BONEX
Boosting Nexus Framework Implementation in the Mediterranean

1st workshop results | Portugal

Workshop purpose

The first participatory workshop of the BONEX project in Portugal took place on **March 31, 2023**, in **Vidigueira, Beja, Alentejo, Portugal**. Its main objective was to apply a **Participatory Systems Mapping** methodology to collaboratively identify and analyse the key **challenges** related to the **Water-Energy-Food-ecosystems (WEFe) nexus** in the Alentejo region. Through this approach, stakeholders were invited to co-construct a shared understanding of the system by developing **Causal Loop Diagrams (CLDs)** that visually represent the interconnections, feedback loops, and dynamics within the local contexto (Figure 1).

Figure 1. Portuguese first workshop participatory exercise

The workshop brought together a diverse group of **stakeholders**, including **farmers managers and owners, regional irrigation managers, academia and regional and local authorities**. This diversity ensured a wide range of perspectives on each component of the WEFe system and enriched the group discussions.

Methods and results

The session was structured in two main parts. In the **first part**, participants were introduced to the BONEX project, the concept of **Nature-Based Solutions (NbS)**, and the results of preliminary public surveys. The methodology for the group work was also presented, including the steps to follow for building the causal diagrams.

During the **second part**, participants were divided into **six working groups**: two focused on **water**, two on **food**, one on **energy**, and one on **ecosystems**. Each group began by identifying two to three key problem variables. Then, they selected a central variable to place at the core of the CLD and collaboratively mapped out the causes, consequences, and potential solutions. Arrows were used to show relationships between

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variables, marked with a "+" sign for reinforcing (positive) effects and a "–" sign for balancing (negative) effects, helping to identify **feedback loops**.

As part of the group exercise, participants worked collaboratively to map out system interactions through CLD. The resulting CLDs represent the perceptions and insights of each group on the main challenges and dynamics within the WEFe nexus. Below you can find two of the CLD elaborate by the participants (Figure 2).

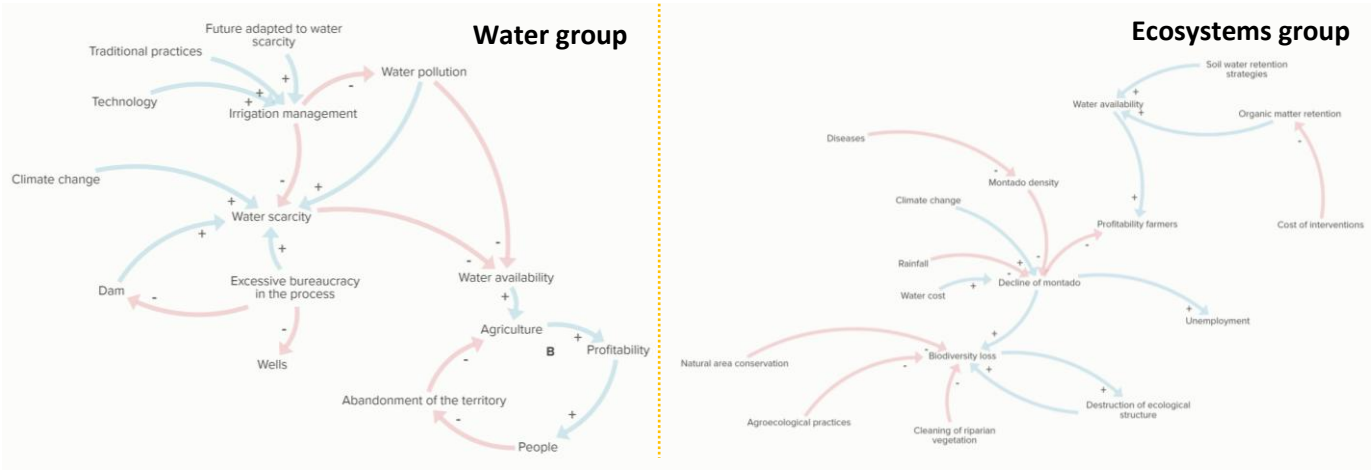

Figure 2. – Illustrative CLDs produced by participants: one addressing water-related challenges and another focusing on ecosystem dynamics.

The **main challenges** identified were:

- In terms of **energy**, energy needs and cost, and conflict the land use energy with other land uses.
- Regarding **ecosystems** the problems discussed were the decline of Montado (*i.e.:* agrosilvopastoral system), biodiversity loss, and soil erosion.
- In relation to **food**, the production, especially the intensive production, and its economic profitability.
- In terms of **water**, the problems identified were scarcity, reserves and access to water.

Participants identified **agricultural intensification** as a cross-cutting driver with multiple consequences, particularly after the start of irrigation from the Alqueva reservoir in 2002. This intensification was seen to increase energy demands and soil erosion, reduce soil fertility and biodiversity, and contribute to rural depopulation. **Public policies** were also seen as promoting monocultures and landscape homogenisation, which in turn undermined ecosystem resilience. The key variables that emerged from the exercise included: **agricultural intensification**, **water availability**, **biodiversity loss**, and **public policy orientation**.

Then each group **presented their CLD to the plenary**, explaining their system logic and the connections identified. Finally, participants were also asked to identify which variables represented **ecosystem services** by placing stickers to indicate importance, allowing for a visual prioritization of key system elements. Using stickers, each participant marked the variables they considered to provide key ecosystem functions or benefits. This step allowed for a visual prioritisation of the system components most valued for their ecological contributions.

Among the many variables identified, some stood out as particularly important across the different WEFe dimensions. **Soil fertility**, **biodiversity**, **water availability**, and the **maintenance of the Montado agroforestry system** were consistently recognised as critical ecosystem services. These variables were not only frequently marked but also centrally positioned in the system diagrams, suggesting a shared perception of their pivotal role in supporting agricultural productivity, ecological resilience, and landscape multifunctionality. Additionally, **erosion control** and **pollination** were highlighted as essential regulating services, especially in relation to agricultural and biodiversity-related challenges. These results indicate that stakeholders perceive the degradation of ecosystems as directly linked to broader systemic issues such as food production, water scarcity, and climate vulnerability. Therefore, preserving and enhancing these ecosystem services is seen not only as an environmental priority but also as a foundation for the long-term sustainability of the region's socio-economic system.

Following the workshop, the BONEX project team conducted a **post-production analysis** of the group diagrams. A single, consolidated CLD was created by merging the outputs from all groups, ensuring conceptual consistency in variable naming and structure (Figure 3).

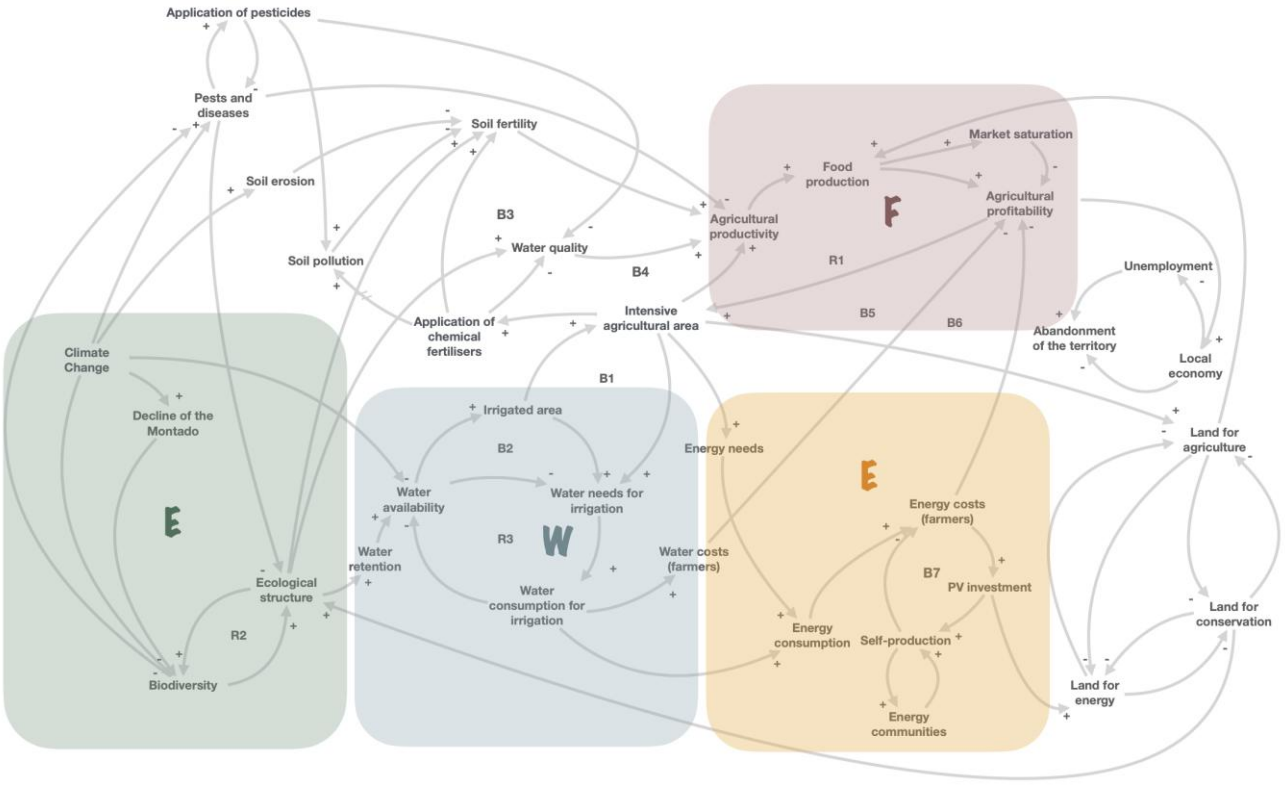

Figure 3.- Post-produced CLD, based on the 6 CLDs resulted from the 1st workshop.