Nile Delta. In a first scenario of this eco-engineering solution, treated domestic effluent will be diverted to feed a string of existing, northernmost canals which run parallel to the coastline. In the second, the treated effluent will be simulated as aquifer recharge.



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## Agricultural landscape of North Aegean Islands, Greece

### The Challenge: Combating rural landscape desertification

Olive cultivation in the hilly areas - with typically shallow soils - of the North Aegean islands was traditionally considered as the main pillar of the islands' agricultural economy. The adoption of unsustainable cultivation practices, and the abandonment of traditional olive cultivation areas due to the lack irrigation water, resulted in severe desertification of the rural landscapes in the islands.

The **challenge owner** is mainly the **Regional Authority of North Aegean** within the Hellenic Ministry of Rural Development and Food.

The **root causes** which gave rise to the identified challenge are multiple and include: unsustainable agricultural practices in hilly areas, non-competitive agriculture with increased cost of production, abandonment of agricultural fields and focus on other economic activities such as tourism, climate change with prolonged drought periods in combination with extreme rainfall events resulting in erosion phenomena particularly in the hilly terrain of islands, and inadequate policies of prevention and recovery.

The **main impacts** are the degradation of soil functions and services, loss of biodiversity, reduction in availability of already scarce fresh water resources, non-productive soils and loss of agricultural income which led to the depopulation of affected areas.

**Our Mission:** Led by **SWRI**, the Living Lab in Greece aspires to develop novel agri-environmental models of olive cultivation in areas vulnerable to desertification. Being the main pillar of the agricultural sector in Lesvos, as well as in all North Aegean islands, our stakeholders are committed to join us to address the challenge of desertification and to restore soil health for the benefit of the environment and the rural communities. In this effort, the ambition of **SWRI** is to establish the first Thematic Park of agri-environmental Nature based Solutions in the Mediterranean as a hub of knowledge transfer, interaction and stakeholders' support that will contribute decisively to the needs of both science-based decision making as well as the societal awareness towards a sustainable future in cooperation with nature.



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## Akkar Al-Atika, Lebanon

### The Challenge: Combating deforestation caused by wild fires

The abundance of greenery in the mountainous Akkar Al-Atika area rendered it a major attraction for both local and foreign tourists alike. In recent years however, droughts have become more frequent, and vast tracts of the area have been almost continuously exposed to massive fire outbreaks that caused the near-total elimination of the areas' forest wealth. As burned trees were cut down, soil erosion quickened at an alarming rate. Restoration efforts are hampered due to the lack of surface water storage infrastructure and unsustainable irrigation practices. This resulted in increased conflicts both among farmers and between different water user groups, i.e. villagers and farmers. A holistic plan of action is needed urgently to restore and preserve the area's scenic beauty of years past. To sustain and conserve the rural community's livelihood, the ingredients of such an action plan would need to include solutions to store and manage rainwater in a cost-effective manner as well as to ensure the conservation of soils. Moreover, targeted awareness-raising and capacity building events should ensure the plan's alignment with national efforts for better environmental management.

The **challenge owners** at the national level are the **Ministry of Energy and Water**, and the **Ministry of Environment**.

The **root cause** of the wild fires is attributed to the collapse of the Lebanese economy which led to a decline in the standard of living and people resorted to arson to have firewood for heating in winter due to a huge rise in the price of fuel.

The **main impacts** are the increase in poverty of the local community, leading to migration since the fire outbreaks destroyed crops and killed livestock and hence sharply reduced their income. Moreover, the impacts have set the area on a path of desertification.

**Our Mission:** Led by the **Lebanese University (UL)**, the Living Lab in Lebanon aspires to put in place rainfall harvesting solutions and smart irrigation systems and to restore forests in a sustainable manner. In this context, the guidance of **DEU DESUM** will be sought to ensure sufficient water is stored to overcome periods of drought. **AMENHYD's** protocol for micro-ecosystem based afforestation in desert landscapes will be trialed and adapted to the mountainous area of Al-Atika.



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## Marmara Lake, Turkey

### The Challenge: Combating natural eco-system degradation

The **Gordes dam construction** reduced the inflow to the Marmara Lake by 70%. Coupled with prolonged droughts, the decreasing lake volume caused a significant reduction in irrigation water and impacted on the lake habitats and bird species in this Wetland of National Importance. Resolving conflicts among water users and the introduction of an alternative bio-economy model are of primary importance.

The **challenge owner** is **State Hydraulic Works (DSI)**, a governmental entity within the Ministry of Agriculture and Forestry of Turkey, which is responsible for the utilization of all national water resources.

The **root causes** that gave rise to the identified challenge are the inadequate planning of water resources in the Marmara Lake watershed, i.e. mainly the construction of the Gordes Dam. In addition, the vagaries caused by climate change, and in particular the prolonged droughts which have been witnessed in recent decades further aggravated the situation.

The **main impacts** are multi-faceted. Socially, the lake provides a significant contribution to the livelihood of the local communities as it accommodates functional services for fisheries, provides water for agricultural activities and proves to be a well-known touristic attraction hotspot. The ecological degradation of the lake has negatively impacted on the local communities in terms of job security and healthy recreational activities. The degradation of the lake ecosystem and the prevailing water scarcity caused a reduction of the profitability of all activities pertaining to the agriculture, fisheries and tourism sectors, while the environmental impacts of the challenge are associated with the reduction of water quality and the loss of biological diversity.

**Our Mission:** Led by **DEU DESUM**, the Living Lab in Turkey aspires to return the Marmara Lake to good ecological status by determining the minimum environmental flow which this would require. This will be based on a novel, dynamic monitoring and proactive intervention scheme that will draw on satellite-based data services, in-situ discharge measurements and improved technologies for supply calibration and the adapted use of meteorological predictions. Moreover, to bring a lasting solution to the ecosystem degradation, **DEU DESUM** will build up a dynamic water allocation scheme that looks not only at the environmental flow but also at the sanitary water needs of the urban settlements in the case study. The novel allocation set-up will resemble the actions of dynamically changing shears on a railway network.



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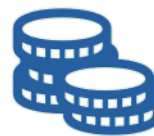
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**Partnership**

 <b>SWRI</b> Soil and Water Resources Institute	Hellenic Agricultural Organization "DIMITRA" – Soil and Water Resources Institute ( <i>SWRI</i> )	
	University of Firenze – Department of Agriculture, Food, Environment and Forestry ( <i>UNIFI</i> )	
	Integrated Resources Management Company Ltd. ( <i>IRMC</i> )	
	Dokuz Eylul University, Industrial Application and Research Center ( <i>DEU DESUM</i> )	
	AMengagement ENvironnement HYDraulique ( <i>AMENHYD</i> )	
	Egyptian Chinese University, Research & Innovation Center ( <i>ECU</i> )	
	Lebanese University - Faculty of Engineering (FoE) & Azm Center for Research in Biotechnology and its Applications ( <i>UL</i> )	
	Tensor Consulting ( <i>TENSOR</i> )	



**Duration**  
36 months



**Budget**  
2.5 million €