BONEX

NEXUS BRIDGING PLAN

Nature-based solutions

Alentejo **Portugal**

PRIMA
PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

This project is part of the PRIMA programme supported by the European Union.

NEXUS BRIDGING PLAN

Nature-based solutions in Alentejo, **Portugal**

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BONEX Boosting Nexus Framework Implementation in the Mediterranean

PRIMA PARTNERSHIP FOR RESEARCH AND INNOVATION IN THE MEDITERRANEAN AREA

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Executive summary

Alentejo region has historically struggled with water scarcity, hindering agricultural modernisation and public water supply. The construction of the *Alqueva* dam increased water availability, shifting agriculture from extensive cereal crops to irrigated olive groves, vineyards, and almond orchards. However, agricultural intensification and climate change have led to water shortages, ecological imbalances, soil degradation, biodiversity loss, and the decline of traditional ecosystems like the *montado*.

The WEFe (Water-Energy-Food-ecosystems) concept highlights the interconnected relationship between water, energy, food production, and ecosystem conservation. The BONEX project[1] aims to provide practical and adapted tools, examine concrete and context-adapted technological innovations, enhance policies and governance and facilitate WEFe nexus practical implementation that balances the social, economic, and ecological trade-offs.

In the scope of the BONEX project, Nexus Bridging Plans were developed for seven Demonstration Projects across the Mediterranean. The NBPs are practical context-specific plans guiding the transdisciplinary implementation of WEFe solution approaches targeting policy makers and practitioners. The current plan outlines the WEFe Nexus Bridging strategy for implementing Nature-Based Solutions (NbS) to address WEFe challenges in *Alentejo* region, Portugal.

NbS can be an effective strategy for addressing environmental issues, especially in the context of climate change. In *Alentejo* region, NbS were implemented to address the WEFe nexus challenges. Measures like cover crops, water line restoration with biodiverse hedgerows, and Mediterranean pond restoration were applied on three farms. Their benefits and costs were assessed through fieldwork with the farmers where the NbS were implemented.

The BONEX project used a participatory approach to identify key WEFe challenges, engaging stakeholders at national, regional, and local levels. Three workshops were held, starting with a Participatory System Mapping (PSM) approach, which helped in mapping the main WEFe nexus relations, validate the project's interventions and co-develop additional solutions, followed by an assessment of the main barriers and opportunities for action.

Despite the benefits of NbS, several barriers hinder their widespread adoption. Financial constraints, lack of technical knowledge, limited cooperation among stakeholders, and bureaucratic complexities pose significant challenges. To overcome these obstacles, complementary measures such as financial incentives, streamlined policies, enhanced cooperation across the agricultural value chain, and improved knowledge-sharing mechanisms are needed. Encouraging stakeholder collaboration, fostering education on sustainable practices, and leveraging funding opportunities can further facilitate NbS implementation.

NbS can play a significant role in addressing WEFe nexus challenges

The key takeaway from this case is that NbS can play a significant role in addressing WEFe nexus challenges. However, they need to be integrated into a broader transformation of agricultural systems. Looking ahead, a multi-sectoral approach that integrates technological innovation, policy reform, and community engagement will be essential to ensuring the long-term sustainability of *Alentejo*'s agricultural landscape and natural resources.

[1] https://bonex-prima.eu

Methodological approach

The aim of BONEX in the *Alentejo* region, Portugal, is to exploit nature-based solutions as a technology to increase the climate resilience of agricultural land, promote soil health, water retention and quality, while activating ecosystem functions that provide valuable services such as pest suppression, pollination and nutrient fixation. The BONEX project adopted a collaborative approach to address the challenges of the WEFe nexus, involving surveys and workshops with the active contribution of different stakeholder groups, promoting integrated and sustainable solutions to respond to local and global needs. The participatory approach was structured in six steps.

The BONEX project adopted a collaborative approach to address the challenges of the WEFe nexus

The **scoping assessment** began with a preliminary analysis of the socio-economic context and local perceptions regarding the WEFe nexus. This was conducted through surveys administered in five small towns across the *Alentejo* region. Following this, **the first collaborative workshop** focused on mapping the WEFe nexus and identifying interconnections between Water, Energy, Food, and Ecosystems. One of the main outcomes of this phase was the development of four **Causal Loop Diagrams** (CLDs), which captured the systemic relationships in the region and supported stakeholders' understanding of WEFe dynamics.

In the post-production phase, the research team integrated the four CLDs created by stakeholders into a single unified model. This technical refinement ensured consistency and alignment across

stakeholders' representations. The **second collaborative workshop** then validated the post-produced CLD with stakeholders, who suggested adjustments as part of the participatory process. The workshop proceeded to co-create and prioritise practical solutions while identifying barriers and enabling factors for their implementation. During the **third collaborative workshop**, participants explored complementary measures specific to **Nature-Based Solutions** (NbS) for the *Alentejo* region. To further enrich the understanding of the WEFe nexus, a **non-monetary benefits survey** was conducted with local stakeholders. This survey, grounded in the Human-Nature Connectedness framework, assessed material, experiential, cognitive, emotional, and philosophical dimensions, aiming to capture both tangible and intangible values associated with the WEFe system. The diversity of participants ensured a holistic vision, although the active involvement of these groups may have reflected their priorities and interests in the proposed results.

Context description

Located in the *Alentejo* region in the south of Portugal, *Alqueva* is a multi-purpose project centred around the *Alqueva* dam, built on the *Guadiana* River. This large reservoir serves as the main water source for an extensive system comprising 72 dams and reservoirs.

The study area is known as *Alqueva* Intervention Zone, located in a region that is heavily dependent on rainfall, has an area of approximately 900,000 hectares and involves 19 municipalities and 97 parishes, 56 of which are covered by irrigation. The *Alqueva* Multi-Purpose Project boasts a vast scale, modern infrastructure, and a wide-ranging impact, enabling the irrigation of 130,0006 hectares *(Figure 1)*.
Over the years, water scarcity in the region has been one of the main constraints to its development, hindering both the modernisation of agriculture and the sustainability of public water supply systems. Through the *Alqueva* dam, the availability of water has increased in the region leading to a transformation of the landscape from vast cereal steppes into permanent crops such as olive groves, vineyards, and almond orchards, supported by intensive irrigation practices. In the short term, the primary beneficiaries of the project were farmers and consumers of products like olive oil, nuts, and wine. However, agricultural intensification and climate change have brought significant environmental and socio-economic challenges to *Alentejo*, including water scarcity, ecological and chemical imbalances in surface waters, soil degradation, biodiversity loss, and the degradation of traditional ecosystems like the *montado*[1] [2].
Climate projections indicate a decline in precipitation, more frequent, prolonged, and intense

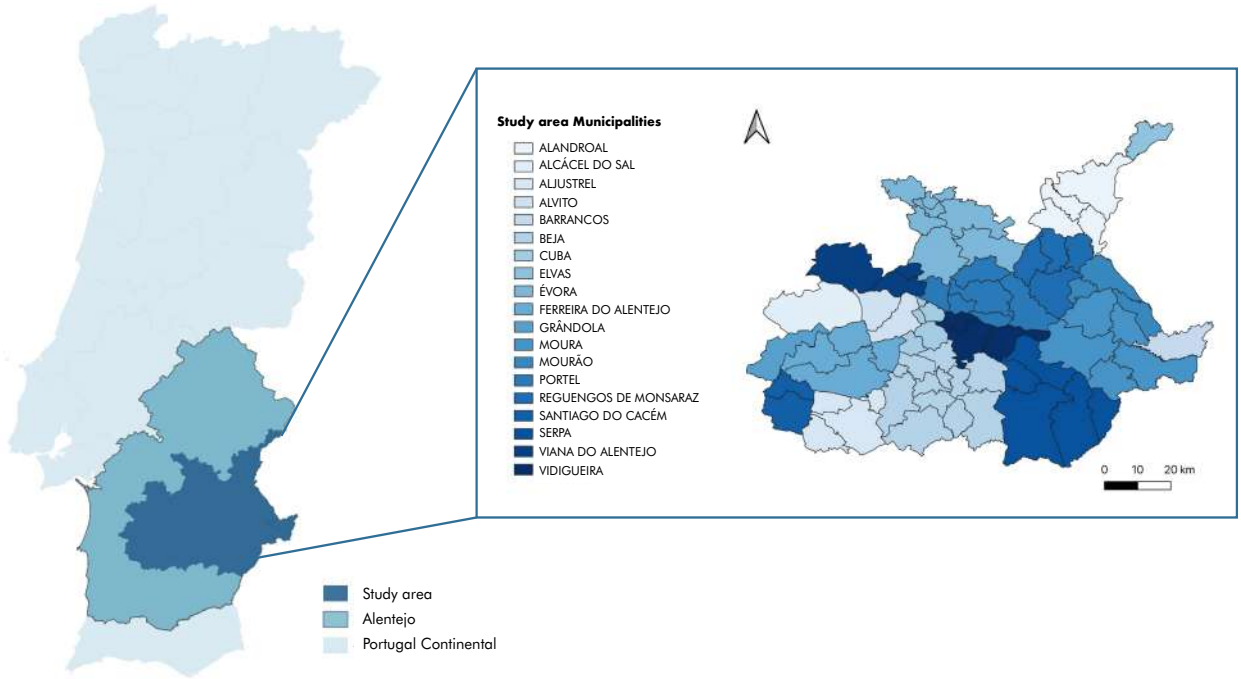

Figure 1 – Location of the 'Alqueva' irrigation area under study by the project, with the municipalities and parishes delimitations.

[1] Morgado, R. et al. (2022). Drivers of irrigated olive grove expansion in Mediterranean landscapes and associated biodiversity impacts, Landscape and Urban Planning, Volume 225, 104429, ISSN 0169-2046. URL

[2] Rodriguez Sousa, A. et al. (2023). Impacts of agricultural intensification on soil erosion and sustainability of olive groves in Alentejo (Portugal). Landscape Ecology, Vol 38(12), Pp 1-20. URL

droughts, and rising temperatures. The region is already experiencing longer heat waves, according to Portuguese Sea and Atmosphere Institute (IPMA). The Mediterranean region, which includes *Alentejo*, is particularly susceptible to climate change[3]. Future projections from the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report (AR6) suggest that summer warming in the Mediterranean could exceed global annual warming by 40–50%, with increasingly frequent and intense heat waves[4]. The region also faces demographic challenges, including an aging population and rural depopulation, which may lead to further decreases in population density in some areas over time, according to the Portuguese National Statistics Institute (INE).

WEFe Nexus issue

During, the participatory workshop, stakeholders have identified the main WEFe-related problems in agrifood system in Alentejo. The development of the CLD *(Figure 2)* was based on these issues and allowed an understanding of the system's dynamics. Nowadays, one of **the main challenges in the Alentejo region are the unsustainable agricultural practices that are degrading soils,**

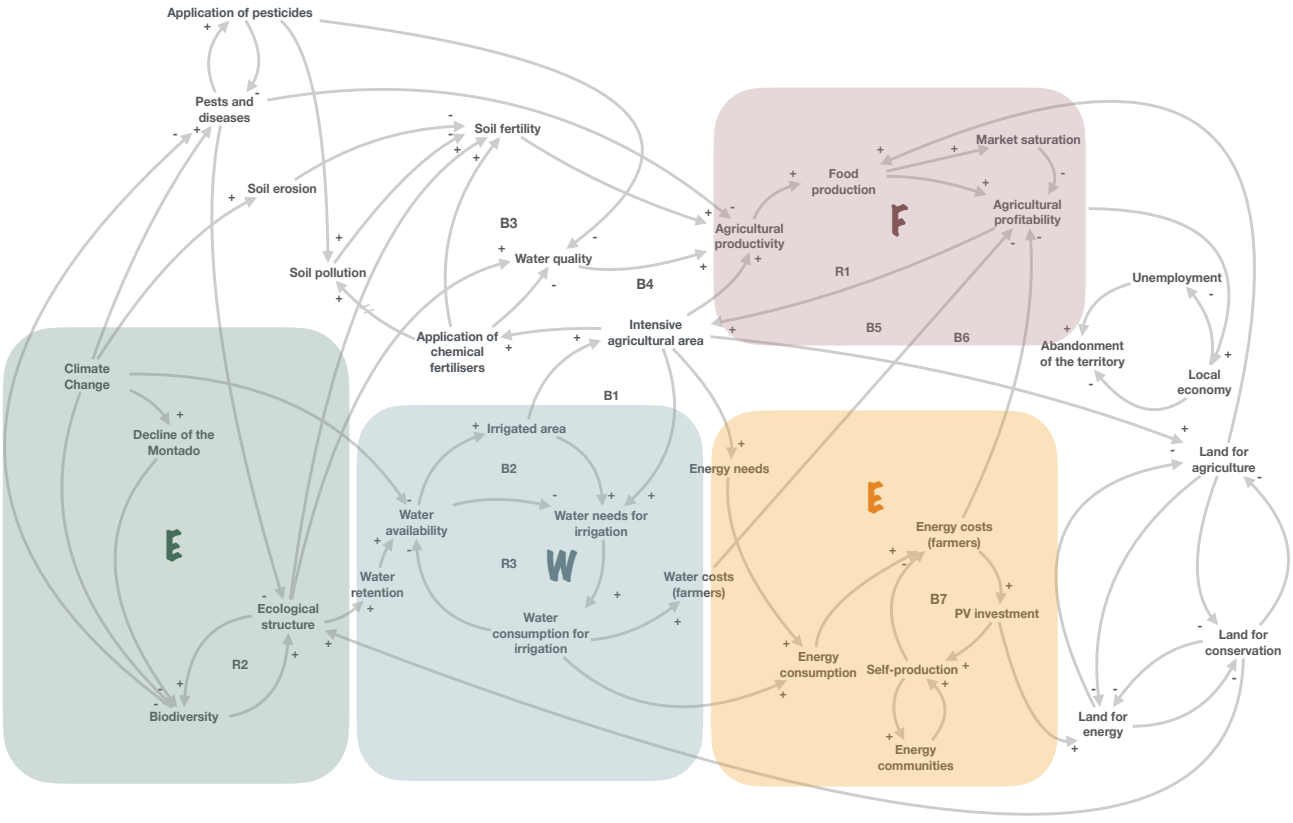

Figure 2 – Causal Loop Diagram resulting from the project's participatory approach that defines the participants' perception of the Alentejo agricultural system.

[3] MedECC, 2024. Interlinking climate change with the Water-Energy-Food-Ecosystems (WEFE) nexus in the Mediterranean Basin. [Drobinski, P., et al. (eds.)]. MedECC Reports. MedECC Secretariat, Marseille, France, 24 pp., ISBN: 978-2-493662-09-5. URL

[4] IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34. URL

harming biodiversity, and wasting water, particularly through the cultivation of high-water-demand crops. Climate change exacerbates this situation, creating a vicious cycle where natural resources are depleted, agricultural productivity declines, and rural landscapes are transformed. This leads to long-term negative economic impacts and accelerates environmental degradation. While resistance to change is expected from those accustomed to the current model, the costs of inaction—such as the collapse of agricultural enterprises, rural abandonment, and the need for future restoration of degraded ecosystems—are far greater. This issue impacts society as a whole, with food security and the health of ecosystems at risk. The situation also presents an opportunity to revitalise rural communities, reduce inequalities, and build a more resilient food system for the future. **The expansion of intensive agriculture** increases productivity and profitability, contributing to local economic growth and reducing unemployment. However, this growth can saturate the market and lower profits. Additionally, agricultural expansion conflicts with conservation areas. Conservation areas help improve ecological structures and help combat pests and diseases affecting crops, which support soil fertility and water quality. This leads to less dependence on pesticides and chemical fertilisers, further improving the environment and reducing agricultural profitability.

Climate change worsens problems like soil erosion and water scarcity, while the degradation of ecosystems such as the *montado* accelerates biodiversity loss. Improving water retention could enhance irrigation but would increase water demand. Expanding irrigated areas intensifies agriculture, raising energy consumption and costs for farmers. To mitigate these costs, investments in renewable energy and energy self-sufficiency are essential. This set of challenges requires a balanced, sustainable approach that protects natural resources, revitalises the rural economy, and prepares the agricultural system for future challenges.

The main stakeholders

in the WEFe nexus in the 'Alentejo' agricultural landscape include farmers (private, cooperatives, associations), local government authorities, energy providers, environmental NGOs, research institutions, and water management authorities.

The main stakeholders in the WEFe nexus in the *Alentejo* agricultural landscape include farmers (private, cooperatives, associations), local government authorities, energy providers, environmental NGOs, research institutions, and water management authorities. Farmers are primarily focused on maximising productivity while managing water and energy use, given the pressing issues of water scarcity and energy costs. Local government authorities aim to balance economic growth with sustainable resource management, often mediating between agricultural and environmental needs. Energy providers focus on ensuring reliable energy supply to the agricultural sector, while environmental NGOs advocate for protecting natural resources and ecosystems, sometimes at odds with intensive agricultural practices. Research institutions contribute knowledge and evidence-based solutions, and water management authorities push for more efficient water use in agriculture. These differing views highlight the complexities of the WEFe nexus and the need for collaborative solutions to balance competing interests.

Non-monetary values

The main objective of this method is to identify and assess the various types of value and dimensions of human-nature connections, which extend beyond the monetary or market-based values associated with WEFe components. It seeks to uncover the additional benefits that the WEFe nexus can generate within a specific social-ecological context or local community. In the *Alentejo* region, 15 surveys were carried out with stakeholders deeply connected to the region's agricultural and cultural landscape. The stakeholders emphasise the region's dependence on its resources for survival and economic sustainability, while also highlighting the deep relational and cultural connections linked to these systems. Considering each WEFe element, the stakeholders interviewed emphasised various adjectives, benefits and emotions linked to each of them *(Figure 3)*, according to their experiences and perceptions of their home, which is the *Alentejo*. Local communities attach significant importance to material, emotional and philosophical connections with their socio-ecological systems. Although the experiential dimension reveals a generally positive relationship with the environment and a solid cognitive understanding, there is still potential to improve education and awareness. This knowledge can contribute to a more holistic approach to managing the WEFe nexus in *Alentejo*, ensuring that environmental sustainability and community resilience are prioritised in the future.

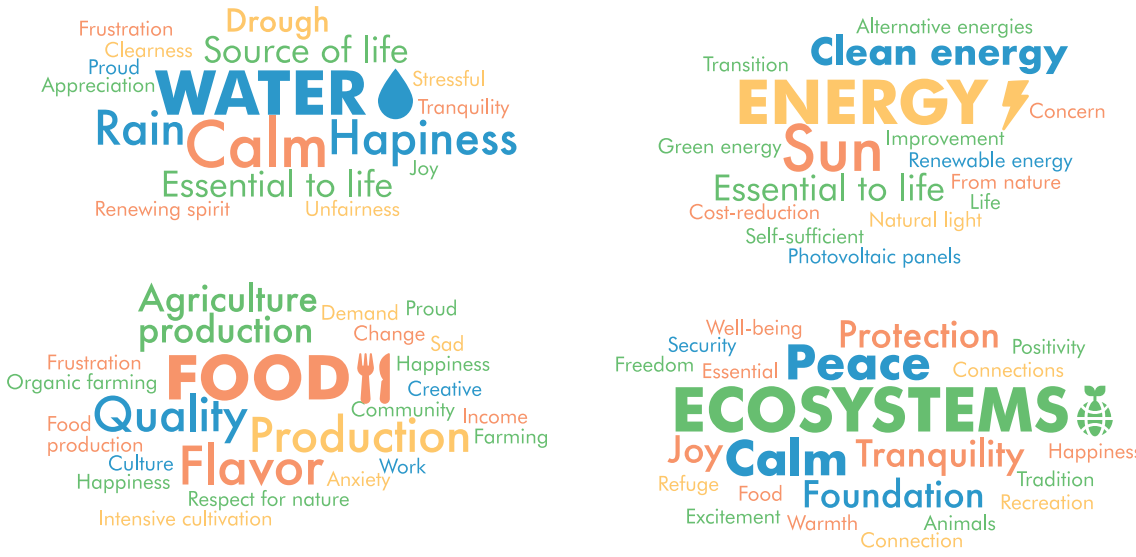

Figure 3 – Word cloud with the values identified by the interviewees to the four components of WEFe.

WEFe solution: Nature-based solutions

Nature-based solutions (NbS) offer an integrated approach to managing agricultural landscapes, aligning productive goals with ecological sustainability. Rather than relying on external inputs, NbS work with natural processes to improve soil health, water management, and biodiversity. In regions like Alentejo, where agricultural systems are increasingly challenged by climate variability, water scarcity, and soil degradation, such solutions provide a promising pathway to enhance farm resilience while

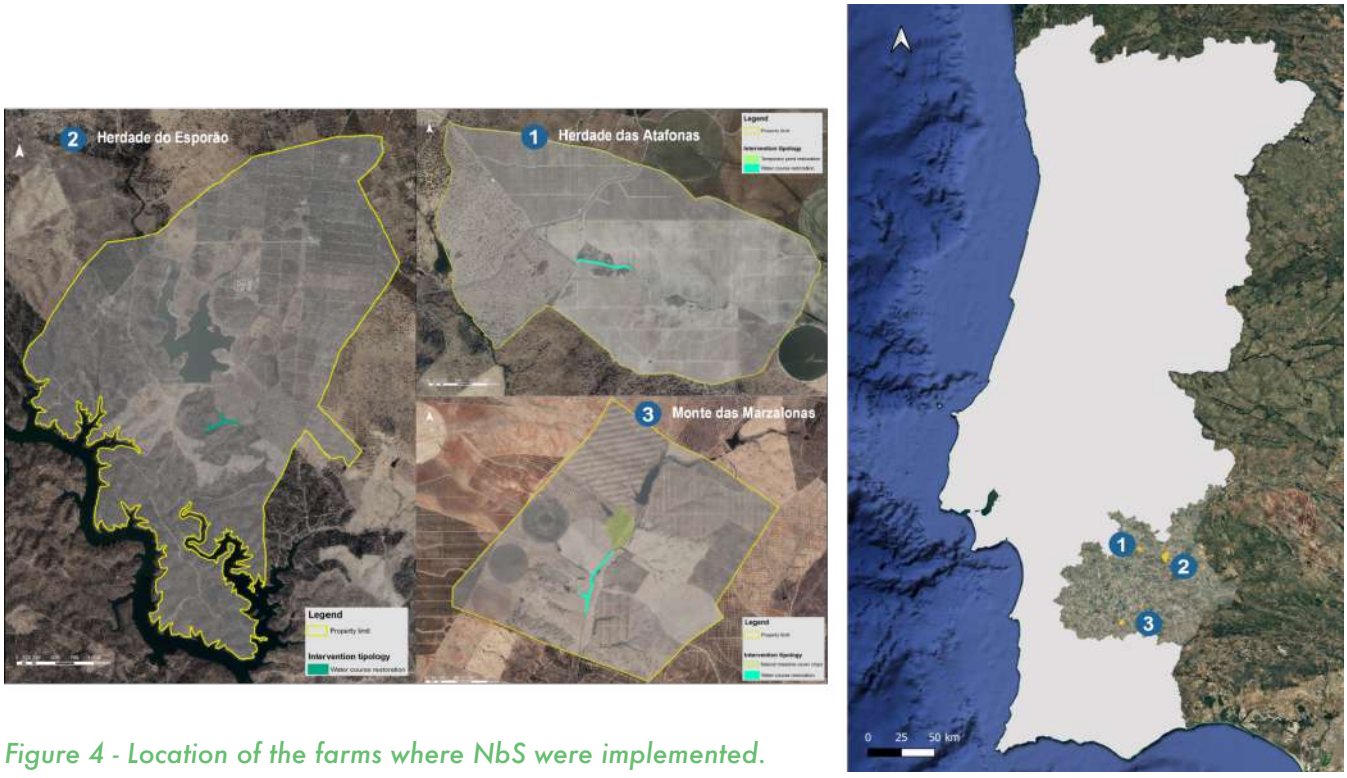

Figure 4 - Location of the farms where NbS were implemented.

preserving ecosystem functions. Within the BONEX project, NbS were tailored to local conditions and tested across three farms - *Herdade das Atafonas*, *Herdade do Esporão*, and *Monte das Marzalonas* - to demonstrate their potential to support the WEFe Nexus in practice *(Figure 4)*.

The diagram below *(Figure 5)* outlines the key steps involved in two major interventions *(Figure 6)*: (1) the establishment of **cover crops** over 10 hectares in *Monte das Marzalonas*, and (2) the **restoration of waterlines with biodiverse hedgerows** over 1,600 meters in *Herdade das Atafonas* and *Monte das Marzalonas*, as well as across 1.23 hectares in *Herdade do Esporão*. The scheme captures the full process, from initial planning and site preparation to implementation and long-term monitoring, illustrating a **structured and evidence-based approach**. These steps not only address pressing environmental challenges such as erosion, water scarcity, and biodiversity loss, but also contribute to the **long-term sustainability and resilience** of agricultural landscapes in the *Alentejo* region.

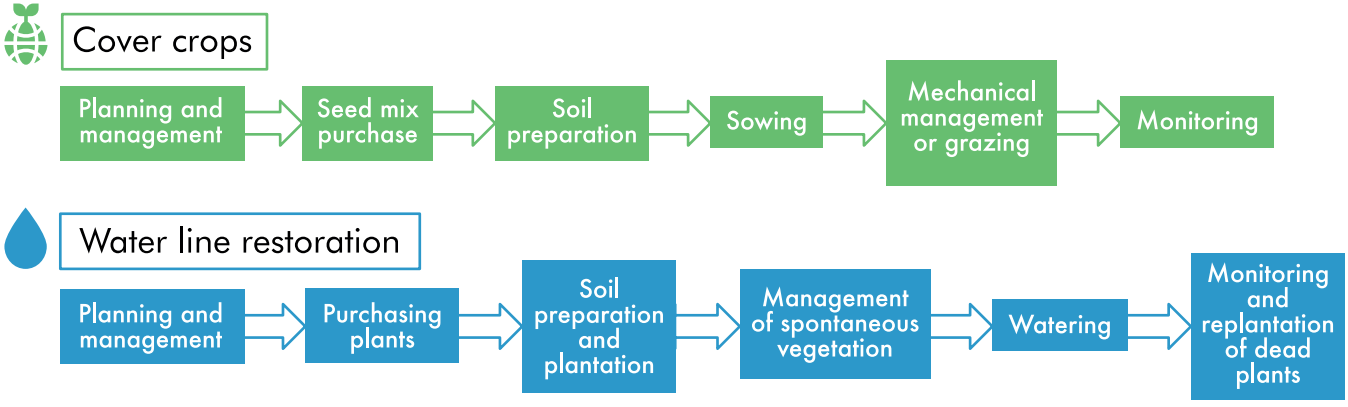

Figure 5 – Overall implementation scheme of the NbS considered.

Figure 6 – Cover crops in 'Monte das Marzalonas' on the left after the first rains of Spring (April 2024), and on the right, waterline restoration with biodiverse hedgerows in 'Herdade das Atafonas' at the beginning of Spring (March 2025).

Regarding the restoration of waterlines, plant mortality varied across locations due to a combination of factors, including **site-specific conditions, climatic variability**, and **levels of maintenance** and monitoring. Variations in soil characteristics, water availability, and exposure to extreme weather events were key determinants of plant survival. Additionally, farming practices—such as irrigation methods and pest control—played an important role in shaping the success of these interventions.

A third intervention consisted of restoring a **Mediterranean temporary water pond** (Habitat 3170*, protected under the EU Habitats Directive) in *Herdade das Atafonas* (Figure 7), covering approximately 0.08 hectares. This measure aimed

Figure 7 – Mediterranean water pond restoration in 'Herdade das Atafonas', before intervention after heavy rain with margin and bottom higher than bordering path (November 2023) and after BONEX interventions in a rainy month (March 2025).

to support local biodiversity, reinforce **ecosystem balance**, and contribute to the **conservation of protected habitats and species** in the region.

Together, these interventions contribute significantly to:

- **Water Retention:** By improving the landscape's ability to capture and hold water, especially during periods of scarcity.
- **Drought Resilience:** Enhancing water availability over longer periods helps the land better withstand drought conditions.
- **Sustainable Agriculture:** The NbS practices not only secure water resources but also maintain soil health and ecological balance, creating a more sustainable agricultural system.

Interviews and on-site visits conducted during the project revealed that stakeholders perceived a range of **additional benefits** from the NbS interventions. These included the **aesthetic value of the agricultural landscape**; visual perception of **more wildlife** on the property; the **lower opportunity cost** associated with the time required for the **soil to be in good condition** after waterlogging, **resulting in less effort in operating machinery** and labour in waterlogged soil; and the **reinforcement of the farm's brand image** and its positioning in the market. These benefits were perceived differently by the different actors, depending on the role in farm management (*e.g.* owner, landscape manager) and the personal orientation, (*e.g.* whether he/she is more profit-oriented, social welfare-oriented or ecological conservation-oriented).

Cost-benefit analysis

A cost-benefit analysis was carried out to evaluate the economic viability of two of the NbS implemented in the project: **cover crops** and **waterline restoration with biodiverse hedgerows.** The analysis considered two time-horizons (15 and 25 years) and three maintenance scenarios: **higher**, **intermediat**e, and **lower maintenance**, reflecting different levels of farmer involvement and use of external services (plantation, planning and monitoring). The values for the intermediate scenario are presented in *Table 1*, as this scenario most closely reflects reality.

Results show that **cover crops** present a positive Net Present Value (NPV) across all scenarios, suggesting they are economically viable under current conditions, with a payback period of 5 years and 5 months. On the other hand, **biodiverse hedgerows** show negative NPVs and do not recover the initial investment within 25 years under current assumptions.

Table 1 –Costs-benefits analysis for the Intermediate scenario within cover crops and waterline restoration with biodiverse hedgerows implemented in Alentejo by BONEX project.

Nature-based solutions	Time Horizon	Total Costs (€/ha)	Total Benefits (€/ha)	Net present value (NPV)
Cover crops	15 years	2 341,25 €	4 764,92 €	2 423,67 €
	25 years	2 865,70 €	6 860,48 €	3 994,79 €
Waterline restoration with biodiverse hedgerows	15 years	14 131,57 €	3 120,94 €	-11 010,63 €
	25 years	14 163,52 €	4 449,77 €	-9 713,74 €

Nonetheless, their clear environmental benefits highlight the importance of public support or incentives to enhance their financial appeal for farmers.

Barriers and complementary measures

The adoption of the NbS faces **several challenges**, according to stakeholders, which can be grouped into five key categories:

- **Funding:** A major obstacle is the limited financial capacity and stability of producers. High investment costs, along with long payback periods, also make it difficult for many to commit to sustainable practices. Additionally, there are barriers in accessing funding and finding the right information about NbS.

- **Knowledge and information:** Farmers often lack technical knowledge and specialised advice on implementing NbS. There is also a low demand for these solutions due to limited awareness and information. Moreover, there is not enough scientific research, experimentation, or technical studies to guide producers in adopting these practices at the right scale.

- **Cooperation:** There is little collaboration between the public and private sectors, and farmers and producers often work isolated. Cooperation across the entire value chain, spanning production, processing, and distribution, is also lacking, which hampers the overall effectiveness of NbS.

- **Bureaucracy and policy issues:** Lengthy licensing processes and frequent policy changes create a sense of uncertainty. Additionally, existing policies often do not reflect the specific realities of the agricultural sector, discouraging farmers from investing in more sustainable practices.

- **Social resistance:** Many producers are hesitant to adopt new practices due to traditional values and established ways of working.

To overcome the main barriers to implementing Nature-Based Solutions (NbS) in the *Alentejo* region, a set of **complementary measures** was identified through the participatory process.

These actions aim to support and facilitate NbS adoption by directly addressing the challenges previously recognised, and include:

- One of the key recommendations for the funding barrier was the implementation of **Payment for Ecosystem Services (PES)** programs, offering financial incentives to landowners who maintain or enhance ecosystem services. Farmers stressed the importance of receiving at least partial payments upfront and highlighted the necessity of effective monitoring and enforcement mechanisms to ensure proper application of NbS.

- **Rural extension programs** were also proposed as crucial tools for bridging the gap between farmers and funding opportunities. These programs would provide advisory services, technical support, and facilitate access to subsidies, grants, and **Payment for Ecosystem Services (PES)** initiatives. In parallel, **reducing water prices** for farmers adopting sustainable practices, such as regenerative agriculture or efficient irrigation, was identified as a strong incentive for scaling up NbS. Stakeholders further emphasised the need for **improved knowledge dissemination**, particularly through rural extension services, academia-business collaborations and standardised criteria across the value chain. These actions would help bridge the information gap and support the effective implementation of NbS.

- A **grouped financing approach**, facilitated by cooperatives or similar platforms, could help small-scale farmers overcome financial and logistical barriers by pooling resources and expertise.

- Establishing platforms such as **assemblies, forums, and cooperatives** could foster dialogue and enhance knowledge-sharing among farmers, policymakers, and businesses.

- To increase economic viability, stakeholders suggested promoting **shared certification schemes**, which would reduce costs for individual farmers and improve access to premium markets. **Locally based policies, initial monetary incentives**, and **ongoing farmer training** were seen as crucial to overcome cultural resistance and ensure widespread adoption of NbS.

- Moreover, **consumer education** on the environmental and social benefits of NbS was viewed as key to generating demand for sustainably produced goods, strengthening cooperation along the entire value chain.

- Finally, the proposed solutions included **adapting policies** to better fit regional needs, **improving coordination among licensing entities**, and **simplifying administrative procedures** through a centralised platform for license applications. Subsidies following a long-term agricultural vision, independent of short-term national policies, would provide stability and encourage sustainable land management.

REWEFe

To assess the status of water, energy, food and ecosystem resources, both individually and jointly, the REWEFe (Rapid Evaluation of Water-Energy-Food-ecosystem nexus) tool was used as it provides quantitative insights on the balance and resource use (production, consumption, incoming and outgoing) of water, energy and food. It also accounts for the main positive and negative ecosystem impacts in monetary terms. For the application of the tool to this case study, three scenarios were defined to assess the effects of NbS in the context of WEFe nexus in *Alentejo*. The tool was applied to the *Beja* municipality, as calculation unit. The REWEFe tool was deployed to quantitatively assess the impacts of enhanced vegetation cover and coupling of solar powered irrigation system (scenarios S1 and S2), and upscaled scenario where a higher adoption rate was assumed (S3).

From the results of the REWEFe tool (summarised in the bar charts *(Figure 8)*, but with more detailed outputs in terms of tables and indicators in the tool itself), the following key conclusions can be drawn:

- Overall, there is a decrease in **energy** consumption as the application of NbS results in less field maintenance and irrigation requirements.

- The negative impacts on the **ecosystem** are reduced as more sustainable practices are adopted *i.e.* transitioning to solar energy (S2) and expansion of natural area through measures such as river restoration.

- There is a lower consumption of **water** in all scenarios compared to the baseline as NbS reduces irrigation demands due to lower evapotranspiration losses. The production of water is also lowered compared to the baseline as more water is directed towards groundwater recharge (higher recharge fraction in S1, S2 and S3).

- Food production increases the most in the last scenario (S3) due to a higher uptake fraction as a result of improved soil nutrients. The blue

water stress is also the lowest for S3 (78%) as more blue water is available for use due to reduced irrigation requirements.

- Dependence on fertilisers is also expected to decrease in the upscaled scenario due to NbS benefits, this in turn reduces the adverse impacts (nutrient leaching and associated CO_2e emissions) on the ecosystem.

Observed synergies and trade-offs: The implementation of NbS positively impacts the environment, as fertilisers and irrigation application decreases; thereby limiting the associated CO_2e emissions and nutrient leaching. Improved nutrient management and healthier soils result in greater food production.

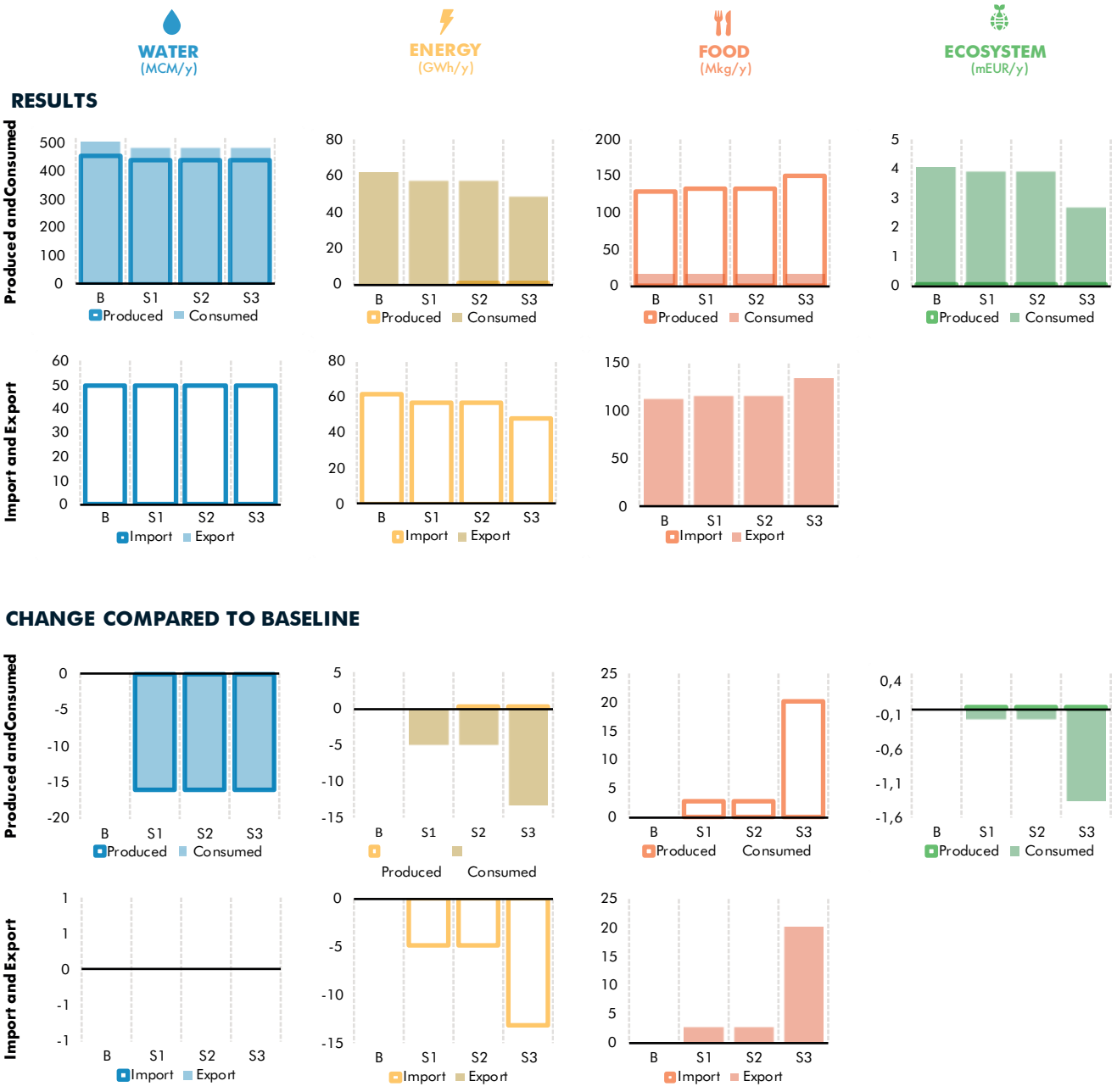

Figure 8 – Results of the three REWEF scenarios: **Baseline (B)** *– The nexus unit of the 'Beja' municipality;* **Scenario 1 (S1)** *– Application of nature-based solutions: i) increase in natural land cover, ii) reduction in energy consumption, iii) increased recharge fraction and iv) enhanced nature value;* **Scenario 2 (S2)** *– Application on nature-based solutions with being powered by solar energy; and* **Scenario 3 (S3)** *– Upscaled scenario with higher adoption rate*

Conclusion

The implementation of Nature-based Solutions (NbS) presents a promising approach to addressing the WEFe nexus challenges in the *Alentejo* region.

By promoting sustainable improving water retention, and enhancing biodiversity, NbS can contribute to long-term ecological balance and economic resilience, contributing directly, in this case, to six Sustainable Development Goals.

The intervention aligns with broader national and European strategies, including the *Alentejo* 2030 Program, the European Green Deal, and the EU Biodiversity Strategy for 2030. These frameworks emphasise sustainable water management, ecosystem restoration, and climate resilience.

Through the BONEX project, NbS were implemented in three farms in *Alentejo*, demonstrating their potential to mitigate climate change impacts, enhance soil health, and support ecosystem services such as pollination, nutrient cycling, and water retention. The participatory and transdisciplinary approach taken in this project played a key role in engaging stakeholders, identifying challenges, and co-creating solutions. Workshops facilitated the exchange of knowledge between researchers, policymakers, and farmers, helping to bridge the gap between science and practical implementation.

Despite the potential benefits, challenges such as financial constraints, social resistance and bureaucratic barriers need to be overcome to ensure successful implementation. Therefore, for these solutions to be effectively adopted, complementary measures such as financial support, policy alignment, cooperation between stakeholders and knowledge transfer are essential.

Moving forward, a holistic approach that integrates technological advancements, policy reforms, and community engagement will be necessary to maximise the impact of NbS. Strengthened collaboration among policymakers, farmers, and researchers will be essential in scaling these solutions, ensuring that the region builds a resilient and sustainable agricultural system. Long-term monitoring and adaptive management strategies will be crucial to ensure the continued effectiveness of NbS in the face of climate change and evolving socio-economic conditions.

Strengthened collaboration among policymakers, farmers, and researchers will be essential in scaling these solutions, ensuring that the region builds a resilient and sustainable agricultural system.

The main conclusion in this case is that NbS can constitute an important solution to tackle some of the WEFe challenges, but they must be part of a wider transformation of agricultural systems. By fostering a collective commitment to sustainability, *Alentejo* can become a model for balancing agricultural productivity with environmental conservation.

Consortium

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