

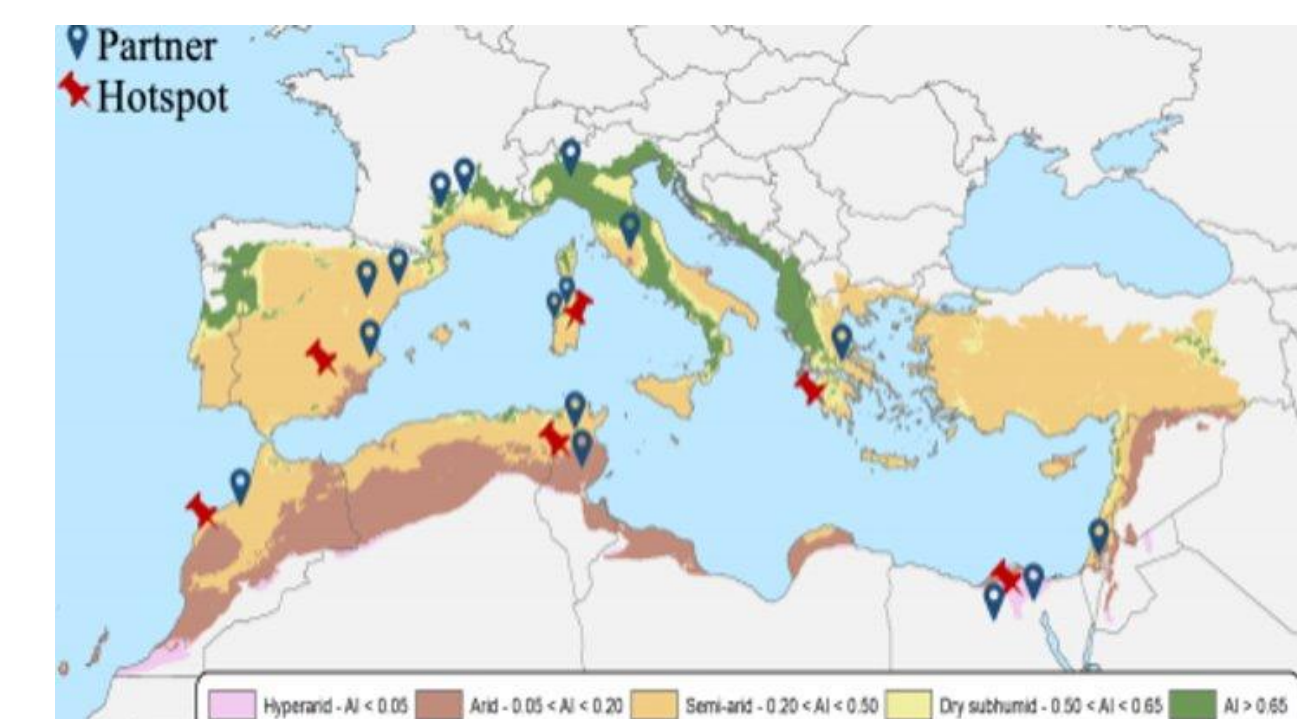
Stakeholder Mapping and Engagement in Living Labs for Co-Designing Nature-Based Solutions in Sustainable Land and Water Management: Insights from the SALAM-MED PRIMA Project

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**THE LIVING LABS PROMOTE THE CO-DESIGN OF INNOVATIVE NATURE-BASED SOLUTIONS (NBSS)
TO ENHANCE THE RESILIENCE OF ENDANGERED MEDITERRANEAN DRYLAND SOCIO-ECOLOGICAL SYSTEMS
AND TO RESTORE DEGRADED ECOSYSTEMS IN ARID AND HYPER-ARID LANDS.**

**WITHIN THE SALAM-MED PRIMA PROJECT, SIX LLS ADDRESSED THE REGION'S RURAL AND AGRICULTURAL COMPLEXITY THROUGH
STAKEHOLDER MAPPING AND NBS CO-DESIGN. DESIGNED AS LEARNING SPACES, THE LLS ADOPTED TAILORED METHODS TO EMPOWER LOCAL
STAKEHOLDERS AND SUPPORT THE SCALING OUT OF NBSS.**



- ✓ Which approach/methodological tools support the process of understanding different perspectives, developing a collective view of the challenges, and identifying potential innovation pathways?
- ✓ Could a shared framework for evaluation facilitate a more inclusive and long-lasting potential innovation pathways?

The Causal Loop Diagram: design thinking for co-creation

- The CLDs provide an overview of the complex interdependencies within each LLS socio-ecological context and the implemented solutions. **They extend systems thinking and participatory modelling approaches** illustrating multiple types of relationships between variables: positive (e.g., soil fertility increasing olive oil production), negative (e.g., reduced precipitation limiting groundwater recharge), and mixed - negative-to-positive or positive-to-negative feedbacks.
- Comparative analysis across LLS reveals notable differences in **how stakeholders perceive system complexity and conceptualize environmental challenges**. Variables were grouped into *determinant drivers*, *affected variables*, *ecosystem service impacts*, and *strategies/actions* representing NBS. The number of variables (21–47) reflects differing awareness and engagement levels. The Italian LL shows the highest complexity and broad stakeholder participation, whereas the Tunisian LL indicates a narrower framing and participation limits. Relationship types also vary, with positive links ranging from 24–41 and negative ones from 7–18, revealing distinct interpretations of system dynamics. The Italian and Greek LLS exhibit stronger socioeconomic integration, likely due to more established participatory governance.
- Some CLDs captured socioeconomic aspects well, while others did not, showing differences in stakeholder understanding, cultural context, and facilitation quality.

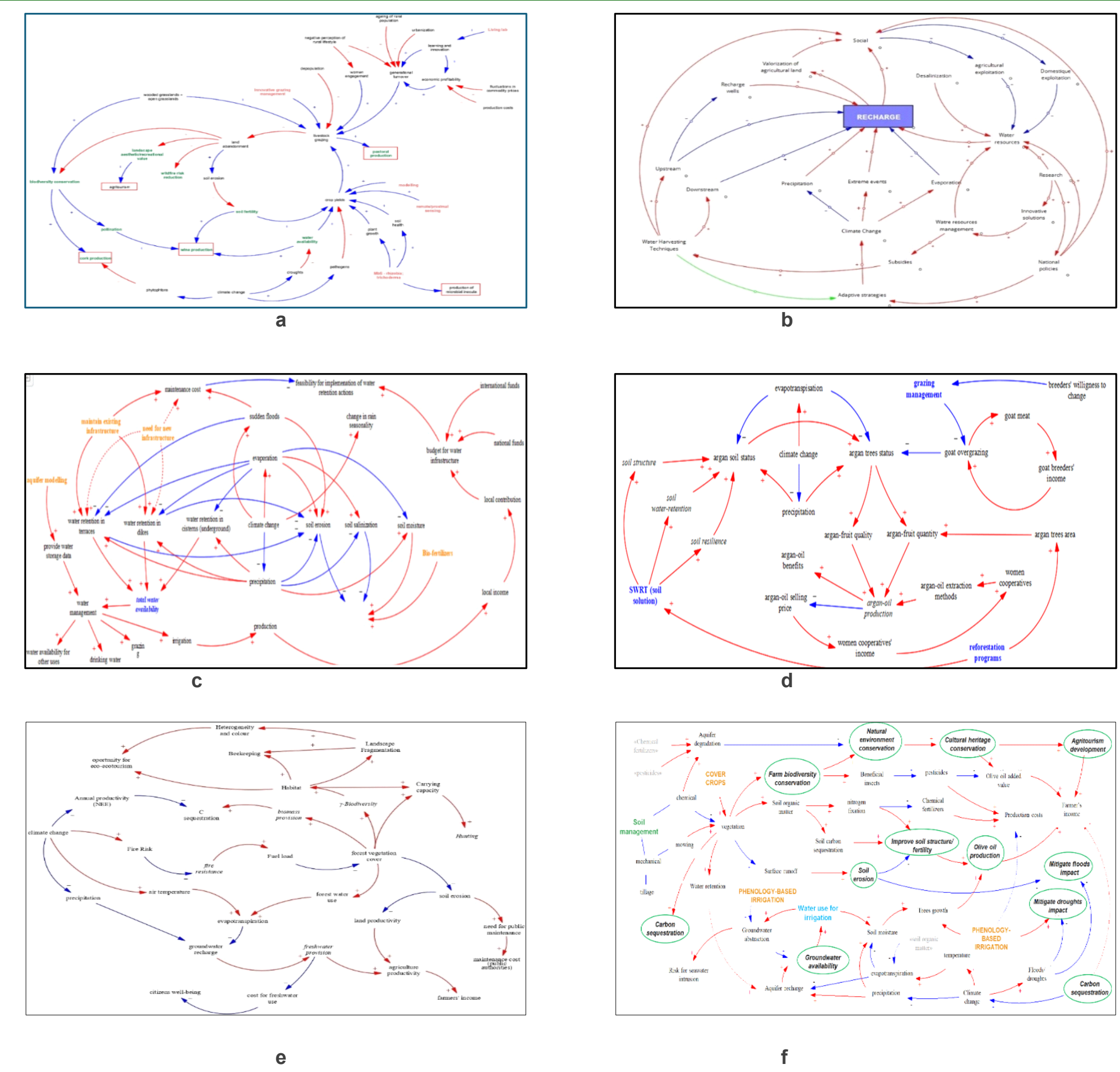


Figure 5 CLD of a) Italian b) Tunisian c) Egyptian d) Moroccan e) Spanish f) of Greek LL.

Social and political impacts

- The SALAM MED project highlights the essential role of **systematic and inclusive stakeholder identification** in the successful co-creation and implementation of NBSs.
- The CLDs proved **effective in integrating scientific expertise with local knowledge** through iterative stakeholder engagement, **bridging the gap between theory and practice** in participatory systems modelling. It supported **shared system understanding, identification of intervention areas** and **creation of new learning environments that enhanced local capacity and innovation**. Yet, some participants struggled with the visual and conceptual complexity of CLDs.
- Ecosystem services have often been undervalued, with little understanding of the interdependencies between economic productivity, ecological resilience, and socio-cultural values**. To address this gap, the project emphasized the **need to expand and adapt stakeholder mapping to capture the complex interactions between environmental, economic, and social dimensions**.
- Inclusivity** is key, with specific efforts to engage women and youth, enriching the stakeholder engagement process with diverse perspectives and promoting equity. Nonetheless, challenges in communicating with illiterate participants and marginalized groups required innovative facilitation strategies.
- Future research** should focus on strengthening **community ownership**, improving adaptive facilitation and capacity building and exploring the **Quintuple Helix Model** to integrate the natural environment as an active driver of knowledge, innovation, and sustainable transformation within socio-ecological systems.