

## The use of Nature-Based Solutions to support sustainable Water-Ecosystems-Food NEXUS management: the LENSES approach

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### Introduction

The sustainable use of natural resources, particularly in Mediterranean region is conditioned by resources availability (water and land), changing climatic conditions, and increasing socio-economic stresses. In this context, the project “LEarning and action alliances for NexuS EnvironmentS in an uncertain future” (LENSES) is developing a stepwise approach to identify local Water, Ecosystems and Food (WEF) challenges that can be addressed in a new practical and conceptual framework, under the nexus perspective. All these activity are based on the building of an exchange and sharing environment, namely Learning & Action Alliances (LAAs) and on the implementation of participatory process (Participatory System Dynamics Modelling -PSDM) allowing the definition of specific local Nature Based Solutions (NBSs).

The proposed paper focuses on the methodology developed in the LENSES aiming to improve water allocation, enhance food security while preserving ecosystems and aiding climate change adaptation through a collecting learning process which supports the operationalization of the Water, Ecosystems and Food Nexus. Project activities involve 7 research centres, 5 SMEs and 1 NPO, with six demonstration pilot sites distributed across 6 countries in the Mediterranean basin (Figure 1) and are oriented toward the development of a new replicable methodology to define specific solutions (Nature Based) to specific issues coming from a participatory approach and stakeholder engagement process.



Figure 1. Lenses Pilot areas.

### Materials and methods

To achieve this purpose, LENSES follows a mixed approach: a) on one hand, it refers on the concept of “managing” the Nexus and accepting the reality of trade-offs and synergies, thus the inherent nature of negotiation and mediation to any nexus management process. In accordance to this, LENSES sees the alternance of conflicts and cooperation as a continuum process allowing to go deeper into the system to understand divergence of interest and social norms to work with this as part of a deep, transformative participatory approach. LAAs drive this transformation; b) on the other hand, PSDM approach focused on

Group Model Building will be used for SDM development with the aim of unravelling the complexity of WEF systems and support an improved understanding of their behaviour. Through the PSDM approach, LENSES pursues a twofold goal. Firstly, it aims at enhancing the legitimacy of the decision-making processes for the WEF nexus management by integrating different kinds of knowledge and problem understandings. Secondly, will enhance the understanding of the complex web of interactions affecting the nexus by using algorithms which link the different domains and run dynamic scenarios. Under this perspective, LENSES postulates that transition towards resilient WEF Nexus systems is only possible through the true engagement of all relevant parties in the policy-dialogue and decision-making across the domains while incorporating uncertainty.

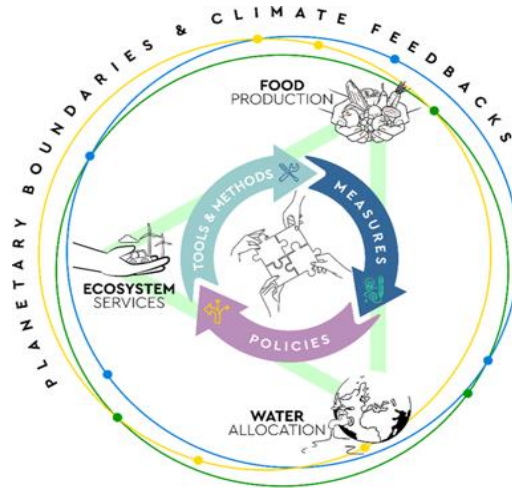


Figure 2. LENSES conceptual framework to support Learning & Action in Nexus Environments.

## Results and concluding remarks

Identified NBSs aims to co-achieve multiple Nexus Domain Objectives (i.e., sectoral goals) activating Nexus Resilience Qualities that should facilitate the transition towards more efficient and resilient Nexus systems. In this study, these measures address vulnerabilities identified in 7 pilot areas distributed across the Mediterranean region and linked to (i) socio-institutional frame, and (ii) climate change. Building on the assumption that biodiversity is the only viable pathway to guarantee water-food security, the NBS will support the delivery of ecosystem services and provide evidence-base for the broader Nexus policy dialogue. Our finding provides an evaluation framework includes a comprehensive catalogue of Nexus related NBSs, whose suitability needs to be evaluated at local level to achieve a better use of protected/natural ecosystems, increase the sustainability and multi-functionality of managed ecosystems, design and manage new ecosystems. To this end, we discuss on local WEF challenges identified in the pilot areas of the project, through a participatory process, which counted on the engagement of a diverse set of relevant stakeholders from across different level. Then, we identify potential NBSs that can help addressing these challenges and increasing the resilience of the WEF nexus, for the long-lasting benefit of local ecosystems. Ultimately, we focus on the deep transformations processes required to our social and economic systems, and the crafting of integrative governance systems and co-design aspects that are needed to operationalize the WEF nexus and bring to effect these deep systemic changes. Our findings can inform policy makers at local and national level and support the drawing of improved policies and decisions that foster a fair and sustainable allocation of resources, thus accelerating the achievement of Sustainable Development Goals.

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