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Accelerating the Restoration of Seagrass Meadows in the Mediterranean area through **Innovative ecosystem-service based Solutions**

Policy Recommendations

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Introduction

Scaling of seagrass restoration across the Mediterranean.

> “Conservation alone is no longer enough; restoration must become a strategic priority.

Global ecosystem degradation has made ecological restoration an increasingly urgent policy priority, as conservation measures alone are no longer sufficient to halt biodiversity loss and maintain ecosystem functions. This challenge is particularly acute in the marine environment, where restoration remains technically complex, costly, and underdeveloped. In the Mediterranean, *Posidonia oceanica* meadows are among the most valuable yet threatened ecosystems, providing essential services such as carbon sequestration, biodiversity support, and coastal protection. Their restoration has therefore become a strategic priority for both biodiversity conservation and climate action. This report examines the ecological, legal and financial dimensions of *Posidonia* restoration in the context of the EU Nature Restoration Regulation. It analyses the current status and threats affecting *Posidonia* meadows, reviews the legislative and institutional frameworks supporting restoration, and assesses available public and emerging private financing mechanisms.

Drawing on the case studies developed through the **ARTEMIS project pilot sites** in Greece, Italy and Spain, the report identifies key implementation gaps and opportunities, and proposes policy recommendations to support the effective scaling of seagrass restoration across the Mediterranean.

1 Nature restoration

> “Ecosystem restoration succeeds only when governance, finance, science and society work together.

Ecosystem restoration, while not a new concept, has gained renewed **strategic importance** as a central response to the global biodiversity and climate crises. International policy frameworks such as the United Nations Decade on Ecosystem Restoration (2021–2030) and the Convention on Biological Diversity Kunming–Montreal Global Biodiversity Framework have elevated restoration into a global policy priority, setting measurable targets for the recovery of degraded ecosystems. Achieving these targets depends not only on ecological feasibility but also on **enabling governance conditions**, including coherent legal frameworks, institutional coordination, adequate financing, stakeholder participation, and access to scientific knowledge. Restoration is therefore increasingly understood as a social–ecological process, requiring coordinated action among public authorities, local communities, scientific institutions, and economic actors to ensure long-term and socially legitimate outcomes.

Within this context, the European Union adopted the **Nature Restoration Regulation** as its first legally binding framework for large-scale ecosystem restoration, establishing targets to restore at least 20% of degraded ecosystems by 2030 and all ecosystems in need of restoration by 2050. The Regulation operationalizes these commitments through National Restoration Plans to be prepared by all Member States, linking restoration planning to long-term spatial, regulatory, and budgetary frameworks.

Financing remains a critical challenge: restoration is costly and often delivers ecological results only over long timeframes, yet it is increasingly recognized as an **investment in natural capital**, generating substantial returns through ecosystem services, climate resilience, and local economic development. The EU’s policy framework therefore combines public funding with efforts to mobilize private finance and emerging market-based instruments, reflecting the growing view that restoring ecosystems is both an environmental necessity and an economic opportunity.

Against this broader policy background, ***Posidonia oceanica*** represents a particularly important case, as its restoration **combines biodiversity, climate, and coastal resilience objectives** in a single marine ecosystem.

2 *Posidonia oceanica*: strategic context

> “Protecting and restoring *Posidonia meadows* is an investment in biodiversity, climate resilience and coastal communities.

Posidonia oceanica is the dominant endemic seagrass species in the Mediterranean Sea, forming extensive underwater meadows that are among the region’s most important marine ecosystems. Although widespread, the species grows slowly, has low natural recovery, and is therefore highly vulnerable to disturbance and difficult to recover once degraded.

Its conservation status across the EU Mediterranean remains **unfavourable**, with major pressures including coastal development, anchoring, dredging, pollution, eutrophication, sediment alteration, and climate change (especially marine heatwaves and warming seas). These combined pressures have caused significant meadow decline across both eastern and western Mediterranean regions over recent decades.

Posidonia meadows deliver **critical ecosystem services**: they support biodiversity, fisheries, coastal protection, nutrient cycling, and water quality, while also acting as one of the most efficient natural carbon sinks globally. Their ecological and economic value is exceptionally high, making them a strategic natural asset for climate mitigation, biodiversity protection, and coastal resilience.

Despite long-standing protection measures, continued decline demonstrates that conservation alone is insufficient. **Restoration is increasingly necessary** and includes:

- **Passive restoration:** removing the pressures causing degradation and allowing natural recovery;
- **Active restoration:** direct interventions such as transplanting shoots, seed planting, and seabed management where natural recovery is too slow or no longer possible.

Successful restoration depends on combining scientific planning, long-term monitoring, and effective protection of restored areas from recurring pressures.

Because of its ecological importance and continued decline, *Posidonia* restoration is increasingly addressed through dedicated legal and policy instruments at international, regional and EU levels.

3 Legislative and institutional framework for *Posidonia* restoration

The restoration of *Posidonia oceanica* is supported by a **comprehensive and multi-layered legal framework** spanning international conventions, Mediterranean regional agreements, and European Union legislation. While only some instruments refer explicitly to *Posidonia* or restoration, together they create a robust governance basis for conservation, restoration, climate action, and marine spatial planning. The recently adopted **EU Nature Restoration Regulation** is the most direct and operational instrument, establishing legally binding restoration targets for marine habitats, including seagrass ecosystems, and providing the principal implementation framework for EU Member States.

Table 1 Policy and legal instruments mentioning restoration and *P. oceanica*
Explicitly (✕) and implicitly (✓)

International Conventions	Explicitly mentions *P. oceanica*/ Seagrass Ecosystems	Explicitly mentions restoration	Implicitly mentions restoration
Convention on Biological Diversity (CBD)	✕	✓	✕
Kunming-Montreal Global Biodiversity Framework (GBF, 2022)	✕	✓	✕
Ramsar Convention	✕	✕	✓
Bern Convention	✓	✓	✕
Convention on the Conservation of Migratory Species of Wild Animals – Bonn Convention	✓	✕	✓
The United Nations Framework Convention on Climate Change (UNFCCC)	✓	✓	✕
Paris Agreement	✕	✓	✕
High Seas Treaty (BBNJ Agreement)			✓
Regional (Mediterranean) Conventions			
Barcelona Convention	✓	✕	✓
EU policy and legislation			
The Environment Action Programme to 2030	✕	✓	✕
EU Biodiversity Strategy 2030	✕	✓	✕
The EU Nature Restoration Regulation (NRR)	✓	✓	✕
EU Habitats Directive	✓	✓	✕
Water Framework Directive (WFD, 2000)	✕	✕	✓
Marine Strategy Framework Directive (MSFD, 2008)	✕	✕	✓
The Common Fisheries Policy	✕	✓	✕
Council Regulation on management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea	✓	✕	✓
Ocean Pact	✓	✓	✕

4 Funding and financing for *Posidonia* restoration

Restoring *Posidonia oceanica* requires **sustained financial resources over long timeframes**, yet current funding remains insufficient compared with estimated restoration needs across the Mediterranean. **Public funding** continues to be the primary source of support, but it is often fragmented, project-based, and not aligned with the long-term ecological recovery of marine habitats.

To scale restoration effectively, a diversified financing model is needed that combines stable public investment with **complementary private and market-based mechanisms.** While EU and national public funds remain the backbone of restoration finance, private contributions, philanthropic support, and emerging instruments such as **payments for ecosystem services** and **nature credits** are increasingly recognised as potential sources to complement public resources and support long-term restoration.

Table 2 Main funding sources for *Posidonia* restoration.

Funding category	Funding sources (examples)	Relevance for *Posidonia* restoration
National public funding	National budgets, environmental funds, research programmes, ETS revenues	Core funding source for restoration, monitoring, and institutional implementation
EU public funding	LIFE, ERDF, Interreg, EMFAF, Horizon Europe, Recovery and Resilience Facility	Supports pilot projects, research, regional cooperation, and large-scale implementation
Private funding	Philanthropic foundations, donor institutions, corporate sustainability investments	• Complements public funding, particularly for pilot actions, innovation and local engagement
Market-based instruments	Payments for ecosystem services, green bonds, biodiversity/nature credits, blended finance	Emerging mechanisms with potential to mobilise long-term private capital linked to ecosystem service benefits

The practical application of these legal and financing frameworks is illustrated through the ARTEMIS pilot sites, which provide insights into implementation challenges and opportunities across different Mediterranean contexts.

5 ARTEMIS case-study context and key findings

> “The challenge is no longer recognising the need for restoration—it is delivering it at scale.

The **ARTEMIS project (Accelerating the Restoration of Seagrass Meadows in the Mediterranean area through Innovative ecosystem-service based Solutions)** provides a practical basis for assessing how restoration of *Posidonia oceanica* can be implemented across different Mediterranean contexts. Focusing on *Posidonia oceanica*, the project tests active and passive restoration approaches at pilot sites in **Crete, Sardinia, and Menorca**, while also examining broader governance and conservation conditions in **Monfalcone**.

The comparative analysis of the legal, governance and financing dimensions across the pilot sites shows that the legal basis for *P. oceanica* protection is already well established under international, regional, and EU law, while the framework for active restoration is still developing. Recent policy developments, especially the Nature Restoration Regulation, create new opportunities by introducing **binding restoration obligations** for marine habitats. However, implementation remains **fragmented** across countries, as restoration is often still treated as a **project-based activity** rather than a permanent public policy function. **National procedures for permitting, technical standards, monitoring, and long-term planning are not yet consistently in place,** limiting the ability to scale restoration beyond pilot actions.

Financing presents a similar challenge. **Public funding remains the main source** of funding across the pilot sites, primarily through EU programmes such as LIFE, Interreg, EMFAF, and Horizon Europe, as well as national environmental and research budgets. Yet these sources remain **insufficient**, fragmented, and often short-term, while *P. oceanica* restoration requires sustained investment over long ecological timescales.

In this context, the ARTEMIS project also explored the potential of ***Posidonia* credits** as a complementary mechanism to mobilise private finance by linking *Posidonia's* ecosystem service benefits—particularly biodiversity value and blue-carbon storage—to biodiversity and carbon credit systems, although their development requires robust governance, monitoring, and verification frameworks to ensure environmental integrity and credibility.

Overall, the ARTEMIS case studies show that the key challenge is not legal recognition of restoration but creating coherent implementation frameworks and reliable financing mechanisms capable of supporting restoration at meaningful scale across the Mediterranean.

6 Accelerating Seagrass Restoration and Finance - 15 Policy Recommendations to Turn Ambition into Action

Based on the findings of the ARTEMIS project, the following **recommendations aim to bridge the gap between policy ambition and operational delivery** and to accelerate the restoration of *Posidonia oceanica* and other seagrass ecosystems across the Mediterranean. They build on the legislative, institutional and financing analysis, as well as the lessons emerging from the ARTEMIS project pilot sites. The policy recommendations are structured around four priority areas:

I. Strengthen Strategic Planning and Governance Alignment

1. **Ensure ambitious, scientifically robust and timely National Restoration Plans (NRPs):** Member States should submit NRPs by September 2026 that are based on sound ecological data, transparent prioritisation criteria, and clear restoration pathways. NRPs should also identify governance gaps and serve as strategic instruments for linking restoration priorities with long-term funding under future EU and national programmes.

2. **Strengthen the European Commission's and Barcelona Convention's guidance and coordination role:** The European Commission should provide clearer guidance on *Posidonia*-specific restoration criteria, monitoring standards and financing alignment during the evaluation of NRPs. The Barcelona Convention can complement this by promoting regional coherence and knowledge-sharing across Mediterranean countries.

3. **Establish a solid scientific basis to guide restoration:** Restoration decisions should always be based on comprehensive baseline assessments, including habitat condition, pressures and ecological functioning. Passive restoration should be prioritised where possible, while active restoration should only proceed where scientific evidence supports its feasibility and long-term success.

4. **Develop dedicated *Posidonia*-specific restoration frameworks:** Countries should establish clear legal and administrative procedures for *Posidonia* restoration, including permitting, technical standards, monitoring requirements and institutional responsibilities. Such frameworks are essential to reduce regulatory uncertainty and enable implementation at scale.

5. **Integrate marine biodiversity and blue-carbon considerations into climate governance frameworks:** Seagrass ecosystems should be formally recognised within national climate planning and carbon accounting systems. This would strengthen links between biodiversity restoration, climate mitigation and adaptation, while opening access to climate-related funding streams.

II. Operational Implementation and Institutional Capacity

6. **Strengthen the role of marine spatial planning and MPAs for *Posidonia* recovery:** Marine Spatial Planning, Marine Protected Areas and Natura 2000 should be used as core tools for preventing further degradation and enabling natural recovery. Effective protection and pressure reduction should be recognised as restoration actions in their own right.

7. **Prioritise compliance and passive restoration before active interventions:** Restoration should only proceed where damaging pressures, such as anchoring, destructive fishing or pollution, are effectively addressed. Passive restoration through pressure removal should be the default first step, with active restoration used selectively where natural recovery is insufficient.

8. **Embed structured stakeholder engagement in restoration planning and implementation:** Stakeholder participation should be systematically integrated into both the preparation of NRPs and site-level restoration actions. The Nature Restoration Regulation, draft NRPs should be made publicly available in a timely and accessible manner to ensure transparency, accountability, scientific scrutiny, and meaningful stakeholder participation. Early and transparent engagement can improve legitimacy, facilitate coordination across governance levels, reduce conflicts, and strengthen long-term social support for restoration measures.

9. **Strengthen institutional capacity:** Public authorities, protected area managers and practitioners need targeted training and operational guidance to implement restoration effectively. Building long-term institutional expertise is critical to move beyond isolated pilot projects.

10. **Promote restoration knowledge transfer and innovation in the Mediterranean:** Mediterranean countries should support peer-learning and exchange of practical experience from pilot initiatives such as ARTEMIS. Innovation in restoration methods, monitoring tools and financing approaches should also be actively encouraged.

III. Public Financing Architecture

11. **Ensure reliable and adequate core public funding for restoration:** Public funding should remain the backbone of seagrass restoration, supported through dedicated budget lines and multi-year allocations. Stable financing is essential because ecological recovery requires long-term interventions and monitoring.

12. **Secure predictable financing under the Multiannual Financial Framework (MFF) 2028–2034:** The next EU budget should ensure dedicated support for marine restoration through integrated funding instruments and national programming. *Posidonia* restoration should remain eligible across biodiversity, climate, cohesion and research funding streams.

II. Operational Implementation and Institutional Capacity

13. **Establish enabling conditions for nature-based financing instruments:** Clear governance frameworks are needed before scaling private financing tools such as payments for ecosystem services or nature credits. This includes legal certainty on ecosystem service ownership, valuation methodologies and eligibility criteria.

14. **Safeguard ecological integrity and financial credibility in marine nature credit markets:** Any future marine nature credit schemes must be based on verified ecological outcomes, strong MRV systems and independent certification. Credits should never be used as offsets for environmental damage, rather to support compliance and additionality to restoration targets.

15. **Develop an EU legislative framework for nature credits, including *Posidonia* ecosystems:** The EU should establish a harmonised legal framework for nature credits to ensure transparency, consistency and market integrity. This framework should explicitly account for marine ecosystems, including *Posidonia* meadows, and build on lessons from pilot initiatives such as ARTEMIS.

7 Conclusions

Achieving large-scale restoration of *Posidonia oceanica* meadows requires a systemic shift from fragmented, project-based interventions to coordinated, long-term strategies supported by coherent governance and adequate financing. Restoration must be treated not as a marginal environmental activity, but as a strategic investment in natural capital, climate resilience, and sustainable economic development.

This report provides a policy roadmap for this transition, outlining practical steps to align governance, secure adequate financing, and mobilize public and private actors to enable large-scale and measurable restoration outcomes across the Mediterranean.

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