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ARTEMIS

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

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Policy Recommendations

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Plan Bleu and The Green Tank

Main Author(s):
Dimitra Syrou, Ioli Christopoulou, The Green Tank
Arnaud Terrisse, Alice Wittevrongel, Plan Bleu

Partners involved

Contributors and Reviewers: All partners

Plan Bleu, The Green Tank, Hellenic Centre for Marine Research (HCMR), Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA), Mediterranean Coast and Sea Foundation (MEDSEA), Minorcan Institute of Studies – Socio-environmental Observatory of Menorca (IME-OBSAM), Municipality of Monfalcone, ECOACSA, EY Denkstatt, Bax & Company.

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Executive Summary

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.

Nature restoration

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.

***Posidonia oceanica*: strategic context**

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.

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.

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: *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.

ARTEMIS case-study context and key findings

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.

Policy Recommendations
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 presented in this report, as well as the lessons emerging from the ARTEMIS project pilot sites, which are presented in the Annex. 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. Early and transparent engagement improves legitimacy, reduces conflicts and strengthens 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.

IV. Responsible Development of Market-Based and Private Financing Instruments

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.

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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Acronyms:

Convention on Biological Diversity (CBD)
Carbon Border Adjustment Mechanism (CBAM)
Common Fisheries Policy (CPF)
Corporate Sustainability Due Diligence Directive (CSDDD)
Corporate Sustainability Reporting Directive (CSRD)
European Commission (EC)
European Maritime, Fisheries and Aquaculture Fund (EMFAF)
European Regional Development Fund (ERDF)
Emissions Trading System (ETS)
European Union (EU)
Global Biodiversity Framework (GBF)
Good Environmental Status (GES)
Intergovernmental Panel on Climate Change (IPCC)
Marine Strategy Framework Directive (MSFD)
Member States (MS)
Nature Restoration Regulation (NRR)
National Restoration Plans (NRPs)
Prioritised Action Framework (PAF)
Sustainable Finance Disclosure Regulation (SFDR)
Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol)
United Nations Convention to Combat Desertification (UNCCD)
United Nations Framework Convention on Climate Change (UNFCCC)
Water Framework Directive (WFD)

ARTEMIS project

ARTEMIS (Accelerating the Restoration of Seagrass Meadows in the Mediterranean area through Innovative ecosystem-service based Solutions) is an EU-funded project under the Interreg Euro-MED Programme, implemented for a period of 33 months (January 2024-September 2026). The main objective of the ARTEMIS project is to restore and conserve seagrass meadows, with a focus on *Posidonia oceanica*, the endemic seagrass species of the Mediterranean Sea. This goal is pursued by developing and implementing innovative restoration protocols and integrating ecosystem service values into financial and policy frameworks. By fostering transnational cooperation and engaging multiple Mediterranean stakeholders, ARTEMIS seeks to ensure the sustainable management of seagrass habitats.

The project brings together ten partners from five countries (Bulgaria, France, Greece, Italy, Spain) and four pilot sites: Crete (Greece), Sardinia and Monfalcone (Italy), and Menorca in the Balearic Islands (Spain). Passive and active restoration techniques for degraded *Posidonia oceanica* meadows are being implemented at three of these sites: Crete, Menorca, and Sardinia.

Figure 1: *Project Partners and Pilot sites*

At these locations, the project collaborates with public authorities, research centers, NGOs, and SMEs throughout all stages of restoration. This includes activities such as stakeholder engagement and awareness raising, ecosystem service valuation, the development of innovative financing schemes, and the enhancement of relevant policy frameworks.

In Monfalcone, where Posidonia meadows are absent, the project focuses on assessing the environmental status of seagrasses (*Cymodocea nodosa* and relict *Posidonia oceanica*) in Panzano Bay. This work involves literature review, stakeholder engagement and awareness raising, and policy development to provide evidence and identify priority areas for conservation and future restoration.

Introduction

With the rapidly declining health of ecosystems worldwide, traditional conservation efforts alone are no longer sufficient to safeguard biodiversity and maintain ecological functions. As a result, **ecological restoration** has emerged as a critical priority to actively recover degraded habitats and support ecosystem resilience. This challenge is particularly pronounced in the marine environment, where limited knowledge, logistical complexity, and high costs make restoration efforts both difficult and resource-intensive. Among marine ecosystems, ***Posidonia oceanica*** (*P. oceanica*) **meadows** are of exceptional ecological importance, providing carbon sequestration, habitat for diverse species, and coastal protection, yet they are experiencing significant decline across the Mediterranean Sea. Consequently, developing effective restoration strategies for *P. oceanica* is essential to counteract these losses and sustain the vital services these seagrass meadows provide.

The report examines **the restoration of *Posidonia oceanica***, focusing on ecological, legislative, and financial aspects within the framework of the EU **Nature Restoration Regulation (1991/2024/EC)**.

The first section contextualizes Posidonia restoration, as it explores ecological restoration, presents the main provisions of the Nature Restoration Regulation and introduces the need for restoration funding. The second section presents an overview of *Posidonia oceanica*, detailing its current status, threats, and the ecosystem services it provides. The third section examines the legislative and institutional frameworks for restoring *Posidonia oceanica* meadows, identifying opportunities and gaps. A comparative analysis highlights common challenges and opportunities across regions, drawing insights from the examination presented in the previous section. The fifth section offers policy recommendations, providing guidance on scientific, operational, legal, and stakeholder engagement steps, as well as strategies for integrating PES and other market-based instruments.

The annex to this report presents the **ARTEMIS case studies from Greece, Italy, and Spain**, analyzing national and site-level status of *Posidonia oceanica* meadows, the supporting legal frameworks, and stakeholder perceptions. Site-specific recommendations are provided for Crete, Sardinia, Monfalcone and Menorca, consolidating lessons learned to accelerate effective Posidonia restoration.

1. Nature Restoration

Restoration is not new as a concept or practice; however, it has evolved and is being applied in more diverse ways serving the purposes of higher-scale policy objectives[1]. "*Restoration of degraded ecosystems across the globe is one of the most urgent tasks facing our generation*" state Ermgassent & Lofqvist (p.413)[2].

The decade 2021–2030 has been declared by the UN as the '**Decade on Ecosystem Restoration**', constituting a global call to action to support the recovery of degraded ecosystems. The **Kunming–Montreal Global Biodiversity Framework (GBF)**[3], adopted under the UN Convention on Biological Diversity (CBD) in 2022, includes **Target 2**, which aims to restore at least 30% of all degraded ecosystems by 2030.

Achieving restoration targets requires the establishment of clear enabling parameters that integrate ecological, policy, social and governance dimensions. Restoration success depends not only on biophysical suitability, but also on the presence of an adequate governance framework[4]. As outlined in Section 1.2, key governance components include: (i) coherent laws, jurisdiction and institutional arrangements; (ii) secure and adequate financial resources; (iii) collaboration and participation mechanisms; and (iv) science, technology and access to information[5]. The simultaneous consideration of scale, scientific knowledge, sociocultural context, financial resourcing and institutional tractability increases the likelihood of long-term stewardship of restored ecosystems[6]. In particular, structured stakeholder mapping and engagement are essential parameters for restoration planning and implementation. Identifying actors with decision-making authority, influence and interest, and developing tailored engagement strategies, enhances transparency, equity and shared ownership of

[1] Baker, S., Eckerberg, K., & Zachrisson, A. (2014). Political science and ecological restoration. *Environmental Politics*, 23(3), 509-524

[2] Zu Ermgassen, S. O. S. E., & Löfqvist, S. (2024). Financing ecosystem restoration. *Current Biology, 34*(9), R412–R417. https://doi.org/10.1016/j.cub.2024.02.031

[3] Secretariat of the Convention on Biological Diversity (CBD). (2022). Decision adopted by the Conference of the Parties to the Convention on Biological Diversity: 15/4. Kunming-Montreal Global Biodiversity Framework (CBD/COP/DEC/15/4). Montreal: Convention on Biological Diversity. https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

[4] Mansourian, S. (2017). Governance and restoration. In S. Allison & S. Murphy (Eds.*), Routledge Handbook of Ecological and Environmental Restoration* (pp. 196-208). Routledge.; Benra, F., Brück, M., Sigman, E., Pacheco-Romero, M., Shumi, G., Abson, D. J., Frietsch, M., & Fischer, J. (2024). National ecosystem restoration pledges are mismatched with social-ecological enabling conditions. *Communications Earth & Environment, 5*, Article 731. https://doi.org/10.1038/s43247-024-01909-3

[5] Mansourian, S. (2018). Governance and ecological restoration: Lessons from landscape approaches. *Environment and Development*, 27, 122–132. https://doi.org/10.1016/j.envdev.2018.07.001

[6] Richardson, B. J., & Lefroy, T. (2016). Restoration dialogues: Improving the governance of ecological restoration. *Restoration Ecology*, 24(5), 701–705. https://doi.org/10.1111/rec.12391

outcomes[7];[8]. Restoration initiatives should therefore operate within a social–ecological systems perspective, where collaboration among public authorities, local communities, economic sectors and scientific institutions strengthens legitimacy, reduces conflicts and improves the durability of restoration results[9].

1.1. The EU Nature Restoration Regulation

The European Union (EU) recognized the need for an institutional framework to urge Member States (MS) to restore degraded ecosystems and included such a target in the **EU 2030 Biodiversity Strategy** adopted in 2020[10]. Consequently, the European Commission (EC) proposed a draft **Nature Restoration Regulation** (NRR) in July 2022. In June 2024 after a period of vivid[11] debates and compromises the NRR[12] was adopted. The NRR complements the EU Nature Directives (Birds[13] and Habitats[14]) in order to respond to the continuing biodiversity crisis, affecting European ecosystems, habitats and species[15]. More particularly, 81% of habitats assessed under the EU Habitats Directive were assessed as having an unfavorable conservation status[16].

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[7] Osborne, T., Brock, S., Chazdon, R., Chomba, S., Garen, E., Gutierrez, V., Lave, R., Lefevre, M., & Sundberg, J. (2021). The political ecology playbook for ecosystem restoration: Principles for effective, equitable, and transformative landscapes. *Global Environmental Change*, 70, 102320. https://doi.org/10.1016/j.gloenvcha.2021.102320

[8] Buitenhuis, Y., & Dieperink, C. (2019). Governance conditions for successful ecological restoration of estuaries: Lessons from the Dutch Haringvliet case. *Journal of Environmental Planning and Management, 62*(11), 1990–2009. https://doi.org/10.1080/09640568.2018.1529556

[9] Benra, F., Brück, M., Sigman, E., Pacheco-Romero, M., Shumi, G., Abson, D. J., Frietsch, M., & Fischer, J. (2024). National ecosystem restoration pledges are mismatched with social-ecological enabling conditions. *Communications Earth & Environment, 5*, Article 731. https://doi.org/10.1038/s43247-024-01909-3

[10] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, "EU Biodiversity Strategy for 2030: Bringing nature back into our lives", COM(2020) 380 final, 20.5.2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380

[11] Aubert, G., & Underwood, E. (2024, July 15). *The Nature Restoration Law – A hard-fought victory for biodiversity and society*. Institute for European Environmental Policy (IEEP), https://ieep.eu/publications/the-nature-restoration-law-a-hard-fought-victory-for-biodiversity-and-society/

[12] Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869, https://eur-lex.europa.eu/eli/reg/2024/1991/oj/eng

[13] *Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:020:0007:0025:EN:PDF*

[14] Council of the European Communities. (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). Official Journal of the European Communities, L 206, 7–50. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

[15] European Environment Agency. (2020). *The European environment — state and outlook 2020* (SOER 2020). European Environment Agency. https://www.eea.europa.eu/en/analysis/publications/soer-2020

[16] European Environment Agency. (2020). *State of nature in the EU — 2020*. European Environment Agency. https://www.eea.europa.eu/en/analysis/publications/state-of-nature-in-the-eu-2020

At the same time, the NRR complements the EU's climate action since it places emphasis on restoration measures that also contribute to climate change mitigation and adaptation.

The NRR includes legally binding, quantified and time-bound targets that cover areas *within and beyond* the Natura 2000 network while it sets non-deterioration obligations for all MS. The **overarching goal of the NRR is to ensure that restoration measures are in place in 20% of ecosystems identified as being in 'poor condition' by 2030 and in all ecosystems in need of restoration by 2050**. The NRR also sets specific targets for wetlands, grasslands, rivers, lakes, heaths and scrubs, rocky and dune habitats, marine ecosystems, urban ecosystems, agricultural ecosystems, forests and pollinators.

In this way, **the NRR is the first legal instrument to provide for large-scale nature restoration**. The main tool for the implementation of the NRR are the **National Restoration Plans** (NRPs) (Article 14) that all MS must prepare and submit by September 2026 for a first review by the EC, before being finalized and resubmitted by September 2027. In the NRPs, MS will provide a quantification of the areas to be restored (Article 15a) and describe the measures planned, or put in place, to meet the restoration targets (Article 15c). The NRPs help produce targeted, organized, spatially planned, and budgeted restoration projects on a large scale over a long-term implementation horizon.

The NRR is a key legal instrument that will support the EU in meeting its commitments as announced in the European Green Deal[17] in relation to reversing biodiversity loss as provided in the EU 2030 Biodiversity Strategy. In addition, the NRR contributes to the EU achieving its global commitments included in the GBF, the UN Sustainable Development Goals[18], and those that derive from the UN Decade on Ecosystem Restoration[19] and the UN Convention to Combat Desertification (UNCCD)[20].

[17] European Commission. (2019). Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions: The European Green Deal, COM(2019) 640 final, 11.12.2019, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2019:640:FIN

[18] United Nations. (n.d.). *Sustainable Development Goals: The 17 goals*., https://sdgs.un.org/goals

[19] UNEP & FAO. (n.d.). *Strategy for the UN Decade on Ecosystem Restoration*., https://www.decadeonrestoration.org/strategy

[20] United Nations Convention to Combat Desertification. (n.d.). *UNCCD*. https://www.unccd.int/

In a nutshell, the NRR, in spite its deficiencies, weak spots[21], and challenges, establishes the institutional framework for ecosystem restoration, to be implemented by the EU-27.

1.2 Financing restoration

Considering the economics of restoration is crucial and it is essential that insights from ecology and economics be brought together[22]. This is particularly important as **ecological restoration is expensive**. Estimates vary and there is no doubt that they will be refined as restoration activities become more mainstream. For example, tropical forest restoration has been estimated to cost anywhere from USD 1,000 per hectare to over USD 7,700/ha[23], while average reported costs for restoration of one hectare of marine coastal habitat were around USD 80,000 and USD 1,600,000 respectively whereas the real total costs (median) are likely to be 2-4 times higher[24].

At the same time, **restoration interventions must be grounded in robust ecological science**. Defining reference conditions, selecting appropriate methods, monitoring ecological outcomes, and adapting measures over time require sustained scientific input and technical expertise. Without such evidence-based design and evaluation, restoration investments risk being inefficient, ineffective, or even counterproductive.

The **NRR aims to mobilize additional finance for restoration activities**. Its impact assessment[25] estimates the cost of implementing the Regulation at approximately EUR 154 billion for the period up to 2070. This figure includes expenses related to restoration activities, land acquisition, compensation payments, and administrative costs incurred by MS. Notably this estimate

[21] Kinnunen, A., Hautamäki, R., Junnila, J. B., Jalkanen, J., Järvi, L., Kulmala, L., Lampinen, J., Havu, M., Junnila, S., & Raymond, C. K. (2025). Assessing the implications of EU Nature Restoration Law targets from carbon sequestration and biodiversity perspectives in a high-green urban environment. npj *Urban Sustainability*, 5(1), Article 20. https://doi.org/10.1038/s42949-025-00213-z

[22] Holl, K. D. & Howarth, R. B. (2000). Paying for Restoration. *Restoration Ecology*, 8(3), 260-267.doi:10.1046/j.1526100x.2000.80037.x; Blignaut, J. N. & Van der Elst, L. (2014). Restoration of natural capital: Mobilising private sector investment. *Development Southern Africa*, 31(5), 711-720. https://doi:10.1080/0376835X.2014.933699

[23] Gasparinetti, P., Blundo-Canto, G., Diaz-Chavez, R., Hovani, L., & Newton, P. (2022). Economic feasibility of tropical forest restoration models based on non-timber forest products in Brazil, Cambodia, Indonesia, and Peru. *Sustainability Science, 17*(6), 1979–1993. https://doi.org/10.1007/s11625-022-01143-4

[24] Bayraktarov, E., Saunders, M., Abdullah, S., & Mills, M., Beher, J., Possingham, H., Lovelock, C. (2016). The cost and feasibility of marine coastal restoration. *Ecological Applications. 26*. 10.1890/15-1077

[25] European Commission. (2022). *Commission staff working document – Impact assessment accompanying the proposal for a Regulation of the European Parliament and of the Council on nature restoration* (SWD(2022) 167 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022SC0167

does not include all restoration activities expected under the NRR, and, specifically, does not include costs for marine ecosystems restoration.

Moreover, restoration often achieves only partial recovery of the natural environment, typically restoring just 80–86% of reference biodiversity levels, and may take **multiple iterations of effort** and several decades to produce significant ecological gains[26]. Hence, not only from an ecological point of view but also from an economic perspective, **protecting existing natural ecosystems is a far more cost-efficient, effective, and sustainable strategy for safeguarding natural capital and securing long term ecological and socioeconomic benefits than restoration**.

Nonetheless, even if, in ecological and economic terms, investing in protection of ecosystems is more advantageous, evidence of a degrading natural world is beyond doubt[27] and conservation is no longer sufficient to ensure a healthy planet that is able to sustain nature and people. In this regard, restoration is necessary to reverse ecosystem degradation, and it must be paid for. **The restoration cost, however, is not only an expense, but also an investment as healthy ecosystems offers numerous valuable services**. In the NRR's impact assessment[28], it is estimated that for every EUR 1 invested in nature restoration, EUR 8-40 are returned "*in terms of ecosystem services, such as improved water purification, flood regulation, crop pollination, carbon sequestration, and better human health*", **thereby demonstrating** that the benefits of the NRR outweigh its costs.

Furthermore, ecological restoration has **additional benefits to the expected ecological and environmental benefits**. For example, it was estimated that the restoration of local freshwater and coastal ecosystems in Humboldt County, CA, USA directly supported 160 and indirectly supported 270–480 full-time, private sector jobs, 37 public sector jobs, and 11 tribal jobs.[29] In addition, spending on restoration projects resulted in over USD 29 million in added-value within the County's economy. This illustrates that investments in **restoration projects have a stimulating effect on economic output and employment** in the restoration-related industries,

[26] Possingham, H. P., Bode, M., & Klein, C. J. (2015). Optimal conservation outcomes require both restoration and protection. *PLoS biology*, *13*(1), e1002052. https://doi.org/10.1371/journal.pbio.1002052

[27] Keck, F., Peller, T., Alther, R. *et al.* (2025) The global human impact on biodiversity. *Nature, 641*, 395–400. https://doi.org/10.1038/s41586-025-08752-2; IPBES, 2019

[28] European Commission. (2022). *Commission staff working document – Impact assessment accompanying the proposal for a Regulation of the European Parliament and of the Council on nature restoration* (SWD(2022) 167 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022SC0167

[29] BenDor, T. K., & Lester, T. W. (2016). *Exploring and understanding the restoration economy*. Washington, DC: Center for American Progress

leading to an "Ecological Restoration Economy"[30]. **These economic benefits often accrue to local communities**, since most projects tend to employ local labor and materials[31].

Consequently, while ecological restoration focuses on the return of nature and its functions **to healthy conditions**, financing of restoration has broader implications that are linked with the services that nature provides to humans and the role of nature in the economy[32]. In this sense it is not just ecosystems that are being restored but the natural capital itself. Within this context, a more inclusive definition of ***natural capital restoration*** has been proposed "*any activity that integrates investment in, and replenishment of, natural capital stocks to improve the flows of ecosystem goods and services, while enhancing all aspects of human wellbeing*"[33].

While public funding for nature conservation and restoration remains essential, the high costs associated with restoration actions demand the development of complementary funding sources. Indeed, several international, regional, and European legal instruments explicitly recognize the need to mobilize additional financial resources for nature and nature restoration in particular. Following the adoption of the NRR, the EU now has a robust institutional framework to support restoration initiatives (see Section 3.1 & 3.3), while the transition toward a nature-positive economy presents opportunities to highlight the benefits of ecosystem restoration. This, in turn, can help attract additional investment to complement public funding[34].

The Environment Action Programme to 2030 (EAP 8), established through Decision (EU) 2022/591[35], further reinforces the financing dimension of

[30] Bendor, T., Putz, F. E., & Boege, V. (2015). Restoration economy: a new paradigm for the restoration of forest ecosystems. In J. Stanturf & P. Madsen (Eds.), *Restoration of boreal and temperate forests* (pp. 205–224). CRC Press. p.209

[31] Shropshire, F. & Wagner, S. (2009). *Economic and employment impacts of wetland restoration*. Environmental Management, 44(5), 840–848.; Weinerman, E., et al. (2012). Restoration economics: Assessing local labor and material use in wetland restoration. *Journal of Environmental Economics and Management*, 63(3), 445–453; Davis, J., et al. (2011). The economic impact of habitat restoration: employment and wages in ecological restoration. *Restoration Ecology*, 19(4), 472–477

[32] Blignaut, J. N., Esler, K. J., de Wit, M. P., Le Maitre, D., Milton, S. J., & Aronson, J. (2014). Establishing the links between economic development and the restoration of natural capital. *Current Opinion in Environmental Sustainability, 7*, 94–101. https://doi.org/10.1016/j.cosust.2013.11.006

[33] Aronson, J., Milton, S. J., & Blignaut, J. N. (Eds.). (2007). *Restoring natural capital: Science, business, and practice*. Washington, DC: Island Press

[34] European Commission. (2022). *Commission staff working document – Impact assessment accompanying the proposal for a Regulation of the European Parliament and of the Council on nature restoration* (SWD(2022) 167 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52022SC0167

[35] European Parliament & Council of the European Union. (2022, April 6). *Decision (EU) 2022/591 on a General Union Environment Action Programme to 2030*. Official Journal of the European Union, L 114, 22–36. https://eur-lex.europa.eu/eli/dec/2022/591/oj/eng

biodiversity and restoration policy. The Programme commits the EU to allocating an increasing share of its budget to biodiversity objectives—at least 7.5% by 2024 and 10% in 2026 and 2027—and promotes the mobilisation of both public and private funding sources to support restoration efforts. It also encourages the use of environmental taxation, green budgeting, and other market-based instruments to facilitate nature-positive investments.

There are several mechanisms available to mobilize additional financing for ecological restoration from non-state actors. Together, these mechanisms reflect a diversified and evolving financial landscape for restoration. The recent "Roadmap to Nature Credits"[36] published by the EC in July 2025 indicates that the EU intends to prepare and lead in this sector. As these instruments are new, there is a need to ensure that the necessary parameters are in place so that their implementation is effective in terms of the restoration targets set.

[36] European Commission. (2025, July 7). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Roadmap towards Nature Credits* (COM(2025) 374 final). EUR-Lex. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0374

2. *Posidonia oceanica* – an Overview

Posidonia oceanica (L.) Delile, also known as Posidonia meadows, Neptune meadows, Neptune grass and Mediterranean tapeweed, is an endemic species to the Mediterranean Sea and the dominant marine angiosperm of the region, where it forms extensive meadows. The most recent assessment of marine habitats in the Mediterranean reports a total of 22, 379 km2 of *Posidonia oceanica (P. oceanica)* mapped across 15 countries, nearly doubling the area mapped in the last major assessment by Teslesca et., 2015[37,38]. *P. oceanica* is a long-lived species, with individual shoots that can live from a few years up to over 30 years and leaves with a long lifespan (70–350 days), and usually occupies coarse-grained sandy sediments, although it can also spread on rocks. The species shows high biomass and production, but slow growth and low recruitment rates, which make it particularly vulnerable to various ecosystem disturbances.

2.1. Current status and threats

***Posidonia oceanica* meadows are threatened** by multiple anthropogenic and environmental stressors. These include **mechanical damage** such as anchoring, dredging, trawling, and other forms of physical disturbance; **coastal development and construction**, which alter shorelines and increase habitat fragmentation; **pollution and eutrophication**, leading to reduced water quality and light availability; **sediment alteration** that affects seabed stability and nutrient balance; and broader **climate change impacts**, including rising sea temperatures and ocean acidification, as well as extreme weather events such as marine heatwaves and intense storms[39]. Collectively, these pressures contribute to meadow degradation, reduced resilience, and long-term decline.

As a result, **high degradation rates** of *P. oceanica* meadows are evident throughout the Mediterranean region, particularly over the last two

[37]Gerovasileiou, V., Sánchez-Espinosa, A., Rodríguez-Rodríguez, D., Fraschetti, S., Mazarrasa, I., Bouafif, C., Ouerghi, A., & Abdul Malak, D. (2026). Updated distribution mapping of *Posidonia oceanica* meadows, coralligenous assemblages and marine caves in the Mediterranean Sea: Implications for conservation and restoration. *Mediterranean Marine Science, 27*(1), 159–172. https://doi.org/10.12681/mms.43060

[38] Telesca, L., Belluscio, A., Criscoli, A. *et al.* Seagrass meadows (*Posidonia oceanica*) distribution and trajectories of change. *Sci Rep* 5, 12505 (2015). https://doi.org/10.1038/srep12505

[39] Grech, A., Coles, R., & Marsh, H. (2011). A broad-scale assessment of the risk to coastal seagrasses from cumulative threats. Marine Policy, 35(5), 560–567 https://doi.org/10.1016/j.marpol.2011.03.003; Orth, R. J., Carruthers, T. J. B., Dennison, W. C., Duarte, C. M., Fourqurean, J. W., Heck, K. L., Hughes, A. R., Judson Kenworthy, K. W., Olyarnik, S., Short, F. T., Waycott, M., & Williams, S. L. (2006). A Global Crisis for SeagrassEcosystems. BioScience, 56(12), 987–996. https://doi.org/10.1641/0006-3568(2006)56[987:AGCFSE]2.0.CO;2

decades, both in the eastern and western parts of the basin[40]. These losses impact the integrity of the seagrass and key ecophysiological and biogeochemical processes of the system (i.e., carbon metabolism, nutrient cycling, etc.), jeopardising the primary role seagrass ecosystems play in delivering key ecosystem services, such as climate mitigation and biodiversity conservation.

Based on the most recent EU Habitats Directive Assessment (2013-2018) **the conservation status of *Posidonia oceanica* in the Mediterranean is assessed as unfavourable–inadequate** (U1), same as in the 2007-2013 period. Updated data is expected in 2026[41].

2.2. Ecosystems Services provided by *Posidonia oceanica* meadows

Seagrasses are among the coastal ecosystems that provide the most economic value worldwide, because of their wide range of ecosystem services[42]. As ecosystem engineers, they shape coastal environments by forming structurally complex, three-dimensional habitats that support high levels of biodiversity. These habitats **provide food, shelter, and nursery areas for species of ecological, recreational, and commercial importance**[43] making seagrasses essential for fisheries and coastal livelihoods. Seagrasses are also **highly efficient long-term carbon sinks**. Although they occupy less than 0.2% of the seafloor, seagrass meadows may account for up to 18% of total ocean carbon burial, contributing significantly to climate change mitigation and long-term carbon storage[44]. In addition, they stabilize sediments, enhance nutrient cycling, regulate water quality,

[40] Litsi-Mizan, V., Efthymiadis, P. T., Gerakaris, V., Serrano, O., Tsapakis, M., & Apostolaki, E. T. (2023). Decline of seagrass (*Posidonia oceanica*) production over two decades in the face of warming of the Eastern Mediterranean Sea. *New Phytologist, 239*(6), 2126–2137. https://doi.org/10.1111/nph.19084

[41] European Environment Agency / Eionet. (n.d.). *Habitat summary: Posidonia beds (Posidonion oceanicae), Marine Mediterranean* [Article 17 web tool]. Eionet Nature. October 6, 2025, from https://nature-art17.eionet.europa.eu/article17/habitat/summary/?period=5&group=Coastal+habitats&subject=1120&region=MMED

[42] do Amaral Camara Lima, M., Bergamo, T. F., Ward, R. D., & Joyce, C. B. (2023). A review of seagrass ecosystem services: Providing nature-based solutions for a changing world. *Hydrobiologia*, 850(12), 2655–2670. https://doi.org/10.1007/s10750-023-05244-0

[43] Bertelli, C. M., & Unsworth, R. K. F. (2014). Protecting the hand that feeds us: Seagrass (Zostera marina) serves as commercial juvenile fish habitat. Marine Pollution Bulletin, 83(2), 425–429. https://doi.org/10.1016/j.marpolbul.2013.08.011; Jr, K. L. H., Hays, G., & Orth, R. J. (2003). Critical evaluation of the nursery role hypothesis for seagrass meadows. *Marine Ecology Progress Series*, 253, 123–136. https://doi.org/10.3354/meps253123; Unsworth, R. K. F., Cullen-Unsworth, L. C., Jones, B. L. H., & Lilley, R. J. (2022). The planetary role of seagrass conservation. Science. https://doi.org/10.1126/science.abq6923

[44] Fourqurean, J. W., Duarte, C. M., Kennedy, H., Marbà, N., Holmer, M., Mateo, M. A., Apostolaki, E. T., Kendrick, G. A., Krause-Jensen, D., McGlathery, K. J., & Serrano, O. (2012). Seagrass ecosystems as a globally significant carbon stock. *Nature Geoscience* 2012 5:7, 5(7), 505–509. https://doi.org/10.1038/ngeo1477

and contribute to coastal protection by reducing erosion and buffering wave energy.

Within this context, ***P. oceanica* meadows represent one of the most emblematic and functionally important seagrass systems in the Mediterranean**. In particular, *P. oceanica* reinforces this engineering role by modifying the physical structure of its habitat and influencing environmental conditions and resource availability. This structural complexity attracts a diverse array of taxa and functional groups that use the meadow for habitat, food, and shelter. The diversity and abundance of organisms associated with *P. oceanica* are strong indicators of meadow health, as ecological interactions among species regulate key ecosystem functions, including carbon preservation. The loss of species or functional groups due to local or climate pressures can trigger ecological cascades, disrupt species–environment feedbacks, and ultimately destabilise ecosystem functioning.

P. oceanica meadows produce organic carbon through their metabolism, while also trapping allochthonous organic particles in their canopy. This carbon is stored in the underlying sediments over centennial and/or millennial scales due to its highly recalcitrant nature and the sub-surface anoxic conditions that favour its slow decomposition. Available data show that ***P. oceanica* meadows have the highest capacity of carbon storage among seagrass species worldwide**[45]. However, **the loss of *P. oceanica* meadows** due to local pressures and/or climate change, including rising water temperatures, **threatens the release of long-term carbon deposits** back to the atmosphere as CO_2, as observed in experimental studies on the species[46].

While the ecosystem services that Posidonia meadows provide are now well-documented and increasingly recognized, efforts are also made to estimate their value. Global estimates suggest that seagrass ecosystems around the world provide a total value of about **€5.57 trillion annually** [47]. However, assessing and valuing Posidonia meadows, especially at the local

[45]Kennedy, H., Pagès, J. F., Lagomasino, D., Arias-Ortiz, A., Colarusso, P., Fourqurean, J. W., Githaiga, M. N., Howard, J. L., Krause-Jensen, D., Kuwae, T., Lavery, P. S., Macreadie, P. I., Marbà, N., Masqué, P., Mazarrasa, I., Miyajima, T., Serrano, O., & Duarte, C. M. (2022). Species traits and geomorphic setting as drivers of global soil carbon stocks in seagrass meadows. *Global Biogeochemical Cycles, 36*(10), e2022GB007481. https://doi.org/10.1029/2022GB007481

[46]Roca, G., Palacios, J., Ruíz-Halpern, S., & Marbà, N. (2022). Experimental carbon emissions from degraded Mediterranean seagrass (*Posidonia oceanica*) meadows under current and future summer temperatures. *Journal of Geophysical Research: Biogeosciences, 127*, e2022JG006946. https://doi.org/10.1029/2022JG006946

[47] Duarte, C.M., Apostolaki, E.T., Serrano, O. *et al.*, 2025. Conserving seagrass ecosystems to meet global biodiversity and climate goals. *Nat. Rev. Biodivers.* **1**, 150–165. https://doi.org/10.1038/s44358-025-00028-x;

and site level, remains a demanding challenge. Relevant methodologies are being developed and tested, as was the case in the ARTEMIS project[48].

2.3. Restoration of Posidonia oceanica

Although several decades of protection measures for *Posidonia oceanica* are in place, its loss continues. Hence, while **continued conservation efforts remain** a priority, there is also a need to **restore degraded and lost meadows**.

The recovery of *Posidonia oceanica* meadows primarily requires the removal of the pressures that caused their degradation. This process is referred to as **passive restoration**. Passive restoration differs from conservation, as it applies to already degraded ecosystems and aims to facilitate their natural recovery, whereas conservation focuses on preventing degradation of ecosystems. Conservation and passive restoration are complementary activities whose implementation reinforce the process of natural recovery, and are, as of late, used often interchangeably.[49] However, natural recovery is often insufficient or too slow, and therefore **active restoration** of the meadows is required. Active restoration involves direct interventions (e.g. sediment management, planting seeds or shoots and transplanting shoots) based on scientific guidelines, which continue to evolve. **Monitoring restored areas at regular intervals over extended periods is necessary**, following specific monitoring protocols. To increase the chances of success of a restoration activity, it is **essential to ensure the protection** of the meadow under recovery from any future pressure.

The following section examines in detail the legislative and institutional framework for restoring *P. oceanica*.

[48] Apostolaki, E. T., Garcia-Escudero, C. A., Gerakaris, V., Skouradakis, G., Dailianis, T., Francesca, F., Cinti, M. F., Congiu, M., Campisi, T., Ulazzi, E., Guala, I., Piazzi, L., Marsinyach, E., Estaún, I., Serrano, O., Foster, N., Terrados, J., Castejón, I., Triay, R., Miotti, C., Rismondo, A., & Orescanin, R. (2024). *Deliverable 1.2.1: Pilot ecosystem service baseline*. ARTEMIS – Accelerating the restoration of seagrass meadows in the Mediterranean area through innovative ecosystem-service based solutions.

[49] Indicatively, the EU Habitats Directive in Article 1 defines conservation as "*a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status…*", whereas, the EU NRR in Article 3 defines restoration as "the process of actively or passively assisting the recovery of an ecosystem in order to improve its structure and functions, with the aim of conserving or enhancing biodiversity and ecosystem resilience, through improving an area of a habitat type to good condition, re-establishing favourable reference area, and improving a habitat of a species to sufficient quality and quantity …".

3. Legislative and Institutional Framework on Restoring *Posidonia oceanica*

Due to its critical ecological role, *Posidonia oceanica* is protected by law or covered by a range of instruments at the international, Mediterranean, European, including by the European Union (EU), and national levels in every Mediterranean country where it is found[50]. This is unlike the situation in other parts of the world where seagrass ecosystems may not benefit from such a strong policy framework.[51] In this section, the legislative and institutional framework on the protection and, particularly, restoration of *Posidonia oceanica* is presented.

In particular, the first sub-section (3.1) presents the international policy instruments, followed by the regional (Mediterranean) framework (3.2) and the EU policy and legislative instruments (3.3) that include provisions on ecosystem conservation and/or restoration and explicitly or implicitly focus on *P. oceanica*. National and sub-national provisions from the countries and regions where the ARTEMIS pilot sites were implemented are presented in the Annex.

Table 1 at the end of the section summarizes this presentation, by providing a list of the instruments and marking whether restoration and *P. oceanica* are explicitly or implicitly mentioned.

3.1. International conventions

The **Convention on Biological Diversity (CBD)**[52] adopted in 1992 aims to conserve biological diversity, promote the sustainable use of its components, and ensure the fair and equitable sharing of benefits arising from genetic resources. The CBD takes an **ecosystem-based approach**, recognizing the importance of ecosystems in maintaining biodiversity and supporting human well-being. While *in situ* ecosystem conservation action is a clear priority of the CBD, it is one of the global agreements that includes **ecosystem restoration** as one of its distinct key areas of focus. **Article 8(f)**

[50] Pergent-Martini, C., Pergent, G., & Boudouresque, C. F., 2024. Posidonia oceanica: Legal protection and conservation measures in the Mediterranean. *Marine Policy*, 145, 104305. https://doi.org/10.1016/j.marpol.2023.104305

[51] UNEP, GRID-Arendal, & UNEP-WCMC, 2020. *Out of the Blue: The Value of Seagrasses to the Environment and to People*. https://www.unep.org/resources/report/out-blue-value-seagrasses-environment-and-people

[52] Convention on Biological Diversity, 1992.. *Convention on Biological Diversity*. https://www.cbd.int/convention/

calls on Parties to "*rehabilitate and restore degraded ecosystems and promote the recovery of threatened species*." This provision has gained renewed importance under the **GBF**.

The **GBF**[53], adopted at COP15 of the Convention on Biological Diversity (CBD) in Montreal in **December 2022,** offers a strong legal and policy basis for advancing ecosystem conservation and restoration. The GBF includes relevant ambitious global targets:

- **Target 1** supports inclusive and integrated land and sea spatial planning to bring biodiversity loss close to zero;
- **Target 2** aims to restore at least 30% of degraded marine and coastal ecosystems by 2030;
- **Target 3** seeks the effective protection and management of at least 30% of marine and coastal areas; and
- **Target 8** emphasizes ecosystem-based approaches to climate change adaptation, mitigation, and resilience
- **Target 15** intends to progressively reduce negative impacts on biodiversity, and their related risks to human activities, as well as the increase of positive impacts, by promoting sustainable patterns of production.

While neither the CBD nor the GBF specifically mention *P. oceanica*, both serve as an umbrella institutional framework for any and all conservation and restoration activities that parties take.

The **Convention on Wetlands of International Importance, 1971**[54], known as the **Ramsar Convention**, adopted in 1971, is the only global treaty dedicated specifically to the protection of wetlands and their biodiversity. Its broad definition of wetlands includes shallow marine areas (up to six meters depth), thereby covering coastal zones where *P. oceanica* occurs.

While its core emphasis is on protection and sustainable management, **restoration** has become an increasingly important aspect of implementation, having been identified already in the 1990's especially in the context of wetland degradation and climate change. Resolution VIII.16 (2002)[55] provides **guidelines for wetland restoration**, including principles, planning, and techniques. More particularly, the **Ramsar Strategic Plan**

[53] Secretariat of the Convention on Biological Diversity (CBD). (2022). Decision adopted by the Conference of the Parties to the Convention on Biological Diversity: 15/4. Kunming-Montreal Global Biodiversity Framework (CBD/COP/DEC/15/4). Montreal: Convention on Biological Diversity. https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

[54] Convention on Wetlands of International Importance especially as Waterfowl Habitat. (1971, February 2). *Ramsar Convention*. United Nations Treaty Series, 996, 245. https://www.ramsar.org/

[55] Ramsar Convention Secretariat. (2002). *Resolution VIII.16: Principles and guidelines for wetland restoration*. https://www.ramsar.org/sites/default/files/documents/pdf/res/key_res_viii_16_e.pdf

2016–2024 (as updated in 2022, to run until 2025) explicitly includes **wetland restoration** as one of its goals and linked targets:

- Goal 2 promotes the restoration and rehabilitation of degraded wetlands.
- Target 4 calls on countries to increase the area of wetlands restored.

The Convention's **Parties** have also agreed to support ecosystem restoration linked to blue carbon, which is particularly relevant to *P. oceanica*. Resolution XIII.14 (2018)[56] further promotes restoration of coastal blue carbon ecosystems. The outcomes of **COP15 (2025)** further reinforce this framework. The adoption of the **Strategic Plan 2025–2034** strengthens alignment with the GBF and global restoration targets[57]. In addition, Ramsar COP15 resolutions further reinforce implementation by strengthening the assessment of pressures and risks affecting wetlands, recognizing that understanding drivers of ecological change is essential for effective conservation and restoration. In particular, the resolution on assessing pressures on and risks to wetlands introduces tools such as the Wetland Vulnerability Assessment Tool (WETVAT) and promotes adaptive management approaches[58]. Finally, the 2025–2028 scientific and technical implementation resolution strengthens monitoring, earth observation, and technical support mechanisms for mapping and restoring seagrass ecosystems[59].

The **Bern Convention (1979/1996)**[60], originally signed in 1979 and amended in 1996 to include marine species such as *Posidonia oceanica*, *Zostera marina*, and *Cymodocea nodosa*, obliges countries that have ratified the Convention to implement national strategies for conserving natural habitats. This includes protecting *P. oceanica* meadows by establishing or managing protected areas, preserving threatened ecosystems, preventing pollution, dumping, or habitat degradation, and regulating human activities, such as coastal development and anchoring, which harm the seabed. The **Bern Convention** does not explicitly focus on **habitat and species restoration**; however, there are provisions that could be considered as a legal basis to restore degraded ecosystems especially where

[56] Ramsar Convention Secretariat (2018) – *Resolution XIII.14. Promoting conservation, restoration and sustainable management of coastal blue carbon ecosystems.* https://www.ramsar.org/document/resolution-xiii14-promoting-conservation-restoration-sustainable-management-coastal-blue

[57] Ramsar Convention Secretariat. (2025). *Resolution XV.23: Ramsar Strategic Plan 2025–2034*. Ramsar Convention on Wetlands. https://www.ramsar.org/sites/default/files/2025-04/COP15_23_3_DR_SP5_e.pdf

[58] Ramsar Convention Secretariat. (2025). *Resolution XV.23: Assessing pressures and risks to wetlands*. Ramsar Convention on Wetlands. https://www.ramsar.org/sites/default/files/2025-04/COP15_23_23_DR_assessing_wetland_pressures_risks_e.pdf

[59] Ramsar Convention Secretariat. (2025). *Resolution XV.10: Scientific and technical implementation for the period 2025–2028*. Ramsar Convention on Wetlands. https://www.ramsar.org/sites/default/files/2025-04/COP15_23_10_future_scientific_technical_aspects_e.pdf

[60] Council of Europe. (1979). *Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)*. European Treaty Series No. 104. https://www.coe.int/en/web/bern-convention

degradation threatens species survival. For example, **Article 4(1)** commits Parties to: "*take appropriate and necessary legislative and administrative measures to ensure the conservation of the habitats of the wild flora and fauna species, especially those that are endangered*." Restoration could be such an "appropriate measure".

The **Convention on the Conservation of Migratory Species of Wild Animals/ CMS - Bonn Convention, 1979** [61], adopted in 1979 and entering into force in 1983, provides a global platform for the conservation and sustainable management of migratory species and their habitats across national borders. While the Convention itself does not contain explicit, standalone provisions on ecosystem restoration, its obligations call on Parties are required to ***"conserve or restore the habitats of migratory species"* (Article III par.4a),** thus, establishing a clear legal basis for restoration measures. For example, where migratory species depend on marine or coastal habitats, such as *P. oceanica*, that have been degraded, Parties could meet their CMS commitments by undertaking habitat restoration to ensure the viability of migration routes and the survival of endangered populations. Concerning *Posidonia oceanica*, a recent **CMS resolution**[62] **adopted in COP 14** urges Parties to strengthen research, conservation, and **restoration of seagrass ecosystems**, emphasizing their importance for migratory species, and encourages Parties to mobilize both international and regional funding (Bonn Convention, 1979).

The **United Nations Framework Convention on Climate Change (UNFCCC, 1992)**[63] established the global framework for addressing climate change, subsequently reinforced by the **Paris Agreement (2015)**[64] adopted under the UNFCCC framework at COP 21, which set binding commitments to keep "*the global average temperature to well below 2°C above pre-industrial levels*" and pursue efforts "*to limit the temperature increase to 1.5°C above pre-industrial levels*". Although none of these instruments explicitly mentions *P. oceanica,* its restoration is increasingly recognized as important in the context of global climate action. This is mainly due to its role as a **blue carbon ecosystem**, capable of capturing and storing significant amounts of carbon dioxide in both its biomass and the sediments it stabilizes. Restoring *P. oceanica* meadows directly supports climate

[61] Convention on the Conservation of Migratory Species of Wild Animals. (1979, June 23). *Bonn Convention*. United Nations Treaty Series, 1651, 333. https://www.cms.int/

[62] Document 27.4.3 https://www.cms.int/sites/default/files/document/cms_cop14_doc.27.4.3_seagrass-ecosystems_e_0.pdf

[63] The United Nations Framework Convention on Climate Change (UNFCCC, 1992) https://unfccc.int/process-and-meetings/the-convention/history-of-the-convention/convention-documents

[64] United Nations. (2015, December 12). *Paris Agreement*. United Nations Treaty Series, 3156, 3. https://unfccc.int/paris-agreement

change mitigation by enhancing natural carbon sinks, which aligns with UNFCCC and the Paris Agreement goals.

Although the Paris Agreement does not explicitly refer to Nature-based Solutions (NbS), its provisions encourage ecosystem-based mitigation and adaptation. In particular, Article 4 requires Parties to prepare and communicate Nationally Determined Contributions (NDCs), while Article 5(1) calls on Parties **to conserve and enhance sinks and reservoirs of greenhouse gases**. Together, these provisions provide a legal basis for including the restoration of carbon-rich ecosystems, such as *P. oceanica* meadows, within national climate strategies. **In this respect, restoring Posidonia meadows supports both mitigation through carbon sequestration and adaptation by enhancing coastal resilience.**

Furthermore, while the UNFCCC and the Paris Agreement establish obligations for Parties to report annual greenhouse gas emissions and removals, the scientific methodologies enabling the inclusion of blue carbon ecosystems are developed by the Intergovernmental Panel on Climate Change (IPCC). In particular, the 2013 IPCC Wetlands Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[65] provides the methodological framework for accounting for carbon stock changes and removals in coastal ecosystems, including seagrass meadows such as *P. oceanica*. **These guidelines enable Parties to include blue carbon ecosystems in national greenhouse gas inventories under the UNFCCC transparency framework.**

The **High Seas Treaty (Biodiversity Beyond National Jurisdiction, BBNJ Agreement, 2023)**[66], which was adopted in June 2023, came into force **on January 17, 2026**. The BBNJ Agreement aims to conserve and sustainably use the marine biodiversity of Areas Beyond National Jurisdiction (ABNJ), such as the high seas. Even though *P. oceanica* is a species that grows along the coastline, which is unlikely to fall in the high seas, the treaty supports conservation measures including the designation of **Marine Protected Areas (MPAs).** In this way it could influence Mediterranean **ecosystem restoration** coordination and transboundary marine areas.

[65] Intergovernmental Panel on Climate Change. (2014). *2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*. IPCC. https://www.ipcc.ch/site/assets/uploads/2018/03/Wetlands_Supplement_Entire_Report.pdf

[66] United Nations. (2023). Agreement on Marine Biological Diversity on Areas Beyond National Jurisdiction (BBNJ), https://www.un.org/bbnjagreement/en

3.2. Regional (Mediterranean) Convention

The **Barcelona Convention, (1976/1995)**[67], signed in 1976 and amended in 1995, brings together 21 Mediterranean countries and the European Union to protect the Mediterranean. Through its biodiversity and habitat protection framework, including the SPA/BP Protocol (1995), it provides important safeguards for *P. oceanica*. Under the SPA/BD Protocol, *P. oceanica* meadows are included in Annex II as **priority habitats**, requiring strict protection. Contracting Parties are consequently obliged to prohibit or regulate harmful activities such as anchoring, dredging, pollution, and coastal development, designate Specially Protected Areas of Mediterranean Importance (SPAMIs), conduct environmental impact assessments, integrate protection into national legislation and marine spatial planning, and implement monitoring programmes.

The **Barcelona Convention** explicitly addresses **restoration**, particularly in the context of **marine and coastal ecosystems** in the Mediterranean region. Restoration is addressed both explicitly and implicitly within the Convention system. The ICZM Protocol (Art. 10) requires protection and cooperative management of marine areas hosting high conservation value habitats. Articles 3 and 6 of the SPA/BD Protocol[68] encourage measures to restore degraded habitats, particularly within protected areas. The Post-2020 SAPBIO[69] further identifies restoration of marine vegetation as a key action area.

Furthermore, the **recent COP24 (Cairo, 2025) strengthened the regional framework for *P. oceanica* restoration**. Decision IG.27/5 adopting the Regional Climate Change Adaptation Framework (2026–2035) explicitly promotes ecosystem-based adaptation and NbS in Mediterranean marine and coastal areas, embedding seagrass restoration within climate resilience policy[70] Decision IG.27/6 on the Ecosystem Approach and Integrated Monitoring and Assessment Programme (IMAP) enhances harmonised regional monitoring of habitat extent and ecological status, operationally triggering restoration where Good Environmental Status is not achieved[71].

[67] United Nations Environment Programme. (1976, February 16). *Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona Convention).* United Nations Treaty Series, 1102, 27. https://www.unep.org/unepmap/who-we-are/barcelona-convention

[68] SPA/BD protocol,: https://www.rac-spa.org/sites/default/files/protocole_aspdb/protocol_eng.pdf

[69] Post-2020, SAPBIO. https://spa-rac.org/en/post-2020-sapbio/

[70] Decision IG.27/5 – Regional Climate Change Adaptation Framework (2026–2035) https://wedocs.unep.org/items/82a41105-f8ff-43bb-9460-6706aa67d3ea

[71] Decision IG.27/6 – Ecosystem Approach Policy and Integrated Monitoring and Assessment Programme (IMAP), https://wedocs.unep.org/items/838e65d9-2a07-44f5-8afd-13f800f6056c; Decision IG.27/7 (SPA/BD Protocol implementation) and IG.27/8 (SPAMIs and Action Plans), https://wedocs.unep.org/items/84d605c0-310e-493c-ac2d-7cac8ff69db4

3.3. EU policy and legislation

The **EU Habitats Directive (Directive 92/43/EEC)**[72], adopted in 1992, serves as the foundational legal framework for protecting natural habitats as well as wild fauna and flora across the European Union. Its primary goal is to support the preservation and improvement of biodiversity throughout the EU. The Directive is structured into six annexes, each outlining specific conservation priorities and actions. Annex I identifies natural habitat types of European importance that require the establishment of Special Areas of Conservation (SACs). Among these is ***P. oceanica*, recognized as a priority habitat** under code 1120* due to its outstanding ecological value and susceptibility to threats.

The **EU Habitats Directive also includes provisions related to restoration**, even though the word "restoration" is not always mentioned. The **aim of the Directive** is to ensure the conservation of natural habitats and wild species, which **implicitly and explicitly requires restoration actions**, especially for degraded habitats and species populations. It provides the legal basis for the EU's protected areas network, the Natura 2000 network, which is formed from the SACs and the Special Protection Areas, designated under the Birds Directive. More particularly:

- **Article 2(2)** states that "*measures taken pursuant to this Directive shall be designed to maintain or **restore**, at favorable conservation status, natural habitats and species of wild fauna and flora of Community interest*."
- **Article 6** notes that Member States are required to take appropriate conservation measures for Natura 2000 sites.

The EU **Water Framework Directive (WFD)**[73], adopted in 2000, establishes a comprehensive framework for protecting and enhancing the quality of inland surface, transitional, and coastal waters, as well as groundwater across the European Union. Its overarching goal is **to achieve good ecological and chemical status for all EU waters**, ensuring the long-term protection and sustainable use of aquatic ecosystems. The Directive sets out a river basin management approach, requiring MS to develop and implement River Basin Management Plans (RBMPs) that integrate water policy with nature conservation objectives.

[72] Council of the European Communities. (1992). Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive). Official Journal of the European Communities, L 206, 7–50. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043

[73] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy https://eur-lex.europa.eu/eli/dir/2000/60/oj/eng

The WFD explicitly integrates the concept of **restoration** through its obligation to reach "good ecological status," which often requires active measures to rehabilitate degraded rivers, wetlands, and coastal ecosystems. Restoration is, thus, embedded as a legal necessity where water bodies have been altered by pollution, over-extraction, or physical modifications. The Directive identifies biological quality elements as indicators of ecological status, including aquatic flora such as **seagrass meadows**. In Mediterranean coastal waters, ***P. oceanica*** is a key indicator species for assessing ecological status under the WFD, reflecting its ecological importance for biodiversity, carbon storage, and coastal stability (Annex V_1.1.4). The health of *P. oceanica* meadows is therefore directly tied to the achievement of WFD objectives, making their protection and, where necessary, restoration a priority for EU MS[74].

The Marine Strategy Framework Directive (MSFD)[75], establishes a comprehensive framework for the protection and conservation of the marine environment across Europe. Its primary objective is to achieve or maintain **Good Environmental Status (GES)** of the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. The Directive outlines **11 qualitative descriptors** that define GES, encompassing aspects such as biodiversity, fish populations, sea floor integrity, and eutrophication. While the MSFD does not explicitly mention restoration, the achievement of GES often necessitates restoration actions, particularly for degraded marine habitats and species. For instance, **Descriptor 1**, which focuses on biodiversity, includes the assessment of seagrass meadows, such as ***P. oceanica***, as key biological quality elements. The health of these meadows is integral to determining GES, and their restoration is often essential to meet the Directive's objectives.

The **Environment Action Programme to 2030** (EAP 8), through Decision 2022/591[76] sets out the EU's environmental priorities for the decade and places strong emphasis on the **restoration of biodiversity and ecosystems** as a central objective. It calls for the protection, preservation, and active

[74] European Parliament, & Council of the European Union. (2000). Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (Water Framework Directive). Official Journal of the European Communities, L 327, 1–73. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060

[75] European Parliament, & Council of the European Union. (2008). Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Official Journal of the European Union, L 164, 19–40. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0056

[76] European Parliament & Council of the European Union. (2022, April 6). *Decision (EU) 2022/591 on a General Union Environment Action Programme to 2030*. Official Journal of the European Union, L 114, 22–36. https://eur-lex.europa.eu/eli/dec/2022/591/oj/eng

restoration of nature, recognizing healthy ecosystems as essential for climate resilience, food security, and human well-being.

The **EU Biodiversity Strategy for 2030**[77], as part of the European Green Deal, adopted in May 2020, sets out the EU's commitments on biodiversity for 2030. It provides a strong basis for conservation and restoration of *P. oceanica*. Although it is not mentioned directly, *Posidonia* appears as a key target within the Strategy's broader goals to protect at least 30% of EU sea areas, with 10% under strict protection, focusing on habitats of high biodiversity value. The **EU Biodiversity Strategy for 2030, adopted in the midst of the Covid-19 crisis,** places **ecosystem restoration** at the **core of its objectives**, included even in its distinctive title "*Bringing nature back into our lives*". It is one of the most ambitious EU policy documents in terms of **explicit commitments to restoration**, both in scope and legal follow-up. In its Headline Commitment, the Strategy states that the EU will put Europe's biodiversity on a path to recovery by 2030 through measures that include the restoration of degraded ecosystems, setting specific targets to restore wetlands, peatlands, forests, grasslands, and marine ecosystems, particularly those that are carbon-rich or biodiversity-rich.

Also, the Biodiversity Strategy explicitly provided for a law on restoration, calling the EC to "*put forward a proposal for legally binding EU nature restoration targets in 2021*" which in turn led to the **EU NRR, which was proposed in 2022 and adopted in 2024**.

The EU **NRR**[78], in force since 18 August 2024, **provides direct and indirect protection for *P. oceanica*** and calls for **restoration and strict protection for marine habitats**. The Regulation was initially envisaged under the EU Biodiversity Strategy for 2030 and aligns with global commitments such as the Kunming–Montreal GBF, thereby reinforcing the protection of *P. oceanica* at the global level. The NRR requires Member States to put in place measures to restore at least 20% of the marine areas falling within the Regulation's scope by 2030. This overarching target is further specified in the Regulation through ecosystem-specific restoration obligations and more detailed provisions for certain marine habitat types, including seagrass ecosystems such as *P. oceanica*.

[77] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, "EU Biodiversity Strategy for 2030: Bringing nature back into our lives", COM(2020) 380 final, 20.5.2020, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A52020DC0380

[78] European Parliament and Council of the European Union. (2024). *Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869,* https://eur-lex.europa.eu/eli/reg/2024/1991/oj/eng

Article 5 of the NRR outlines obligations for **restoring marine ecosystems**, specifically targeting habitat types listed in Annex II, including seagrass meadows and, specifically, ***P. oceanica***. *P. oceanica* is a priority habitat under EU Habitats Directive and one of the key descriptors of biodiversity quality under the Marine Strategy Framework Directive, demonstrating the attempted coherence of the new Regulation with existing legislation. MS are required to put in place measures that are necessary to improve to 'good condition', habitat types which are not in good condition. Measures must concern 30% of the area of each marine habitat group in poor condition by 2030, increasing to 60% by 2040 and 90% by 2050 (Art. 5(1)). In addition to improving degraded habitats, the regulation mandates the re-establishment of habitats where they have disappeared, with similar progressive targets: at least 30% of the necessary area by 2030, 60% by 2040, and 100% by 2050 (Art. 5(2))[79].

The **EU Common Fisheries Policy (CFP)**, established in 1983 and currently governed by Regulation (EU) No 1380/2013 on the Common Fisheries Policy[80], primarily aims to ensure the sustainable management of fish stocks and the fishing sector. However, it also seeks to minimise the environmental impacts of fishing activities and thereby contributes indirectly to the conservation of *P. oceanica*. The CFP refers to restoration in the context of rebuilding harvested populations above levels capable of producing maximum sustainable yield (Article 2). The CFP incorporates the ecosystem-based approach and requires that fishing activities avoid or minimise negative impacts on the marine environment. In this regard, the CFP provides the legal basis for the adoption of specific technical conservation measures aimed at reducing habitat damage from fishing activities. These measures, adopted through separate fisheries regulations, include restrictions on the use of certain towed fishing gear and spatial limitations on trawling, which indirectly protect *P. oceanica* meadows.

Council Regulation (EC) No 1967/2006[81] concerning **management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea,** commonly referred to as the "Mediterranean Trawling Regulation," establishes a framework to regulate fishing activities in the Mediterranean, particularly bottom trawling, with the aim of protecting

[79] see more in section 2.1

[80] European Parliament & Council of the European Union. (2013, December 11). *Regulation (EU) No 1380/2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC*. Official Journal of the European Union, L 354, 22–61. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R1380

[81] Council Regulation (EC) No 1967/2006 of 21 December 2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea (as amended). (2006). *Official Journal of the European Union*, L 409, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006R1967-20260110

marine habitats and ensuring the sustainable use of fishery resources. **The Regulation explicitly protects seagrass habitats, including *P. oceanica*, by prohibiting the use of trawl nets, dredges, boat seines, shore seines and similar towed gear over seagrass beds (Article 4).** Bottom trawling can cause significant physical damage to Posidonia meadows by uprooting seagrass, disturbing sediments, and degrading[82] habitat structure. **In addition, the Regulation restricts trawling within 3 nautical miles from the coast or in waters shallower than 50 metres (Article 13), whichever is reached at a shorter distance.** By imposing these spatial and gear-based prohibitions, the Regulation directly reduces habitat destruction and creates more favourable conditions for the conservation and recovery of vulnerable ecosystems such as *P. oceanica* meadows.

The **European Ocean Pact**, announced in June 2025, brings together all EU maritime and ocean-related policies into a single, coherent framework, with one of its six priorities focused on restoring ocean health. **In terms of restoration, it proposes a revision of the Maritime Spatial Planning Directive to improve coordination across sectors and maritime uses**. The Pact urges MS to establish and manage marine protected areas to safeguard and rehabilitate degraded ecosystems. **It also promotes the creation of European blue carbon reserves to conserve and restore carbon-rich marine habitats**. These measures aim to rebuild marine biodiversity and enhance ecosystem resilience. To track progress, the EU plans to introduce an Ocean Act by 2027, alongside a high-level Ocean Board and a public dashboard to monitor restoration outcomes.

Recent policy developments at EU level further reinforce the strategic importance of blue carbon ecosystems, including seagrasses, within the climate policy framework. Key among these developments is the adoption of the **EU Climate Law**[83] in 2021 which sets a legal target for the EU to attain climate neutrality by 2050 and intermediate targets, beginning with a target of reducing emissions by at least 55% compared to 1990 levels by 2030. The EU Climate Law recognizes the role of natural carbon sinks and the need to "*enhance removals of emissions by natural sinks*". In 2026 the second intermediate target was agreed, aimed at a reduction of net greenhouse emissions by 90% compared to 1990 levels by 2040.[84]

[82] European Commission. (2025). *European Ocean Pact,* https://oceans-and-fisheries.ec.europa.eu/european-ocean-pact_en
[83] Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law'). https://eur-lex.europa.eu/eli/reg/2021/1119/oj/eng
[84] Regulation (EU) 2026/667 of the European Parliament and of the Council of 11 March 2026 amending Regulation (EU) 2021/1119 as regards the setting of a Union intermediate climate target for 2040. https://eur-lex.europa.eu/eli/reg/2026/667/oj/eng

In line with these developments, efforts to integrate coastal and marine ecosystems have been made in the review of the **EU Land Use, Land Use Change and Forestry (LULUCF) Regulation**[85] to highlight their role in carbon accounting, sequestration, and long-term climate mitigation.

Table 1: *International and European policy instruments that explicitly (✓) and implicitly (×) mention restoration and P. oceanica.*

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)	×	×	✓

[85] European Parliament and Council of the European Union. (2018, May 30). *Regulation (EU) 2018/841 on the inclusion of greenhouse gas emissions and removals from land use, land use change and forestry in the 2030 climate and energy framework, and amending Regulation (EU) No 525/2013 and Decision No 529/2013/EU*. Official Journal of the European Union, L 156, 1–25. https://eur-lex.europa.eu/eli/reg/2018/841/oj/eng

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 *P. oceanica* Restoration

Despite this complex and multilevel framework, the funds currently allocated for biodiversity conservation are insufficient to close existing gaps, let alone to cover the additional funding needs for restoration.

The 2025 Environmental Implementation Review[86] included an updated investment gap for meeting environmental legislation across key areas, such as water, the circular economy, pollution prevention, and ecosystem protection. The updated investment gap is estimated at EUR 122 billion per year across the EU. More than half of this total results from **the inability to meet biodiversity financing needs, estimated at EUR 66.75 billion per year**. Of this amount, less than half has been secured, leaving a **biodiversity funding gap in the EU of EUR 38.66 billion per year**[87]. This amount includes the funding needed to implement the NRR, which also acknowledges a funding gap.

For Mediterranean seagrass restoration, recent assessments indicate a critical financing gap: of the estimated EUR 336 million required annually for *P. oceanica* conservation in the Mediterranean, only EUR 17 million is currently invested.[88] This shortfall is largely driven by the high costs associated with active restoration, which can range between EUR 516,000 and EUR 942,000 per hectare[89], compared to the relatively lower costs of passive conservation measures. These costs remain estimates as most restoration efforts concerns research projects and have not reached a level where economies of scale may apply. However, the gap is also linked to the fact that current funding models, predominantly reliant on public grants and philanthropy, are providing insufficient resources to maintain the ecological integrity of the Mediterranean basin and its seagrass ecosystems.

[86] European Commission. 2025 Environmental Implementation Review: Environmental implementation for prosperity and security. COM(2025)420 final. Brussels, 7 July 2025. https://environment.ec.europa.eu/law-and-governance/environmental-implementation-review_en

[87] Environment Investment Needs and Gaps V.1 . 2026. https://app.powerbi.com/view?r=eyJrIjoiMTE4YWNhNjktYmE1Yi00NDljLWFiODItMjNmMjVhNjc0NzE1IiwidCI6ImIyNGM4YjA2LTUyMmMtNDZmZS05MDgwLTcwOTI2ZjhkZGRiMSIsImMiOjh9

[88] WWF Blue Seeds, Mediterranean Posidonia Network, WWF Med & OFB, 2024. Consultancy study to identify financial flows and existing financing mechanisms towards the protection and restoration of seagrass Blue Carbon ecosystems in the Mediterranean Sea.

[89] Mediterranean Posidonia Network. (2025). *Policy Brief 2025: Mediterranean Posidonia Network – Priority recommendations for seagrass protection and restoration* (with WWF Mediterranean and partners). WWF Mediterranean. https://wwfeu.awsassets.panda.org/downloads/mpn_policy-brief_2025.pdf

This section examines the institutional provisions and corporate requirements increasingly being adopted to bridge this funding gap and presents the various funding sources available. Several EU national and public instruments already finance *P. oceanica* conservation and are gradually expanding support for its restoration. However, it is essential that these public sources remain reliable and consistent, as well as provide dedicated funding that can be used more effectively. At the same time, there is significant potential to attract private investment through market-based instruments or additional private or blended funding mechanisms.

4.1. Legal and institutional provisions facilitating restoration funding

This section contextualizes the financial landscape in which restoration initiatives currently operate, providing a basis to assess complementary and innovative funding options.

4.2. Nature policy provisions and funding

First, the international, regional, and European nature-related policy instruments that include provisions supporting the financing of P. *oceanica* restoration are presented. Then, the section outlines the EU instruments that have recently been adopted introducing biodiversity-related corporate requirements. These requirements serve as an additional motive to trigger investment interest in nature restoration.

The relevant legal provisions are presented in **Table 2**, which brings together the key international, regional, and European treaties and agreements relevant to ecosystem and nature restoration, with a specific focus on their more recent provisions for financing. The provisions presented vary from recommendations for integrating the value of ecosystem services to calls to secure additional resources.

Of the listed provisions only few explicitly refer to seagrass ecosystems or *P. oceanica,* as most are not ecosystem specific. The NRR and the Barcelona Convention Decisions, for example, include provisions relating to finance, but these cover all species or habitats detailed in their annexes, and, therefore, also *P. oceanica*. Similarly, the Ramsar Resolution on wetlands restoration, implicitly covers *P. oceanica,* as seagrasses are included in the overarching definition of wetlands. The Bonn Convention Resolution on seagrass, including provisions on financing, is one of the few instruments to explicitly concern seagrasses alone. However, all the finance-linked

provisions of biodiversity instruments, such as the GBF and the EU 2030 Strategy are also relevant to *P. oceanica*.

The finance-related provisions are particularly aimed at bridging the funding gap noted, leading the GBF to call for an increase of global biodiversity financing to USD 200 billion per year from various funding sources. The EU 2030 Biodiversity Strategy sets the ambition for the EU at EUR 20 billion per year.

To secure these funds, beyond the well-established and necessary public funding sources, global, regional and EU policy instruments call for the redirection of environmentally harmful subsidies toward nature conservation and restoration. In addition, they increasingly encourage the mobilization of private finance and the development of innovative financing mechanisms and tools.

While the redirection of funds is not examined in this study, it is worth noting the vast difference between funding directed to activities with harmful impacts on nature (estimated in 2023 at USD 7.3 trillion) and the USD 220 billion directed to activities with a positive impact. Of the funding directed to harmful activities, USD 4.9 trillion comes from private investment, while environmentally harmful public subsidies account for USD 2.4 trillion. Of the funding directed to activities with a positive impact, 90% (USD 197 billion) is public funding[90].

With this context in mind, the provisions presented above demonstrate that the policy and **legal frameworks already create space for the development and application of various funding approaches for restoration**. In other words, the foundation for mobilizing a broader mix of financial resources, including additional public funds, market-based instruments, partnerships, and other innovative structures, has already been laid. Consequently, **creating an enabling environment for scaling up restoration finance in line with contemporary policy objectives is the next challenge to be overcome**.

[90] United Nations Environment Programme (2026). *State of Finance for Nature 2026: Nature in the red: Powering the trillion dollar nature transition economy*. Nairobi. https://wedocs.unep.org/handle/20.500.11822/49119

Table 2: *International and European policy instruments that concern funding tools and mechanisms for Nature*

International Conventions	
Ramsar Convention	Special mention to develop tools for economical assessment of ecosystem services (Resolution XIV.17/2022)[91]. Also, Resolution XV.25[92] (COP15, 2025) on the assessment of wetland values and services reinforcing the economic valuation dimension of wetland conservation.
The Kunming-Montreal Global Biodiversity Framework (2022)	**Target 19**[93] mentions that parties must "***Substantially and progressively increase the level of financial resources from all sources,*** *in an effective, timely and easily accessible manner,* ***including domestic, international, public and private resources,*** *in accordance with Article 20 of the Convention, to implement national biodiversity strategies and action plans,* ***by 2030 mobilizing at least USD 200 billion per year****, including* ***by****: (a)* ***Increasing total biodiversity related international financial resources*** *from developed countries, […] (b) Significantly* ***increasing domestic resource mobilization, facilitated by the preparation and implementation of national biodiversity finance plans*** *or similar instruments according to national needs, priorities and circumstances; (c) Leveraging private finance, promoting blended finance, implementing strategies for raising new and additional resources, and encouraging the private sector to invest in biodiversity, including through impact funds and other instruments; (d)* ***Stimulating innovative schemes such as payment for ecosystem services, green bonds, biodiversity offsets and credits,*** *benefit-sharing mechanisms, with environmental and social safeguards (e)* ***Optimizing co-benefits and synergies of finance targeting the biodiversity and climate crises****, (f) Enhancing the role of collective actions, including by indigenous peoples and local communities, Mother Earth centric actions and non-market-based approaches including community based natural resource management and civil society cooperation and solidarity aimed at the conservation of biodiversity* […]"

[91] Ramsar Convention on Wetlands, *Resolution XIV.17: The protection, conservation, restoration, sustainable use and management of wetland ecosystems in addressing climate change*, adopted at the 14th Meeting of the Conference of the Contracting Parties (COP14), Wuhan & Geneva, 5–13 November 2022 https://www.ramsar.org/sites/default/files/documents/library/xiv.17_climate_change_e.pdf

[92] Ramsar Convention on Wetlands. (2025). *Resolution XV.25: Assessment of wetland values and services*. 15th Meeting of the Conference of the Contracting Parties (COP15)., https://www.ramsar.org/sites/default/files/2025-09/XV.25_assessment_wetland_values_e.pdf

[93] Secretariat of the Convention on Biological Diversity. (2022). *Target 19: Mobilize $200 billion per year for biodiversity from all sources, including $30 billion through international finance*., https://www.cbd.int/gbf/targets/19

Convention on the Conservation of Migratory Species of Wild Animals – Bonn Convention	In UNEP/CMS/COP 14/ Doc.27.4.3: Annex 1 Par. 5[94] recommends Parties to "***provide financial support and resources for the conservation and restoration*** *of seagrass ecosystems and the role they play in supporting migratory species*". **Annex 1 Par. 2[95]** requires Parties **to leverage funding** from relevant international and regional mechanisms such as the Global Environmental Facility or the Green Climate Fund and others to support seagrass conservation and management.
Paris Agreement	Article 9 Par. 3[96] states that developed country Parties should continue to take the lead in **mobilizing climate finance from a wide variety of sources, instruments and channels**, noting the significant role of public funds, through a variety of actions […].
Regional (Mediterranean) Conventions	
Barcelona Convention	**Strategic Direction 2.3.3[97]** requires Parties to **set up financial mechanisms** (National funds, payment for ecosystem services, compensations) to support policies ensuring the provision of environmental and social services. **Strategic Direction 5.6.1**[99] requires Parties to promote environmental tax reform to reduce tax on labour and **integrate the polluter-pays principle and extended producer responsibility into finance policy.** **Strategic Direction 7.3.3**[99] calls Parties to create an **investment facility** for sustainable development implementation in the Mediterranean, involving international financial institutions, development banks, the European Union and bilateral donor agencies. **At COP24 (2025)**[98] Parties adopted the updated Mediterranean Strategy for Sustainable Development (2026–2035), reinforcing resource mobilization and sustainable finance alignment at regional level, without establishing a dedicated financing mechanism.

[94]Convention on the Conservation of Migratory Species of Wild Animals. (2024). *Seagrass ecosystems* (UNEP/CMS/COP14/Doc.27.4.3)., https://www.cms.int/sites/default/files/document/cms_cop14_doc.27.4.3_seagrass-ecosystems_e_0.pdf
[95]Convention on the Conservation of Migratory Species of Wild Animals. (2024). *Seagrass ecosystems* (UNEP/CMS/COP14/Doc.27.4.3). 14th Meeting of the Conference of the Parties (COP14), Samarkand, Uzbekistan,:https://www.cms.int/sites/default/files/document/cms_cop14_doc.27.4.3_seagrass-ecosystems_e_0.pdf
[96] United Nations Framework Convention on Climate Change. (2015). *Paris Agreement*, https://unfccc.int/sites/default/files/english_paris_agreement.pdf
[97] United Nations Environment Programme / Mediterranean Action Plan. (2016). *Mediterranean Strategy for Sustainable Development 2016–2025 (Decision IG.22/02)*. https://wedocs.unep.org/items/f117d0a4-0140-4c96-9a69-b2f323066c37
[98]European Commission. (2025, December 5). *EU and partners boost Mediterranean Sea protection at COP24*., https://environment.ec.europa.eu/news/eu-and-partners-boost-mediterranean-protection-cop24-2025-12-05_en

European/Regional	
The Environment Action Programme to 2030	The Programme commits the EU to allocating an increasing share of its budget to **biodiversity objectives**—at least 7.5% by 2024 and 10% in 2026 and 2027—and promotes the mobilisation of both public and private funding sources to support restoration efforts. MS are encouraged to phase out environmentally harmful subsidies at national level, make greater use of **market-based instruments**, **green budgeting and financing tools**, including those required to ensure a socially fair transition, and support businesses and other stakeholders in developing standardized natural capital accounting practices.
EU Biodiversity Strategy 2030	It aims to **unlock at least EUR 20 billion per year** of combined public and private finance to support nature, with a significant part allocated to **restoration of degraded ecosystems**, including marine habitats.
The EU Nature Restoration Regulation	**Point 78 of the preamble of the NRR** calls all MS to ensure meeting the targets and fulfilling the obligations set out in this Regulation, with **utmost importance that adequate private and public investments are made in restoration**. Article 14 par. 12 requires that MS may promote the **deployment of private or public support schemes** to the benefit of stakeholders implementing restoration measures referred to in Articles 4 to 12 including land managers and owners, farmers, foresters and fishers.
Communication From the European Commission 'Roadmap towards Nature Credits'	On July 07, 2025, the European Commission issued a Communication Document on the Roadmap towards the Roadmap Towards Nature Credits[99]. In this document the EC expresses the intention to build a robust, scientific and institutional framework for Nature Credits. This initiative is new but is clearly on building tools to fund Nature.

[99] European Commission. (2025, July 7). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Roadmap towards Nature Credits* (COM(2025) 374 final). EUR-Lex. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0374

4.3. Corporate motivations linked to nature restoration

In addition to the above environmental policy instruments that call for increased funding for nature and its restoration, **there is also a growing body of legal instruments, particularly at the EU level, introducing nature-related corporate obligations**. **Beyond these legal requirements, a range of voluntary and market-based initiatives is also emerging, encouraging corporate engagement in nature protection and restoration.** Their aim is to transform investments in adverse impact activities towards more sustainable options, integrating stronger requirements in corporate disclosure. They are deemed necessary in order to change business-as-usual policies, through disincentivizing corporate actions that cause the loss of biodiversity.[100]

The evolving EU sustainability regulatory framework has recently undergone a significant shift with the adoption of the Omnibus simplification package (2025–2026), aimed at streamlining corporate sustainability obligations. Following a period of rapid regulatory expansion under the European Green Deal, the Omnibus Package introduces targeted amendments to key instruments, including the Corporate Sustainability Reporting Directive (CSRD), the Corporate Sustainability Due Diligence Directive (CSDDD), the EU Taxonomy, and the Carbon Border Adjustment Mechanism (CBAM) [101]. These reforms seek to reduce administrative burden, enhance legal certainty, and safeguard EU competitiveness, while maintaining core environmental and social objectives. As a result, corporate sustainability requirements are increasingly framed around materiality, proportionality, and risk-based approaches, with implications for the extent to which companies engage in biodiversity protection and ecosystem restoration.

An important tool to guide investments towards more sustainable options is **Regulation (EU) 2020/852**, known as the EU Taxonomy Regulation[102]. The regulation defines which "*economic activities qualify as environmentally sustainable for the purposes of establishing the degree to which an investment is environmentally sustainable*". As a market transparency tool,

[100] IPBES, 2026. Summary for Policymakers of the Methodological Assessment Report on the Impact and Dependence of Business on Biodiversity and Nature's Contributions to People. Jones M., et al, eds. IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.15369060

[101] European Parliament & Council of the European Union. (2026, February 24). *Directive (EU) 2026/470 amending Directives 2006/43/EC, 2013/34/EU, (EU) 2022/2464 and (EU) 2024/1760 as regards certain corporate sustainability reporting and due diligence requirements*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32026L0470

[102] European Parliament & Council of the European Union. (2020, June 18). *Regulation (EU) 2020/852 on the establishment of a framework to facilitate sustainable investment (EU Taxonomy Regulation)*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32020R0852

it helps direct private capital towards more sustainable projects. *P. oceanica* restoration, due to its role in carbon sequestration, biodiversity enhancement, and coastal protection, can align with the regulation's criteria, particularly under categories such as the protection of marine ecosystems and climate change mitigation, thereby becoming more attractive to investors. Furthermore, **Article 9(f)** of the regulation explicitly identifies "*the protection and restoration of biodiversity and ecosystems*" as one of its environmental objectives. These objectives are further supported by the Environmental Delegated Acts[103] which cover the remaining environmental objectives, including the sustainable use of water and marine resources, the transition to a circular economy, pollution prevention, and biodiversity and ecosystem protection[104]. A significant update is adoption of the Omnibus simplification package on 4 July 2025, introducing a new Delegated Act that streamlines EU Taxonomy reporting by adding a **10% materiality threshold**, meaning companies no longer need to assess or report on economic activities (or financial exposures) that collectively account for less than 10% of their turnover, Capital Expenditure (CapEx) or Operational Expenditure (OpEx); for financial institutions - less than 10% of known use-of-proceeds exposures. In practice this means that restoration activities below these thresholds may be considered immaterial and, thus, not reported. This reflects the broader Omnibus-driven shift toward materiality-based reporting, potentially limiting the visibility of smaller-scale restoration activities.

The **Corporate Sustainability Reporting Directive (CSRD)[105]**, which entered into force in January 2023, aims to ensure that investors and other stakeholders have access to information necessary to assess business impact on people and the environment, and to assess risks and

[103] Commission Delegated Regulation (EU) 2023/2485 of 27 June 2023 amending Delegated Regulation (EU) 2021/2139 establishing additional technical screening criteria for determining the conditions under which certain economic activities qualify as contributing substantially to climate change mitigation or climate change adaptation and for determining whether those activities cause no significant harm to any of the other environmental objectives. https://eur-lex.europa.eu/eli/reg_del/2023/2485/oj/eng and Commission Delegated Regulation (EU) 2023/2486 of 27 June 2023 supplementing Regulation (EU) 2020/852 of the European Parliament and of the Council by establishing the technical screening criteria for determining the conditions under which an economic activity qualifies as contributing substantially to the sustainable use and protection of water and marine resources, to the transition to a circular economy, to pollution prevention and control, or to the protection and restoration of biodiversity and ecosystems and for determining whether that economic activity causes no significant harm to any of the other environmental objectives and amending Commission Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32023R2486

[104] European Commission. (n.d.). List of Implementing and Delegated Acts on Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020. https://finance.ec.europa.eu/document/download/083f92ce-1f3d-464a-88a3-5079dee8eef5_en?filename=taxonomy-regulation-level-2-measures-full_en.pdf

[105] Directive (EU) 2022/2464 of the European Parliament and of the Council of 14 December 2022 amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as regards corporate sustainability reporting, https://eur-lex.europa.eu/eli/dir/2022/2464/oj/eng

opportunities from Environmental, Social and Governance (ESG) issues (including biodiversity). CSRD applies a staged reporting timeline depending on the characteristics of a company. Based on its provisions, companies need to determine material Dependencies, Impacts, Risks, and Opportunities (DIROs) in their value chain. To prioritize actions for Posidonia meadows, DIROs would need to be identified where a **company's value chain interacts with seagrass ecosystems**, if biodiversity is determined to be a material topic following a double materiality assessment under the CSRD framework. Under the Omnibus Package, the scope of the CSRD has been significantly reduced, limiting its application to large companies with more than 1,000 employees and a turnover above EUR 450 million, while also postponing reporting requirements for companies not yet in scope. With regards to biodiversity reporting, the Omnibus simplification postulates that companies need to report on nature-related transition plans, policies, targets, or actions only if such are already present – preparation of new information for purposes of disclosure is not required.

The **Sustainable Finance Disclosure Regulation (SFDR)**[106] is in force since 2021 and aims to improve transparency in the market for sustainable investment products. It harmonizes sustainability disclosure obligations for financial market participants and financial advisers with respect to financial products. At the organizational (entity) level, financial market participants must disclose their mandatory or optional Principal Adverse Impacts (PAIs), that is, potential impacts of an entity on ESG factors, including biodiversity. With respect to *P. oceanica,* companies must disclose the share of investments in investee companies with sites/operations located in or near biodiversity sensitive areas. ***P. oceanica* meadows fall under these biodiversity sensitive areas**, given their status as a priority habitat under the Habitats Directive (92/43/EEC); therefore, entities have to report on their activities near *P. oceanica* insofar as companies this applies. They also have an option to disclose share of investments in investee companies whose operations affect threatened species. However, the global listing of *P. oceanica*'s conservation status is listed as "least concern" in the IUCN Red List of Threatened Species does not necessitate such reporting.

Furthermore, at the fund level, funds that promote and integrate ESG issues into their investment process (Article 8 or "light green funds") or funds that have the objective of sustainable investment (Article 9 or "dark green funds") may integrate "*protection and restoration of biodiversity and ecosystems*", thus including *P. oceanica* as an applicable environmental objective.

[106] Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector. https://eur-lex.europa.eu/eli/reg/2019/2088/oj/eng

The **Corporate Sustainability Due Diligence Directive (CSDDD)**[107], in force since July 2024 and subsequently simplified under the EU Omnibus package (2025–2026)[108], requires companies to conduct due diligence on human rights and environmental impacts across their operations and value chains. While the CSRD focuses on disclosure, the CSDDD focuses on due diligence processes, without requiring companies to achieve specific environmental outcomes. Recent revisions further reduce administrative burdens and narrow the scope of application, limiting it to a small number of very large companies (approximately 0.5% of EU firms). As a result, companies are primarily required to demonstrate that due diligence procedures are in place, rather than to actively reduce pressures or contribute to ecosystem restoration. Its relevance to seagrass ecosystems depends on whether in-scope companies materially impact such habitats.

All these legislative initiatives form **a preliminary basis upon which a more coherent and accountable governance and institutional system must be built to ensure funds for restoration**. As such, even they may offer an incentive for the engagement of the private sector in seagrass restoration.

Indeed, **non-state actors are both encouraged and increasingly obliged to take on a more active role in the need to close the identified funding gap**, complementing the central role that the public sector undoubtably maintains. These non-state actors can be of various categories, ranging from non-governmental civil society organizations, donor foundations and research or academic institutions to Small and Medium Enterprises (SMEs) and large corporations and financial institutions aiming at varied objectives. Their involvement can be diverse ranging from project funding, management, facilitation, or knowledge generation[109,110].

[107] European Parliament and Council of the European Union. (2024). *Directive (EU) 2024/1760 on corporate sustainability due diligence and amending Directive (EU) 2019/1937 and Regulation (EU) 2023/2859*. Official Journal of the European Union. https://eur-lex.europa.eu/eli/dir/2024/1760/oj

[108] Council of the European Union. (2026, February 24). *Council signs off simplification of sustainability reporting and due diligence requirements to boost EU competitiveness*. https://www.consilium.europa.eu/en/press/press-releases/2026/02/24/council-signs-off-simplification-of-sustainability-reporting-and-due-diligence-requirements-to-boost-eu-competitiveness/

[109] Armitage, D., de Loë, R. C., & Plummer, R. (2012). *Environmental Governance and its Implications for Conservation Practice*. Ecology and Society, 17(4): 8.

[110] Betsill, M. M., et al. (2021). Understanding international non-state and subnational actors for biodiversity and their possible contributions to the post-2020 CBD global biodiversity framework: Insights from six international cooperative initiatives. *International Environmental Agreements: Politics, Law and Economics*, 22(1), 1–25. https://doi.org/10.1007/s10784-021-09547-2

The **motive** for being engaged may also differ[111]. Private foundations, donors, and individuals may choose to fund restoration projects to increase sustainability, promote their mission, or meet their personal drives. For-profit businesses and investors may be driven from a corporate social responsibility ethic but may also choose to uptake restoration programs realign capital flows with measurable ecological outcomes in response to the growing regulatory and strategic imperative for businesses to meet nature-positive obligations, as outlined above. In addition, there is growing evidence that corporate actors are engaging in restoration-related activities on a voluntary basis, driven by the need to reduce physical and transition risks, particularly within supply chains, and to secure ecosystem services that underpin their economic activities. This includes investments aimed at maintaining or restoring environmental conditions necessary for long-term business continuity.

Any actor may respond to the need for scalable, long-term capital matching the decadal timelines of marine ecosystem recovery and be grounded on the increasing recognition that seagrass meadows generate quantifiable, market-relevant value, beyond intrinsic worth, through services such as coastal protection, fisheries enhancement, and climate resilience.

4.4. Funding Sources for *P. oceanica* restoration

The next challenge in financing restoration is to identify the funding sources. This sub-section provides an overview of the principal funding sources that are currently available to support nature restoration.

Traditionally and importantly nature financing originates from public sources and/or donor institutions. Gradually, in addition to nature conservation, funding is directed also to the implementation of nature restoration activities. At the same time, innovative financing instruments that include the involvement from the private sector increasingly emerge. Funding for *P. oceanica* restoration is, in most Mediterranean countries, not yet coordinated under a single funding instrument. Rather, several instruments exist that can provide financial support for restoration activities.

Public financing is the main source of funding, whether at the national or EU level, reflecting the central role of governmental and EU-level instruments in financing environmental action. Several of these sources are

[111]Grimm, K. E. (2022). Follow the money: Understanding the Latin America and Caribbean mangrove restoration funding landscape to assist organizations and funders in improved social-ecological outcomes. Conservation Science and Practice, 5(5), e12815.

already being utilized in the countries hosting the ARTEMIS pilot sites, thereby offering concrete examples of how public funding frameworks are operationalized at both the national and local levels.

4.5. National public funding

At the **national level**, state and or region budgets can provide funding for nature conservation and restoration. For example, in **Greece**, the Green Fund[112], the Public Investment Programme[113] and national research resources may be used to secure nature conservation and restoration activities.

An additional resource available to MS, supplementing their national budgets derives from the **revenues they receive from the EU Emissions Trading System (ETS)**[114]. As part of EU climate policy, currently 100% of ETS from auction revenues is earmarked for climate action, including mitigation and adaptation measures. Following the integration of the maritime sector in the EU ETS, specific mention of protection and restoration of marine-based ecosystems is made within this context. Posidonia meadows provide proven climate benefits by storing carbon, protecting shorelines, and supporting marine biodiversity, making their restoration a strong candidate for ETS-financed measures.

Finally, **legal cases for ecological damage** have raised the importance of enforcing existing national regulations related to the protection of marine ecosystems. In 2024, the French Maritime Court of Marseille ordered two yacht captains, who had anchored in restricted areas in the Mediterranean, to pay compensation for damage caused to Posidonia meadows. The court recognised the ecological damage in civil proceedings and ordered the yacht captains to pay compensation to recover for the loss of ecosystem value to the Rhône-Méditerranée-Corse Water Agency to carry out ecological restoration work on the Posidonia meadows[115]. This is the first time that a Court has recognised ecological damage caused to a protected species grounded in a legislative basis for the regime governing liability for environmental damage. This case allows recognition of the fundamental

[112]Green Fund. (n.d.). . https://prasinotameio.gr/en/
[113]Bank of Greece. (n.d.). *Public investments programme*. https://www.bankofgreece.gr/en/main-tasks/general-government-entities/public-investments-program
[114]European Environment Agency. (2025, December 17). *Use of auctioning revenues generated under the EU Emissions Trading System*. https://www.eea.europa.eu/en/analysis/indicators/use-of-auctioning-revenues-generated
[115]Tribunal maritime de Marseille. (2024, November 22). *Jugement du 22 novembre 2024 relatif au préjudice écologique causé aux herbiers de posidonie*. https://www.obs-droits-marins.fr/_bibli/articlesPage/642/docs/tribunal-maritime-de-marseille-22-novembre-2024.pdf

asset value of *P. oceanica* which was estimated to be around EUR 86,000 ha/year and set a precedent for future funding streams from the regulation of anchoring and mooring at sea.

4.6. EU Funding

At the EU level, the available resources are outlined in budgetary periods of seven years, referred to as the EU's **Multiannual Financial Framework (MFF)**[116], (current period: **2021–2027**). The MFF is structured around thematic priorities that allocate available funds to programmes, instruments and mechanisms; each having its own distinct scope and priorities. Beyond the MFF 2021–2027, **additional financial resources** became also available through the **European Recovery Plan**; an emergency support package (**NextGenerationEU**) aimed at rebuilding the European economy and strengthening its resilience in the aftermath of the COVID-19 pandemic. The total available EU resources for the current financial period amount to approximately **EUR 2 trillion** (in 2020 prices), with around **EUR 1.2 trillion** coming from the MFF 2021–2027 and **EUR 806.9 billion** from NextGenerationEU.

In each previous revision of the MFF, environmental integration has been strengthened, mainly through the revision of the provisions of the thematic priorities and the regulation of the different funds. The current, 2021-2027 MFF, includes natural resources and the environment as one of its thematic priorities. In addition, the 2021-2027 MFF includes a horizontal minimum commitment to allocate **30% of the whole MFF budget to support the EU's climate targets** and since 2024 a commitment to allocate **7.5% of the annual budget for biodiversity, with the commitment increasing to 10% for the annual budgets of 2026 and 2027**. To meet this horizontal commitment, there is differentiation of required percentage allocation across the available funds, with some funds having higher commitment targets. In numerical terms, the allocation was foreseen to amount to around EUR 100 billion for biodiversity-related spending, including restoration efforts[117]. A similar, but higher commitment, of **37%**, was provided for in the Recovery and Resilience Facility of the NextGenerationEU package in order to finance climate and biodiversity actions.

[116] European Commission. (n.d.). *Multiannual Financial Framework 2021-2027: documents*. https://commission.europa.eu/strategy-and-policy/eu-budget/long-term-eu-budget/2021-2027/documents_en

[117] European Commission, Directorate-General for Environment; Nesbit, M.; Whiteoak, K.; Underwood, E.; et al. (2022). *Biodiversity financing and tracking: Final report*. Publications Office of the European Union. DOI:10.2779/950856 https://op.europa.eu/s/Aiw9

The 2021-2027 MFF, as was the case in previous periods, includes financing provisions for such actions as habitat and species conservation and recovery and monitoring, that can be found across many of the available funds. Most significant of these, especially for *P. oceanica* and its restoration are **LIFE**, the **European Regional Development Fund (ERDF)**, to which **Interreg** is a distinct part, the **European Maritime, Fisheries and Aquaculture Fund (EMFAF)**, and **Horizon Europe**.

To facilitate the Member State's financial planning especially in meeting their obligations under the EU Habitats Directive for an effective Natura 2000 network, MS prepare and submit to the EC a **Prioritised Action Framework (PAF)**[118] (Art. 8 Habitats Directive). The PAF aims to estimate funding needs and outline co-financing opportunities in line for each MFF period. For *P. oceanica*, MS can identify restoration needs such as seagrass meadow recovery, protection from anchoring, or improved water quality. **By linking ecological priorities with funding opportunities, PAFs help ensure resources are directed efficiently.** This makes them a practical tool for planning and financing large-scale restoration of *P. oceanica* habitats.

The expected **NRPs**[119] (Art. 15 of the NRR)[120] are also to facilitate financial planning for restoration, as MS are to outline funding needs and sources for the restoration measures provided therein are to indicate the means of public, private, financial and co-financing in accordance with Article 15 (3)(u) of the NRR.

Additionally, EU-level instruments funded by ETS revenues, such as the Innovation Fund, as part of its **award/selection criteria** can promote projects that have also *co-benefits* for biodiversity protection.

The funding programmes, instruments and mechanisms in the current MFF that are more relevant to *Posidonia restoration* are briefly presented below.

The **LIFE Programme**[121] is the EU's only dedicated funding instrument for the **environment**, **climate action**, and **clean energy transition,** managed

[118]European Commission. (n.d.). *Financing Natura 2000*. https://environment.ec.europa.eu/topics/nature-and-biodiversity/natura-2000/financing-natura-2000_en

[119]European Commission. (2025). *Commission Implementing Regulation (EU) 2025/912 of 19 May 2025 laying down rules for the application of Regulation (EU) 2024/1991 as regards a uniform format for the national restoration plan*. Official Journal of the European Union. https://eur-lex.europa.eu/eli/reg_impl/2025/912/oj

[120]European Parliament and Council of the European Union. (2024). *Regulation (EU) 2024/1991 of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869*. Official Journal of the European Union. https://eur-lex.europa.eu/eli/reg/2024/1991/oj

[121] Regulation (EU) 2021/783 of the European Parliament and of the Council of 29 April 2021 establishing a Programme for the Environment and Climate Action (LIFE), and repealing Regulation (EU) No 1293/2013. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0783&qid=1779104688406 and

by the EC, usually via calls for proposals taking place on an annual basis. For the 2021–2027 period, the programme co-finances projects that contribute to nature and biodiversity conservation, circular economy and pollution reduction, climate change mitigation and adaptation, and transition to clean energy. LIFE focuses on pilot, demonstration, and best-practice projects that help implement EU environmental and climate legislation and policies. It plays a key role in supporting the European Green Deal and the EU's goal of climate neutrality by 2050.

Table 3: *Projects on P. oceanica or other seagrass species restoration co-funded through the EU LIFE funding instrument.*

Project	Description	Member states	Funding source
LIFE SEPOSSO[122]	It addresses governance, good practices and innovative tools for transplantation of Posidonia in Italy	Italy	LIFE
StrongeSea[123]	It aims to enhance conservation status of Posidonia meadows among other priority marine habitats in Sardinia	Italy	LIFE
SEA FOREST life[124]	Focused on carbon sequestration capacity of Posidonia meadows in Italian seas; reducing erosion, consolidating habitats.	Italy	LIFE
LIFE Transfer[125]	The project aimed at promoting the recovery of four seagrass species *Zostera marina* (eelgrass), *Zostera noltii* (dwarf eelgrass), *Ruppia cirrhosa* (spiral ditchgrass) and the seagrass *Cymodocea*	Italy, Greece, Spain	LIFE

European Climate, Infrastructure and Environment Executive Agency (CINEA). (n.d.). *LIFE programme*. https://cinea.ec.europa.eu/programmes/life_en

[122] LIFE SEPOSSO project. (n.d.). *Supporting environmental governance for the Posidonia oceanica sustainable transplanting operations*. https://lifeseposso.eu/en/

[123] STRONG SEA LIFE project. (n.d.). *STRONG SEA – Survey and TReatment ON Ghost Nets SEA LIFE.*: https://www.strongsealife.eu/en/

[124] SEAFOREST LIFE Project. (n.d.). *Posidonia meadows as carbon sinks of the Mediterranean.*, https://www.seaforestlife.eu/en/

[125] LIFE TRANSFER Project. (n.d.). *Seagrass transplantation for transitional ecosystem recovery.*, https://www.lifetransfer.eu/

	nodosa, in coastal lagoons across the Mediterranean.		
LIFE SIP GR Blue[126]	It focuses on improving the implementation and monitoring of the MSFD in Greece, across all descriptors, i.e. including *P.oceanica*. Moreover, it aims to enhance policy coherence between the MSFD and related EU and regional frameworks, notably the Nature Restoration Law and obligations under the Barcelona Convention, supporting integrated marine and biodiversity policy implementation.	Greece	LIFE
LIFE POSIDONIA[127]	It focuses on protecting *Posidonia oceanica* seagrass meadows in the Balearic Islands, Spain. These underwater ecosystems are vital for biodiversity, coastal protection, and carbon storage. The project aimed to map and monitor seagrass habitats and reduce human impacts such as anchoring and pollution. It introduced conservation measures like eco-friendly mooring systems and management plans. Overall, the project contributed to the long-term preservation of Mediterranean marine ecosystems.	Spain	LIFE

[126]European Commission. (n.d.). *Integrated approach for the implementation of the Marine Strategy Framework Directive in Greece (LIFE24-IPE-EL-LIFE SIP GR Blue).*, https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE24-IPE-EL-LIFE-SIP-GR-Blue-101203482/integrated-approach-for-the-implementation-of-the-marine-strategy-framework-directive-in-greece

[127] Conselleria de Medi Ambient del Govern de les Illes Balears. (n.d.). *LIFE Posidonia: Protection of Posidonia grasses in SCIs of the Balearic Islands.* https://lifeposidonia.caib.es/user/index_en.htm

The European Regional Development Fund (ERDF) and **Cohesion Fund**[128] are the main development funds in the EU, implementing the EU's cohesion policy. They aim to support economic, social and territorial cohesion across the EU, mainly by reducing regional imbalances and financing environmental and transport infrastructure, respectively. Aimed at a "Green Europe" the two funds can co-finance activities that strengthen nature conservation, promote green infrastructure, climate adaptation, river basin restoration, urban NbS and sustainable regional development. Actions **supporting *P. oceanica* conservation and restoration**, as well as sustainable tourism or any other sustainable activities that are linked to regional development, can be co-financed by the ERDF.

Interreg[129] is a distinct part of the ERDF. Therefore Interreg, shares the same scope and overarching priorities with the ERDF. The Interreg programmes are specifically designed to promote cross-border, transnational, and interregional cooperation across the EU, contributing to regional development and cohesion. It has been instrumental in supporting **cross-border exchanges on nature restoration**, including through the **Natural Heritage Mission**.

Table 4: *Projects on P. oceanica or other seagrass species restoration co-funded through the ERDF and Interreg instruments*

Project	Description	Member states	Funding source
Environment and Climate Change Programme (ECCP)[130]	Horizontal Conservation Actions for Marine Habitat Types	Greece	ERDF
ARTEMIS[131]	**ARTEMIS** (Accelerating the Restoration of Seagrass Meadows in the Mediterranean) is a project under the Interreg Euro-	Greece Italy, Spain France, Bulgaria	ERDF - Interreg

[128] *Regulation (EU) 2021/1058 of the European Parliament and of the Council of 24 June 2021 on the European Regional Development Fund and on the Cohesion Fund*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1058

[129] Regulation (EU) 2021/1059 of the European Parliament and of the Council of 24 June 2021 on specific provisions for the European territorial cooperation goal (Interreg) supported by the European Regional Development Fund and external financing instruments. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R1059&qid=1779104864733 and Interreg (n.d.) *Interreg: EU funding programme*. https://interreg.eu

[130] Ministry of Environment and Energy. (2025). *Horizontal actions for the conservation of marine habitat types,* https://peka-program.gr/prosklisis/orizonties-draseis-diatirisis-thalassion-typon-oikotopon/ (in Greek)

[131] Interreg Euro-MED Programme. (n.d.). *ARTEMIS: Accelerating the restoration of seagrass meadows in the Mediterranean area through innovative ecosystem-service based solutions*. https://artemis.interreg-euro-med.eu/

	MED Programme aiming to restore and conserve Posidonia and other seagrass meadows in the Mediterranean. It uses pilot restoration projects, develops financial mechanisms like Payment for Ecosystem Services (PES), and seeks to integrate ecosystem service values into policy and governance.		
POSEIDONE[132]	Urgent conservation actions of Posidonia beds of Northern Latium Restoring damaged Posidonia meadows and raising awareness in Lazio	Italy	ERDF - Interreg

The European Maritime, Fisheries and Aquaculture Fund (EMFAF)[133] supports the sustainable use of seas and coastal resources and activities that foster a blue economy. By co-financing with national and local actors, EMFAF **integrates restoration into fisheries management** and coastal development, bridging economic activities with the recovery of resilient marine ecosystems. Under the 2021–2027 programme, it can fund **ecological restoration and habitat recovery** (including *P. oceanica*), reduce fishing impacts, remove marine litter, and enhance biodiversity monitoring.

Table 5: *Projects on P. oceanica or other seagrass species restoration co-funded through the EMFAF*

Project	Description	Member states	Funding source
Marine forest of Redeia[134]	The Marine Forest platform is an initiative by Redeia and the Ecomar Foundation launched to restore *P. oceanica*	Spain	EMFAF - "Pleamar" Programme

[132] Interreg VI-A Italy–Slovenia Programme. (n.d.). *POSEIDONE – Promotion of green and blue infrastructure for a new environment*, https://www.ita-slo.eu/en/poseidone

[133] *Regulation (EU) 2021/1139 of the European Parliament and of the Council of 7 July 2021 establishing the European Maritime, Fisheries and Aquaculture Fund and amending Regulation (EU) 2017/1004.* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R1139

[134] Redeia. (n.d.). *Marine forest: Commitment to the ocean.* https://www.redeia.com/en/sustainability/climate-change/marine-forest-of-redeia

	meadows in the Mediterranean by 2030. It combines active restoration (planting fragments and seeds) with passive measures (removing stressors), research into improved restoration techniques, and education and outreach.		(co-financed)

Horizon Europe[135] is the EU's key research and innovation funding programme for 2021–2027, managed by the EC. It also promotes advanced monitoring tools and collaboration between scientists, policymakers, and communities, enabling evidence-based restoration and protection of seagrass habitats. Under the Horizon program there are five Missions (large-scale, goal-driven initiatives) set to address challenges. The **"Restore our Ocean and Waters Mission"**[136] contributes to the Green Deal and aims to protect and restore marine and freshwater ecosystems and biodiversity, prevent and eliminate pollution, support a sustainable blue economy, and achieve climate neutrality in ocean and water systems. **Horizon Europe can fund innovative projects to restore habitats, including *P. oceanica* meadows, by supporting research on transplantation methods, climate resilience, and ecosystem services**.

Table 6: *Projects on P. oceanica or other seagrass species restoration co-funded through Horizon Europe.*

Project	Description	Member states	Funding source
POSIDONIArXiv[137]	A research project that aims to reconstruct ecosystem processes, dynamics, and changes over time in *P. oceanica* meadows. In this way it informs restoration by identifying past biodiversity levels, natural		Horizon Europe

[135] European Parliament & Council of the European Union. (2021, April 28). *Regulation (EU) 2021/695 establishing Horizon Europe – the Framework Programme for Research and Innovation, laying down its rules for participation and dissemination*. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R0695

[136] European Commission. (n.d.). *EU Mission: Restore our Ocean and Waters*. Directorate-General for Research and Innovation. https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters_en

[137] European Commission. (n.d.). *Project information: Horizon Europe project (Grant agreement ID: 101105307)*. CORDIS. https://cordis.europa.eu/project/id/101105307

	variability, and key ecological shifts.		
CLIMAREST[138]	An EU-research project that develops, tests, and optimizes a modular toolbox of methods, protocols and stakeholder-engagement strategies for restoring coastal and marine ecosystems.		Horizon Europe

The European Agricultural Fund for Rural Development – EAFRD / CAP Rural Development[139] is the rural development pillar of the Common Agricultural Policy **(CAP)**, funds voluntary measures where farmers and communities **restore or enhance nature.** Even though not directly connected to *P. oceanica* and/or maritime restoration, experience and good practices linked to terrestrial and freshwater ecosystems could be drawn and guide financing opportunities for *P. oceanica*.

The Recovery & Resilience Facility (RRF)[140] is the largest and central instrument of the NextGenerationEU. It provides funding through **grants and loans to support green recovery and climate resilience.** The EU has set a target to dedicate at least **37% of the NextGenerationEU budget to climate-relevant, including biodiversity actions and expenditure**. *P. oceanica* restoration projects enhance carbon sequestration, protect biodiversity, and improve coastal resilience to climate change, so they fit the funding prerequisites of these funds.

Table 7: *Projects on P. oceanica restoration co-funded through Next Generation and the EU RRF*

Project	Description	Member states	Funding source
Atlas Posidonia[141]	An initiative in the Balearic Islands that seeks to map	Spain	Next Generatio

[138]CLIMAREST project. (n.d.). *Coastal climate resilience and marine restoration tools for the Arctic-Atlantic basin*. https://climarest.eu/

[139] *Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the Common Agricultural Policy (CAP Strategic Plans), financed by the European Agricultural Guarantee Fund (EAGF) and by the European Agricultural Fund for Rural Development (EAFRD).* https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R2115

[140] *Regulation (EU) 2021/241 of the European Parliament and of the Council of 12 February 2021 establishing the Recovery and Resilience Facility*, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021R0241

[141]European Commission. (n.d.). *Atlas Posidonia*. Horizon Europe – EU Mission: Restore our Ocean and Waters.https://projects.research-and-innovation.ec.europa.eu/en/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/restore-our-ocean-and-waters/atlas-posidonia

	and monitor *P. oceanica* meadows. The aim is to reduce damage (e.g. from anchoring) to Posidonia meadows and to support their conservation.		n EU Recovery, Transformation and Resilience Plan
Marine Ecosystem Restoration (MER)	The aims of the project are to implement measures for the restoration and protection of seabeds and marine habitats, to strengthen the national marine and coastal ecosystem observation system, and to map coastal and marine habitats of conservation interest in Italian waters.	Italy	Next Generation EU National Recovery and Resilience Plan (NRRP)

While the above opportunities are available, and indeed biodiversity financing can be found in various funded interventions and projects, based on the EU's biodiversity spending tracking, **the earmarked target of biodiversity spending for the current MFF is unlikely to be met**.[142] Indeed, while the initial 7.6% was achieved in 2024, with biodiversity spending increasing from 3.7% in 2021 to a forecast of 8% in 2027, the 10% will not be met. This is also reflected by looking at some of the funds identified above, based on the latest available data. Indicatively, MS have planned to allocate from the EU funding (i.e. not accounting for national co-financing) approximately only EUR 7 billion (approximately 2%) to nature of the total cohesion budget policy of EUR 357 billion;[143] and approximately EUR 377 million (approximately 7%) to nature of the total budget of the EMFAF of EUR 5.3 billion.[144] One of the funds, nearing the minimum allocation for provision for biodiversity is the Interreg programme, since EUR 973 million (9%) has been planned to be spent on nature of the total EUR 10.7 billion.[145]

[142] European Commission. 2025.. Biodiversity Overview 2025 – Table Budget contribution – Biodiversity. 12 June 2025. https://commission.europa.eu/strategy-and-policy/eu-budget/performance-and-reporting/horizontal-priorities/green-budgeting/biodiversity-mainstreaming_en

[143] European Commission. 2026. Cohesion Open Data Platform https://cohesiondata.ec.europa.eu/cohesion_overview/21-27# The biodiversity expenses are coded as "RSO2.7 Nature protection and biodiversity".

[144] European Commission. 2026. Cohesion Open Data Platform – EMFAF. https://cohesiondata.ec.europa.eu/funds/emfaf/21-27/#financing The biodiversity expenses are coded as "MSO1.6 Protection and restoration of nature".

[145] European Commission. 2026. Cohesion Open Data Platform – Interreg. https://cohesiondata.ec.europa.eu/funds/interreg/21-27#. The biodiversity expenses are coded as "RSO2.7 Nature protection and biodiversity".

EU Funding post-2027

Looking ahead, preparations are underway for the upcoming **2028–2034 programming period**[146]. The EC presented its proposals on the size and structure of the new Multiannual Financial Framework (MFF), as well as the provisions of the main funding instruments in July 2025[147] and accompanying and sectoral proposals in September 2025. Based on the proposal, the EU budget is again expected to total nearly EUR 2 trillion; however, the thematic priorities and structure of the MFF are significantly revised. The proposals of the EC include the following provisions that are relevant to nature restoration and, by extension also, to *P. oceanica* restoration:

- **Environmental commitment**: A horizontal target of at least 35% of the EU budget is set to be spent towards the goals of the EU Green Deal. This target covers climate and overall environmental action. A dedicated target for biodiversity, similar to the newly introduced 7.5-10% target during the current MFF, is not foreseen. Rather, biodiversity action is included in the new percentage target. Similarly to the current MFF, to meet this horizontal commitment, there is differentiation of required percentage allocation across the available funds, with some funds having higher commitment targets.

- Budget contributions to the climate and biodiversity policies are to be tracked based on a three-tiered coefficient system of 0%, 40% and 100% to a given policy.[148] Nature protection and restoration interventions are to apply the 100% coefficient towards the environmental component of the new target, but their contribution to climate mitigation and to climate adaptation and resilience vary from 0%, 40% or 100% depending on the type of intervention and ecosystem protected and restored. The protection and restoration of coastal ecosystems, to which the restoration of seagrasses and *P. oceanica* is presumably included, are recognized with a coefficient of 100% across these categories.

[146]European Commission. (2025). *The 2028–2034 EU budget for a stronger Europe*. European Commission. https://commission.europa.eu/strategy-and-policy/eu-budget/long-term-eu-budget/eu-budget-2028-2034_en#legal-documents

[147] European Commission. 2025. Communication from the Commission to the European Parliament, the European Council, the European Economic and Social Committee and the Committee of the Regions. A dynamic EU Budget for the priorities of the future - The Multiannual Financial Framework 2028-2034. (COM/2025/570 final/2) https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC0570R%2801%29&qid=1753797062248

[148] European Commission. 2025. Proposal for a Regulation of the European Parliament and of the Council establishing a budget expenditure tracking and performance framework and other horizontal rules for the Union programmes and activities. (COM/2025/545 final). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025PC0545&qid=1753797488776. See in particular interventions #281-287 in Annex I, Intervention fields and indicators.

- A new **European Fund for Economic, Territorial, Social, Rural and Maritime Sustainable Prosperity and Security** (NRP Fund)will bring together EU funds that are distinct under the current MFF.[149] Most of the funding instruments integrated into the new Fund are those that currently are characterized by shared management between the EC and the MS, a national funding pre-allocation and are implemented by MS. These include funding instruments of the Common Agriculture Policy, the Common Fisheries Policy, and the Cohesion Policy. As such the Fund will integrate funding with such instruments as the ERDF, the Cohesion Fund and the EMFAF. The greatest share of the available funds will be delivered to the MS through the **National and Regional Partnership Plans (NRPPs), the Interreg Plan and the EU Facility**. The NRPPs, which will be prepared by each MS and will outline reform and investment priorities, must be consistent with the NRPs of each MS.

- Based on the EC's proposal, the Programme for Environment and Climate Action **LIFE** will no longer be a distinct dedicated funding instrument. Funding for climate and the environment will be allocated through the EU Facility of the newly proposed NRP Fund and the EU Competitiveness Fund.

- The **Interreg programmes** will be integrated in the new NRP Fund. However, it will retain its distinct character and be implemented through an Interreg Plan and Interreg Plan chapters that will cover distinct geographic areas.

- A new **EU Competitiveness Fund** will integrate 14 of the existing EU funds[150]. The new EU Competitiveness Fund integrates part of LIFE, especially the segment linked to climate transition, awareness raising and governance. The EU Competitiveness Fund will coordinate with

[149] European Commission. 2025. Proposal for a Regulation of the European Parliament and of the Council establishing the European Fund for economic, social and territorial cohesion, agriculture and rural, fisheries and maritime, prosperity and security for the period 2028-2034 and amending Regulation (EU) 2023/955 and Regulation (EU, Euratom) 2024/2509. COM (2025)565 final/2. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025PC0565R%2801%29&qid=1753697054840 and European Commission. 2025. Proposal for a Regulation of the European Parliament and of the Council establishing the European Fund for Regional Development including for European Territorial Cooperation (Interreg) and the Cohesion Fund as part of the Fund set out in Regulation (EU) [...] [NRP] and establishing conditions for the implementation of the Union support to regional development from 2028 to 2034. COM (2025) 552 final. https://commission.europa.eu/publications/european-fund-regional-development-and-cohesion-fund_en

[150] European Commission. 2025. Proposal for a Regulation of the European Parliament and of the Council on establishing the European Competitiveness Fund ('ECF'), including the specific programme for defence research and innovation activities, repealing Regulations (EU) 2021/522, (EU) 2021/694, (EU) 2021/697, (EU) 2021/783, and amending Regulations (EU) 2021/696, (EU) 2023/588, (EU) [EDIP]. COM(2025)555 final/2. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025PC0555R%2801%29&qid=1754057198136

Horizon Europe, which, however, will retain its distinct character as a funding tool.[151]

Other EU funding sources

The European Investment Bank (EIB)[152], the EU's investment bank, lends directly to public authorities, utilities, or large companies for projects. In recent years, the EIB has increased its financing for climate and nature projects, including habitat restoration. Furthermore, the **EIB's Climate Bank Roadmap (2021–2030)[153] commits to aligning all operations with the Paris Agreement and dedicating at least 50% of annual financing to climate action and environmental sustainability**, including biodiversity and ecosystem restoration. Since *P. oceanica* plays a key role in blue carbon sequestration, its restoration could be considered a priority within this framework.

InvestEU[154] is a new EU Programme introduced under the 2021–2027 MFF to replace and consolidate several earlier financial instruments. It consists of three components: the InvestEU Fund, the InvestEU Advisory Hub, and the InvestEU Portal. The InvestEU Fund with a budget of around EUR 26.2 billion acts as a guarantee and financial instrument to leverage public and private investment, with the aim of mobilising over €370 billion in support of EU policy objectives, including the green transition. It is implemented in partnership with financial institutions such as the European Investment Bank and national investment banks. Under InvestEU, nature restoration can be supported indirectly through financing frameworks, funds, and infrastructure projects, particularly under the "sustainable infrastructure" window.[155] In the EC proposal for the 2028-2034 MFF, the EU Competitiveness Fund, draws from the experience of InvestEU, which it integrates.

[151] European Commission. 2025. Proposal for a Regulation of the European Parliament and of the Council establishing Horizon Europe, the Framework Programme for Research and Innovation, for the period 2028-2034 laying down its rules for participation and dissemination, and repealing Regulation (EU) 2021/695. (COM (2025)543 final. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025PC0543&qid=1753802854776

[152] European Investment Bank. (n.d.). *European Investment Bank*. https://www.eib.org/en/index.htm

[153] European Investment Bank. (n.d.). *EIB Group Climate Bank Roadmap*. https://www.eib.org/files/publications/thematic/eib_group_climate_bank_roadmap_en.pdf

[154] Regulation (EU) 2021/523 of the European Parliament and of the Council of 24 March 2021 establishing the InvestEU Programme and amending Regulation (EU) 2015/1017. (Consolidated version). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02021R0523-20251224

[155] Indicatively: European Investment Fund. 2026. "EIB Group promotes biodiversity in Europe with €60 million guarantee for Sienna Investment Managers fund" Press release 2 April 2026. https://www.eif.org/press/all/eib-group-promotes-biodiversity-in-europe-with-eur60-million-guarantee-for-sienna-investment-managers-fund

4.7. Philanthropic Contributions and Donor Institutions

Philanthropic foundations, donor institutions and even individuals can play a vital role in supporting nature restoration projects, including the restoration of *P. oceanica* meadows, by providing flexible funding that often complements public and private investments. These entities are frequently able to take risks on innovative or pilot projects that might not yet qualify for large-scale government funding, helping to advance restoration techniques and community engagement. Additionally, philanthropic grants can support scientific research, capacity building, and awareness campaigns, which are essential for the long-term success of restoration activities. By mobilizing resources and fostering partnerships among local stakeholders, donors and philanthropists help fill critical funding gaps and accelerate the conservation and restoration of this vital marine ecosystem.

For example, the **Conservation Collective**[156], a global network of locally focused environmental foundations dedicated to protecting and restoring the natural world, includes the Cyclades Preservation Fund[157] (Greece), the Ionian Environment Foundation[158] (Greece), the Argosaronic Environment Foundation[159] (Greece), the Menorca Preservation[160] (Spain), the Mallorca Preservation Foundation[161] (Spain), Ibiza Preservation[162] (Spain) have actively funded marine conservation initiatives, including efforts to protect and restore *Posidonia* habitats across the Mediterranean.

4.8. Market-based Instruments

Innovative, market-based financing mechanisms can mobilize substantial capital for the restoration of *P.oceanica* and other seagrass species. These mechanisms also represent an essential first step toward developing business models that facilitate broader access to financing[163]. These tools help shift funding away from traditional grants toward scalable, performance-driven models that attract both public and private investors.

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[156] Conservation Collective. (n.d.). *Conservation Collective: Protecting and restoring nature globally*. https://conservation-collective.org/
[157] Cyclades Preservation Fund. (n.d.). *Cyclades Posidonia Alert*. https://cycladespreservationfund.org/programs/cyclades-posidonia-alert/
[158]Ionian Environment Foundation. (n.d.). *Ionian Environment Foundation*. https://ionianenvironment.org/
[159] Argosaronic Environment Foundation. (n.d.). *Argosaronic Environment Foundation*. https://argosaronicenvironment.org/
[160] Menorca Preservation. (n.d.). *Menorca Preservation*. https://menorcapreservation.org/
[161] Mallorca Preservation Foundation. (n.d.). *Mallorca Preservation Foundation*. https://mallorcapreservation.org/en
[162] IbizaPreservation. (n.d.). *IbizaPreservation*. https://ibizapreservation.org/en/
[163] UNEP, GRID-Arendal, & UNEP-WCMC, 2020. Out of the Blue: The Value of Seagrasses to the Environment and to People.

Market-Based Instruments (MBIs) are mechanisms which influence actors' behaviour by changing their economic incentive structure and contribute to environmental policy objectives. They may be voluntary or mandatory. Indicatively these can include taxation, fiscal incentives or removal of perverse incentives, and liability rules as well as certification schemes. Emission-trading systems have already gained prominence and once well-regulated they have significant impact on reducing greenhouse gas emissions of sectors which are more targeted. Also, Public-Private Partnerships (PPPs) are increasingly being promoted as a means to leverage private capital for large-scale restoration projects while aligning conservation goals with corporate sustainability agendas[164]. Additionally, green bonds have emerged as a viable tool for raising funds dedicated to environmental objectives, including land rehabilitation and forest restoration[165]. Payments for Ecosystem Services (PES), are also gaining interest as they have been used widely to support restoration initiatives[166]. Biodiversity offsets, carbon credits, and nature credits, the newest of the market-based instruments that have emerged, can also play a critical role in aligning economic and ecological objectives. By linking returns or payments to measurable environmental outcomes, they promote accountability while supporting long-term conservation goals.

In this context, MBIs are emerging as pivotal enablers: policy tools that harness financial incentives to redirect investment toward verified nature-positive outcomes, transforming ecosystems, including seagrasses and *P. oceanica* **from a subsidy-dependent conservation target into a bankable natural infrastructure asset**.

Payment for Ecosystem Services (PES) schemes and emerging carbon removal or nature credit mechanisms present potential opportunities to mobilize additional financing for restoration. However, their **effectiveness depends on robust governance frameworks, clear methodologies, and strong environmental safeguards**. In particular, ensuring additionality, permanence, and avoiding double counting are critical to maintaining credibility and delivering real ecological outcomes. As such, these instruments should be developed cautiously and complement, rather than substitute, public funding for restoration. In this context, the integration of blue carbon ecosystems into EU climate accounting frameworks, such as

[164]Organisation for Economic Co-operation and Development (OECD). (2019). *Making blended finance work for sustainable development*. https://www.oecd.org/dac/making-blended-finance-work-for-sustainable-development-9789264288768-en.htm

[165]European Commission. (2023). *European green bonds regulation*. https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/european-green-bond-standard_en

[166]United Nations Environment Programme (UNEP). (2008). *Payments for ecosystem services: Getting started*.https://www.unep.org/resources/report/payments-ecosystem-services-getting-started

the LULUCF Regulation, may further support the development of credible financing mechanisms by strengthening the link between restoration outcomes and measurable carbon benefits[167].

Nature Credits

Prominent among nature market-based financing instruments are nature markets, specifically through **Carbon and Biodiversity (or nature) Credits**.

Nature credits are an emerging financial mechanism designed to support biodiversity conservation and ecosystem restoration by assigning economic value to measurable ecological improvements. Unlike carbon credits, which quantify reductions in greenhouse gas emissions, nature credits focus on positive biodiversity outcomes, such as restored habitats, increased species richness, and enhanced ecosystem services.

Nature credits operate within voluntary biodiversity markets, creating a direct link between ecological restoration and financial value. The process begins with restoration projects implementing activities that deliver measurable biodiversity gains (for example, improving the extent and/or condition of *P. oceanica* meadows).

Each credit represents a verified unit of ecological gain, grounded in scientific evidence, and validated through independent monitoring. These credits are intended to be additional, meaning they would not occur without the credit-financed intervention, durable, and transparent, ensuring that they reflect real improvements beyond business-as-usual scenarios. These outcomes are verified through standardized methodologies supported by robust Monitoring, Reporting, and Verification (MRV) systems. Once validated, credits are issued as tradable units representing positive nature outcomes[168].

By creating a tradable asset class linked to ecological outcomes, nature credits enable companies, investors, and governments to meet nature-positive commitments and strengthen ESG performance[169]. Nature credits can also enable blended finance models where public funds act as de-

[167] JPI Oceans (2026), *Pathways and opportunities for a better policy integration of blue carbon ecosystems under the EU LULUCF Regulation*, https://jpi-oceans.eu/en/integrating-blue-carbon-ecosystems-under-eu-lulucf-regulation-new-policy-brief

[168] International Advisory Panel on Biodiversity Credits. (2024). *Framework for high integrity biodiversity credit markets*. https://www.iapbiocredits.org/framework

[169] WWF Blue Seeds, Mediterranean Posidonia Network, WWF Mediterranean, & Office français de la biodiversité. (2024). *Consultancy study to identify financial flows and existing financing mechanisms towards the protection and restoration of seagrass blue carbon ecosystems in the Mediterranean Sea*.

risking capital, attracting private co-investment and accelerating restoration at scale[170].

Revenue from credit sales is reinvested into further restoration, monitoring, and stakeholder engagement, creating a sustainable funding loop that benefits both ecosystems and local economies.

Most nature credits are designed to rely on primary, site-specific data for species and ecosystem assessments, highlighting the importance of field-based information[171]. However, the absence of harmonization among these standards creates challenges for comparability and scalability, and the lack of standardization and control makes credibility assessments difficult and subjective. This mirrors broader concerns about crediting systems: a recent synthesis of 14 studies covering 2,346 carbon credit projects found that fewer than 16% of issued credits represented real emission reductions, underscoring the need for stronger science, policy support, and integrity mechanisms before such markets can be responsibly scaled[172] . Another study highlights that many emerging biodiversity credit schemes still rely on weak baselines, flexible methodologies, and limited third-party oversight, raising substantial risks of over-crediting and undermining market integrity[173].

Examples of initiatives with transparent and detailed methodologies include the Nature Positive Initiative[174], which aims to establish global indicators for ecosystem and species recovery, while the ERA Brazil standard provides a clear framework for measurement requirements. The Wallacea Trust uses a “basket of metrics” approach to track biodiversity gains over time, supporting long-term monitoring and adaptive management. Similarly, the Verra Sustainable Development Verified Impact Standard Nature Framework incorporates multiple indicators for biodiversity, and the BioCarbon Biodiversity Standard applies a multi-criteria model to assess species and landscape-level diversity. Also, the International Advisory Panel for Biodiversity Credits reinforces a principled approach by promoting

[170] Álvarez, D., García, Á., Alonso, P. C., Paspaldzhiev, I., Georgiev, M., & Pavlova, D., 2025. *Investment Opportunities in Seagrass Restoration*. Marseille: Interreg Euro-MED.

[171] Ostermann, Willemen, Paspaldzhiev, Pavlova, & Georgiev, 2025. *Guide on best practices sharing biodiversity data for private companies*. Biodiversa+.

[172] Probst, B. T.,2024. Systematic assessment of the achieved emission reductions of carbon crediting projects. *Nat Commun*, 9562.

[173] Wunder, S., Fraccaroli, C., Bull, J.W., Dutta, T., Eyres, A., Evans, M.C., Thorsen, B.J., Jones, J.P., Maron, M., Muys, B. and Pacheco, A., 2025. Biodiversity credits: an overview of the current state, future opportunities, and potential pitfalls. *Business Strategy and the Environment*, 34(7), pp.8470-8499.

[174] Nature Positive Initiative. (2023). *Nature Positive by 2030: A global goal for nature*. https://www.naturepositive.org/what-is-nature-positive

integrity, local stewardship, and measurable ecological outcomes.[175] In addition, Plan Vivo's PV Nature standard provides a certification framework for biodiversity projects, combining multi-metric monitoring with requirements for community engagement and third-party verification[176]. In addition, initiatives such as the Biodiversity Credit Alliance, supported by international organisations including the United Nations Development Programme, aim to promote alignment, integrity, and comparability across emerging biodiversity credit frameworks, further reinforcing the development of credible nature markets[177].

In Europe, the development of nature credits is guided by the **EU Nature Credits Roadmap[178]**, which sets out a strategy for high-integrity credit schemes aligned with existing biodiversity legislation, including the Nature Restoration Regulation. The roadmap calls for expert oversight of certification and governance, supports pilot projects across terrestrial and marine ecosystems, and introduces a two-step model: (i) first, certifying biodiversity outcomes through standardized methodologies and MRV systems; (ii) second, issuing credits based on verified ecological results to ensure transparency, traceability, and investor confidence. The roadmap also ensures that nature credits do not undermine the polluter-pays principle or lead to greenwashing, maintaining the integrity of the market and its environmental objectives. To promote the development of a nature credits market an expert group has been set up by the EC to encourage an inclusive approach of design.[179]

Nature credits for P. oceanica restoration

Seagrass credits are not currently offered because evidence for consistent, measurable carbon sequestration or biodiversity gains remains weak, and the regulatory and governance frameworks needed for credible marine credit markets are largely absent[180]. In a review of 53 existing nature credits shows that only one explicitly references *Posidonia oceanica*, with three covering seagrass more broadly, nine targeting coastal ecosystems, four addressing marine environments, and the remainder focused on terrestrial

[175] IAPB. (2025). International Biodiversity Panel for Biodiversity Credits. https://www.iapbiocredits.org/home.

[176] Plan Vivo. (n.d.). *PV Nature documents*. https://www.planvivo.org/projects/certify-a project/pvnature/pv-nature-documents

[177] Biodiversity Credit Alliance. (n.d.). *Biodiversity Credit Alliance*. https://www.biodiversitycreditalliance.org/

[178] European Commission. (2025, July 7). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Roadmap towards Nature Credits* (COM(2025) 374 final). EUR-Lex. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52025DC0374

[179] European Commission. Nature Credits. https://green-forum.ec.europa.eu/green-business/nature-credits_en

[180] Probst, B. T. (2024). Systematic assessment of the achieved emission reductions of carbon crediting projects. *Nat Commun*, 9562 .

contexts highlighting that Mediterranean seagrass habitats remain underrepresented from current nature credit methodologies (**Figure 2**).

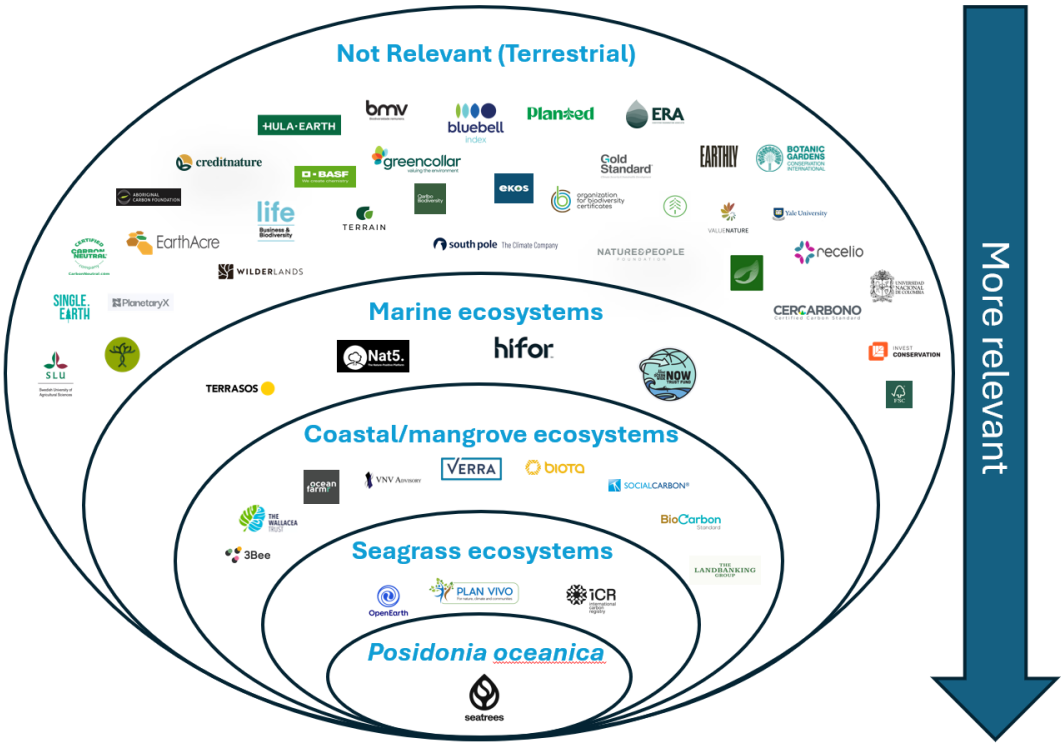

Figure 2: *Representation of Posidonia oceanica and Related Ecosystem Classes in Existing Nature Credit Methodologies (own work).*

However, there is growing regulatory and investment interest and rapid progress, linked to increasing knowledge acquired on the functioning of the marine environment and the improved methodologies measuring the ecosystem services they provide. Indicatively, a study used a mechanistic model for *Zostera marina* meadows to estimate carbon outcomes, over a 10-year period for four common restoration strategies: seeding, transplanting, conserving existing meadows, and sediment infill prior to transplanting.[181] Results showed that transplanting outperformed seeding due to faster bed expansion, while sediment-focused strategies (infill and conservation) yielded carbon benefits up to 13–33 times higher than restoration alone. These findings underscore the importance of integrating sediment management with habitat restoration to maximize carbon credit potential and ecosystem services, suggesting that seascape-level approaches may offer the greatest climate and biodiversity gains[182].

[181] Ward, M. D.-D, 2025. Management approach matters: meeting seagrass recovery and carbon mitigation goals. *npj Ocean Sustain*, 18.

[182] Ward, M. D.-D. (2025). Management approach matters: meeting seagrass recovery and carbon mitigation goals. npj *Ocean Sustain*, 18.

Recently, Seatrees has published a marine credit protocol aiming to standardize the MRV methodology behind credits for coral reef, mangrove, kelp forest and seagrass restoration[183].

While Posidonia meadows function as efficient carbon sinks, relying solely on carbon revenues can be challenging due to market price volatility, restoration costs and nature risks. Consequently, the **financial case is expanding towards "stacking" benefits or utilizing Biodiversity (or Nature) Credits**. This evolution reflects a broader shift toward outcome-based financing mechanisms that tie payments directly to the delivery of measurable, multi-functional ecosystem benefits, from coastal protection and fisheries support to climate resilience. Such arrangements go beyond one-off grants by embedding a “beneficiary-pays” logic, where industries like tourism or insurance, which derive tangible value from healthy meadows, contribute recurrently in proportion to the additionality their investment secures. For Mediterranean seagrass restoration, the benefits are substantial. By creating a tradable asset class linked to ecological performance, nature credits can help close the annual funding gap for *P. oceanica* conservation, complement public funding and donor grants.

The ARTEMIS project proposes nature credits as a strategic lever for restoring *P. oceanica* meadows and the ecosystem it supports. The ARTEMIS methodology integrates MRV with the UN SEEA Ecosystem Accounting[184] framework to guarantee additionality and measurable impact: key factors for market credibility. By embedding these safeguards, nature credits become a financial instrument capable of attracting institutional investors, sustainability-driven corporations, and impact funds.

[183] McCarthy O, H. L., 2025. Seatrees Crediting Protocol for Marine Restoration. Seatrees/Sustainable Surf.

[184] United Nations, 2024. System of Environmental Economic Accounting - Ecosystem Accounting. New York: United Nations.

Table 8:*Available Funding Sources and Funding Planning Tools for P. oceanica Restoration Across Pilot Sites*

FUNDING SOURCES				
Funding Source	**Level**	**Type**	**Scope / Purpose**	**Relevance to *P. oceanica* Restoration**
National funds and budgets	National	Public funding	Funds for environmental, climate, investment, and/or research projects depending on funding line and national priorities	Can finance relevant projects
EU Emissions Trading System (ETS) Revenues	National	Public	Climate action and adaptation	100% of ETS revenues must support climate-related action. *Posidonia* meadows are eligible due to carbon sequestration and resilience benefits.
EU LIFE Programme (2021–2027)	EU	Public co-funding	Funds environment, climate, and energy transition projects	Dedicated environmental funding instrument; supports pilot and demonstration projects on nature and biodiversity, including *Posidonia* restoration.
European Regional Development Fund (ERDF) & Cohesion Fund	EU/ National and Regional	Public co-funding	Regional cohesion, sustainability, infrastructure	Can co-finance nature-based solutions, restoration, and regional sustainable development linked to *P. oceanica*.
Interreg (part of ERDF)	EU/ Transnational	Public co-funding	Cross-border cooperation	Supports regional and transboundary projects, including marine restoration and sustainable coastal management.
European Maritime, Fisheries & Aquaculture Fund (EMFAF)	EU/ National	Public co-funding	Blue economy, sustainable fisheries, marine ecosystems	Directly supports habitat restoration, biodiversity protection, and reducing pressures on marine environments, including *Posidonia*.
Horizon Europe (2021–2027)	EU	Public	Funds scientific research and innovation	Funds research for restoration techniques, ecosystem services, monitoring tools. Includes Mission “Restore Our Ocean and Waters”.

European Agricultural Fund for Rural Development (EAFRD/CAP)	EU/ National	Public	Rural development, sustainable agriculture	Indirectly relevant—good practices from terrestrial ecosystems may inform marine restoration strategies.
Recovery and Resilience Facility (RRF) – NextGenerationEU	EU/ National	Public -	Green transition, climate & biodiversity recovery	37% of funds must support climate/biodiversity; *Posidonia* restoration qualifies due to its climate mitigation and ecosystem benefits.
Innovation Fund (ETS-based)	EU	Climate Innovation Fund	Supports low-carbon, high-impact solutions	Can support nature-based solutions if tied to measurable climate benefits. Relevant for scalable, climate-linked *Posidonia* restoration.
European Investment Bank (EIB)	EU	Public / Private Investment Bank	Loans to public/private entities for climate and nature projects	EIB's Climate Bank Roadmap commits to financing biodiversity and ecosystem restoration; *Posidonia* qualifies as blue carbon.
Market-Based Instruments	EU or national	Private / Public (EU or National)	Green bonds, nature credits, impact investments, PES	*Posidonia* aligns with criteria for sustainable investments; can attract private capital under Article 9(f).
Philanthropic Contributions & Donor Institutions	International / Regional/ EU/ National	Private	Grants for conservation, research, community projects	Complements public funds; de-risks innovation and supports local engagement (e.g. Conservation Collective network).
PLANNING TOOLS				
Prioritised Action Frameworks (PAFs)	EU/National Planning Tool	Funding planning tool under Habitats Directive	Aligns Natura 2000 priorities with EU funding	MS identify funding needs and restoration priorities (e.g. anchoring prevention, habitat recovery); aligns restoration with financing.
National Restoration Plans (under NRR)	National	Planning Instrument	Required under the EU Restoration Regulation	MS must outline funding sources (public (national and/or EU), private, co-financing) for each restoration action, including marine habitats.
EU Taxonomy	EU	Green Investment Guide		Establishes criteria for determining whether an economic activity qualifies as environmentally sustainable

5. *P. oceanica* restoration: Identifying Gaps and Opportunities

This section provides a comparative synthesis drawing on the preceding analysis of the legislative and institutional framework on nature restoration and financing restoration (Section 3 & 4) and findings from the country case studies, where the ARTEMIS pilot sites were located (Annex). It identifies detectable trends, structural gaps and emerging opportunities for accelerating the restoration of *P. oceanica*, with particular emphasis on how regulatory provisions, funding instruments, and stakeholder dynamics materialize.

The comparison reveals a recurrent pattern: **while the policy and legal framework for Posidonia protection is largely in place and the one for Posidonia restoration is rapidly being adopted, its operationalization remains uneven, fragmented, and weakly connected to innovative financing mechanisms**. The experience from the four pilot sites of the ARTEMIS project confirms that countries have different starting points, as well as trajectories in translating policy ambition into practice.

5.1. Legislative Framework: From Formal Protection to Effective Restoration

P. oceanica, across the Mediterranean and particularly in the Euro-Mediterranean region, benefits from an **exceptionally dense legal protection** framework. At EU level, the Habitats Directive, the MSFD, the WFD, and the NRR jointly establish obligations to prevent deterioration, improve conservation status, and restore degraded marine habitats. At regional level, the Barcelona Convention and its SPA/BD Protocol recognize Posidonia meadows as priority habitats and promote restoration measures. International biodiversity and climate instruments (CBD, GBF, Paris Agreement) further reinforce the legitimacy of Posidonia restoration as both biodiversity and climate action.

Comparative analysis of the pilot sites demonstrates that, although all pilot countries operate within the same overarching global, Mediterranean, and EU framework, **national and sub-national implementation varies considerably in terms of clarity, coordination, and enforceability**. Variability is particularly evident between Natura 2000 and marine protected areas and areas beyond such designations. Conservation and impact prevention remain prioritized, while restoration obligations are often

indirect or implicit in national legal systems. Protection is widely recognized as the most cost-effective strategy; however, in the context of accumulated degradation and accelerating climate pressures, protection alone is insufficient. Restoration is therefore necessary.

Although policy frameworks for restoration are emerging across the EU and the Mediterranean, Posidonia-specific **operational restoration frameworks are largely absent at national and sub-national levels**. Clear and enforceable site-level procedures for authorization, permitting, and technical standards remain underdeveloped, while property rights are ill-defined and competences are unclear. This increases the risk of inconsistent practices and limits the capacity to scale restoration in a coherent and coordinated manner.

During this transitional phase, where restoration is politically endorsed but not yet fully embedded in binding national planning and budgeting instruments, **restoration efforts remain heavily dependent on short-term, project-based funding**. As restoration is still treated as a research focus and a project activity rather than a structural policy function, continuity is limited and scaling to ecologically meaningful spatial and temporal levels remain constrained. Institutional capacity for long-term monitoring, enforcement, and adaptive management is also uneven and often concentrated at local or project level. This situation affects the long-term effectiveness and sustainability of restoration initiatives.

At the same time, significant opportunities are emerging. There is **growing acceptance of nature-based solutions as credible responses to climate and biodiversity crises, with carbon-rich ecosystems such as seagrass meadows gaining prominence** due to their combined mitigation, adaptation, and resilience benefits.

Experience from the ARTEMIS pilot sites demonstrates that *P. oceanica* restoration can generate tangible local benefits, including enhanced coastal protection, sustained tourism value, and improved ecosystem resilience, thereby strengthening local acceptance and long-term social support.

The adoption of the NRR represents a qualitative shift, introducing legally binding, quantified and time-bound restoration targets for marine habitats, including seagrass meadows. Through the preparation and implementation of the NRPs restoration is expected to move from voluntary or project-based initiatives to a structural policy obligation. Timely submission, approval, and effective design of these Plans will therefore be critical.

Beyond EU Member States, implementation of the NRR may catalyse the development of a Mediterranean-wide approach to Posidonia restoration, with potential transferability to non-EU countries.

Finally, project-based initiatives such as ARTEMIS contribute to the emergence of best practices and technical lessons, refining scientific methodologies, operational standards, and permitting procedures. As experience accumulates and exchange intensifies across projects and countries, there is potential for greater harmonisation of approaches, supporting the systematic operationalisation of restoration policies across the Mediterranean.

5.2. Financing Restoration: Persistent Gaps and Emerging Instruments

Public funding constitutes the backbone of Posidonia restoration. It originates primarily from EU funding instruments (LIFE, ERDF/Interreg, EMFAF, Horizon Europe, RRF) and national budgets.

While public funding remains essential and comparatively reliable, the funding gap identified remains substantial. **Funding flows are fragmented, short-term, and predominantly project-based, misaligned with the long temporal scales required for marine ecosystem recovery**. Although a biodiversity financing target was included in the EU's 2021–2027 Multiannual Financial Framework (MFF), it is unlikely to be fully achieved. Moreover, despite the additional funding needs arising from the implementation of the NRR, the EC has not proposed a dedicated biodiversity financing target in the draft MFF 2028–2034. Instead, biodiversity interventions are expected to contribute to broader climate and environmental spending targets alongside other environmental priorities.

To address this gap, **the legislative framework increasingly recognizes the role of private and blended finance in supporting long-term restoration**. The Global Biodiversity Framework (GBF), the EU Biodiversity Strategy, the NRR, the EU Ocean Pact, and the Roadmap towards Nature Credits all acknowledge the need to mobilize additional financial resources, particularly private capital. Nature credits, in particular, aim to channel investment toward restoration efforts and complement public funding.

However, these **opportunities remain largely underdeveloped**. Restoration continues to be framed primarily as a cost rather than as an investment in natural capital. While innovative financing mechanisms have begun to emerge for terrestrial ecosystems such as forests, peatlands and

wetlands, their development in marine environments and seagrass ecosystems faces additional complexity. Challenges relate to governance arrangements, property rights, ownership of ecosystem services, verification of ecological outcomes, limited harmonized methodologies for valuation, and gaps in operational guidance.

Given the novelty of these instruments, robust governance parameters are essential to ensure effectiveness. Scientific credibility, transparent monitoring and reporting, reliable measurement, reporting and verification (MRV) systems, and clear accountability mechanisms are prerequisites. Legal certainty, secure tenure arrangements, and alignment with EU legislation are also required. Capacity-building and technical guidance for stakeholders will be critical to support their responsible development.

While methodologies to assess carbon sequestration, biodiversity benefits and coastal protection services exist, their integration into legal, financial and spatial planning frameworks remains limited. As a result, restoration benefits are often externalized from investment and decision-making processes. Translating ecosystem service values into payment mechanisms, compensation schemes, or investable instruments remains a central challenge.

Nature credits are gaining attention, particularly for Posidonia meadows due to their combined biodiversity and blue-carbon value. Yet their credibility and scalability depend on harmonized scientific protocols, transparent registries, third-party verification, traceability systems, and effective public–private alignment. Without these safeguards, market integrity risks undermining restoration objectives.

At the same time, important opportunities emerge. The forthcoming MFF 2028–2034 offers an opportunity for the EU to strengthen predictable and adequate public financing for restoration, including through the integration of NRPs into national and regional programming instruments. EU funds can support implementation, pilot applications, research, technical refinement and cross-Mediterranean cooperation, ensuring continuity and harmonization of approaches.

Innovative financing instruments, including payments for ecosystem services (PES), such as nature credit schemes, if embedded in sound governance and scientific integrity, can mobilize complementary private finance and support restoration at scale. The EU Roadmap towards Nature Credits and the establishment of an Expert Group provide an institutional pathway for developing credible frameworks over the coming years. Pilot

initiatives, including ARTEMIS, contribute to practical insights and methodological refinement.

Private sector engagement is also expanding, as businesses increasingly recognize their dependence on ecosystem services such as tourism, fisheries, coastal protection and climate regulation. **New corporate sustainability and disclosure requirements further integrate biodiversity considerations into financial decision-making, creating additional entry points for private participation in restoration initiatives**.

At the same time, **the alignment between biodiversity restoration and climate policy remains insufficiently operationalized**. Although P. *oceanica* meadows provide significant blue-carbon sequestration and climate adaptation benefits, these functions are not yet systematically integrated into national greenhouse gas inventories, climate reporting frameworks, or broader financial planning instruments. Strengthening the coherence between nature and climate governance frameworks would enhance policy consistency, improve access to climate-related funding streams, and create clearer investment signals. Aligning biodiversity restoration objectives with carbon accounting systems, corporate disclosure frameworks and sustainable finance taxonomies is therefore essential to embed Posidonia restoration within both environmental and economic decision-making structures.

In synthesis, **the comparative analysis confirms that the principal challenge for *P. oceanica* restoration is no longer normative recognition but systemic implementation**. Effective restoration requires not only legal obligations, but also coherent regulatory frameworks, standardized operational procedures, robust scientific methodologies, practical guidance, predictable and sufficient financing, and sustained stakeholder engagement.

6.Policy Recommendations

The following policy recommendations aim to **bridge the gap between policy ambition and operational delivery** and to **accelerate the restoration of *P. oceanica* and other seagrass ecosystems across the Mediterranean.** While the main focus is on *P. oceanica* for which knowledge is advanced, the recommendations also address relevant issues for other seagrass species, such as *C. nodosa*.

The policy recommendations respond to the systemic challenges identified in the legislative, institutional and financing analysis, as well as to the operational lessons emerging from the ARTEMIS pilot sites. While normative recognition of restoration objectives is now well established at international, regional and EU levels, implementation remains fragmented, under-resourced and operationally inconsistent. **The recommendations are therefore structured across four interlinked dimensions: strategic planning and governance alignment; operational and institutional frameworks; public financing architecture; and responsible development of market-based instruments.**

6.1. Strengthen Strategic Planning and Governance Alignment

Recommendation 1: Ensure ambitious, scientifically robust and timely National Restoration Plans

Member States should prepare and submit **ambitious and scientifically grounded first draft NRPs by September 2026**. These Plans must be based on the best available science, apply transparent ecological criteria to delineate priority restoration areas, and clearly justify the use of passive and active restoration measures.

The drafting process of the NRPs is in itself a **critical governance opportunity**. It should be used to systematically identify institutional, regulatory and capacity gaps that currently limit the scale and effectiveness of *Posidonia oceanica* restoration. This process can help clarify responsibilities among competent authorities, streamline permitting procedures, define property and tenure rights, and assess technical and monitoring capacities that need to be strengthened (see Recommendation 4). It is important to establish who will make the final decision in the governance chain and that all stakeholders are aware of this. Depending on the governance structure in place, this should be clear from the outset in order to manage stakeholders' expectations in the governance process and to understand the power balances. Recognising and addressing these gaps

during the preparation phase will be essential to accelerate implementation in the coming years.

NRPs should also function as **strategic financial planning instruments**. They must guide the integration of Posidonia restoration priorities into National and Regional Partnership Plans under the MFF 2028–2034, ensuring that ecological objectives are directly linked to predictable, dedicated and multi-annual funding allocations. Restoration areas and measures included in the NRPs must also be considered as funding priorities for other funding sources.

Although non-EU Mediterranean countries are not required to prepare NRPs, the methodologies, prioritization criteria and governance approaches developed under the EU framework can serve as a reference model for broader Mediterranean cooperation and policy convergence.

Recommendation 2: Strengthen the European Commission's and Barcelona Convention guidance, evaluation and financing coordination role

During evaluation of NRPs, especially of the Mediterranean MS, the EC should encourage the inclusion of **Posidonia-specific restoration criteria, standardized monitoring indicators and clear justification for restoration approaches** to ensure ecological credibility and comparability across MS. To support MS in this process, the Commission should build on and strengthen its **Nature Restoration Regulation (NRR) Reference Portal**[185], for example, drawing material from the pan-European BiodivRestore Knowledge Hub[186], the Network Nature for NbS related knowledge[187] and its six Policy Themes[188], as well as the Natural Heritage Mission of the Interreg Euro-MED Programme[189] to enhance its role in facilitating knowledge exchange on restoration implementation, standardized monitoring protocols and blended financing approaches.

Guidelines and best practices developed by the **Barcelona Convention** can support Mediterranean countries in this process.

[185] European Commission. (n.d.). *Nature Restoration Regulation reference portal*. https://biodiversity.europa.eu/europes-biodiversity/nature-restoration/reference-portal-for-nature-restoration-regulation

[186] Biodiversa+. (n.d.). *BiodivRestore Knowledge Hub*. https://www.biodiversa.eu/engagement/biodivrestore-knowledge-hub/

[187] NetworkNature. (n.d.). *About NetworkNature*. https://networknature.eu/networknature/about/about-networknature

[188] NetworkNature. (n.d.). *Themes*., https://networknature.eu/networknature/themes

[189] Natural Heritage Mission of the Interreg Euro-MED Programme (n.d.). https://natural-heritage.interreg-euro-med.eu/

Beyond its evaluation role, **the Commission should publish and operationalize its report on available financing sources for restoration plans**, in line with Article 19(7) of the NRR, and provide guidance aligning Prioritised Action Frameworks (PAFs), NRPs and EU funding instruments. Strategic coherence in financial planning is essential to scale restoration effectively. Strategic coherence between ecological planning and financial programming is essential to ensure that restoration targets translate into predictable, multi-annual funding allocations.

The Commission should further encourage Member States to establish dedicated national budget lines, multi-year financial commitments and fiscal incentives for restoration. Public funding should be strategically deployed to de-risk investments and leverage complementary private capital through blended finance mechanisms, ensuring long-term and scalable support for restoration.

Recommendation 3: Establish a solid scientific basis to guide restoration
A strong scientific foundation is essential to ensure effective and credible restoration. This requires establishing a **comprehensive baseline of seagrass ecosystem condition,** including environmental history, pressures and their impacts, **habitat damage and loss, ecological indicators, and key ecosystem processes**, prior to initiating restoration activities.

Based on scientific guidance, passive restoration, primarily through pressure removal, should be prioritized where conditions allow, given its cost-effectiveness and resilience benefits. Active restoration should only be undertaken where scientifically justified and supported by clear methodologies and long-term monitoring.

Monitoring of restoration activities should begin early, following baseline assessment of seagrass extent, condition, and ecosystem functioning. It should combine traditional ecological metrics with advanced tools such as eDNA, align with EU reporting obligations (Habitats Directive, Water Framework Directive, Marine Strategy Framework Directive, and Nature Restoration Regulation), and extend over ecologically meaningful timeframes. Long-term monitoring is critical to assess restoration outcomes. Data collected support robust Measurement, Reporting and Verification (MRV) systems for restoration financing and potential nature credit mechanisms.

While common standards are necessary for coherence, **restoration approaches must be adapted to site-specific ecological, social, and governance conditions**. A “one-size-fits-all” approach will not ensure

success. Frameworks should therefore be adaptive and context-sensitive, allowing for site-specific implementation while remaining aligned with EU and national objectives.

As restoration science evolves, methodologies and monitoring protocols should be regularly reviewed and updated to ensure effectiveness and scientific integrity.

Recommendation 4: Develop dedicated Posidonia-specific restoration frameworks

Despite strong legal protection for *Posidonia oceanica*, and evolving restoration mandates, several Mediterranean countries **lack dedicated and standardized restoration frameworks and procedures** to facilitate implementation in the field. The NRR introduces binding targets and NRPs are under development; however, the absence of species-specific procedures creates regulatory uncertainty and risks inconsistent implementation.

Dedicated provisions are therefore needed to clarify permitting, within and beyond Marine Protected Areas (MPAs) and Natura 2000 sites, **define property and tenure rights**, **set technical standards** based on the best available science, **clarify institutional responsibilities and competences,** and **establish quality control mechanisms**. These should reflect national governance structures, requiring centralized approaches in countries such as Greece and potentially regional frameworks in decentralized systems such as Spain. Clear provisions on property and tenure rights, permitting procedures and compliance mechanisms are essential to provide legal certainty for both conservation authorities and potential investors.

Defining these procedures early on will allow identified governance and institutional gaps to be filled and will facilitate the implementation of the NRPs, when approved.

Recommendation 5: Integrate marine biodiversity and blue-carbon considerations into climate governance frameworks

Seagrass ecosystems and the services they provide contribute to both biodiversity and climate objectives and should therefore be formally **integrated into climate reporting frameworks** and national carbon accounting systems. Such integration can enhance coherence between climate and biodiversity policies while strengthening the strategic positioning of seagrass restoration within national planning, implementation and reporting cycles.

Seagrass restoration, and particularly the restoration of *Posidonia oceanica* meadows, **should be explicitly recognised and operationalised as a climate mitigation measure** alongside its role in climate adaptation. As blue carbon ecosystems, seagrasses contribute significantly to carbon sequestration and long-term storage, while their restoration enhances natural carbon sinks and prevents emissions associated with habitat degradation. This requires the progressive integration of seagrass ecosystems into national greenhouse gas inventories, as well as into LULUCF accounting frameworks and monitoring, reporting and verification (MRV) systems, in line with evolving IPCC methodologies.

Mediterranean countries should explicitly incorporate the protection and restoration of seagrass ecosystems as complementary measures contributing to climate neutrality objectives. This includes recognising their contribution to emissions reduction targets, identifying restoration actions as eligible mitigation measures. Especially in the case of EU MS, this recognition should be translated by being integrated into the next revisions of their National Energy and Climate Plans (NECPs)., and by ensuring alignment with NRPs under the NRR. Particular emphasis should be placed on the inclusion of *Posidonia oceanica* meadows as additional carbon pools within enhanced MRV systems, building on emerging approaches already being explored in countries such as Greece[190].

Climate policy frameworks should also recognise the dual role of seagrass ecosystems in mitigation and adaptation. Beyond carbon sequestration, seagrasses contribute to coastal protection, resilience to extreme weather events, and the reduction of climate-related risks. These functions should be systematically integrated into national adaptation strategies and planning instruments. **Strengthening synergies** between biodiversity policy (NRPs), climate mitigation policy, and adaptation frameworks is essential to maximise co-benefits and ensure policy coherence.

Finally, restoration priorities and actions should be explicitly **linked to climate-related funding streams,** including EU climate finance instruments and ETS revenues, recognising seagrass restoration as a cost-effective nature-based solution delivering measurable climate benefits. Such alignment can unlock additional financing, strengthen investment signals, and position Mediterranean countries at the forefront of integrating blue carbon ecosystems into climate policy and sustainable finance.

[190] Apostolaki, E.T., Efthymiadis, P.T., Gerakaris, V. et al. The untapped potential of Poseidon grass in Greece as a hotspot for climate change mitigation. Reg Environ Change 26, 21 (2026). https://doi.org/10.1007/s10113-025-02503-9

6.2. Operational Implementation and Institutional Capacity

Recommendation 6: Strengthen the role of marine spatial planning and MPAs for Posidonia recovery

Marine spatial planning (MSP), Marine Protected Areas (MPAs), and Natura 2000 sites should be strengthened as **core governance tools for the conservation, passive restoration, and, where ecologically justified, active restoration of *Posidonia oceanica* meadows**. Reducing and managing pressures through spatial protection measures is often the most effective, scalable, and economically viable restoration strategy for seagrass ecosystems, particularly when compared with large-scale transplantation efforts. In this sense, effective protection measures should themselves be recognised as restoration actions within National Restoration Plans (NRPs) and related national restoration frameworks.

Well-managed and adequately enforced MPAs and Natura 2000 sites can support natural recovery processes by limiting chronic and acute pressures such as anchoring, destructive fishing practices, coastal infrastructure development, and cumulative ecosystem degradation. MPAs and Natura 2000 sites should therefore play a central role not only in biodiversity conservation, but also in restoration planning, enforcement, ecological monitoring, and the long-term maintenance of ecosystem resilience.

Active restoration measures, including transplantation, should primarily complement, rather than replace, broader pressure reduction and spatial protection strategies, and should be prioritised in areas where ecological feasibility and long-term protection can be ensured.

Effective management, long-term monitoring, surveillance, compliance, and enforcement mechanisms remain essential for protected areas to fulfil this role. Without adequate governance and enforcement capacity, the formal designation of protected areas alone will not be sufficient to support meaningful *Posidonia* recovery.

Recommendation 7: Consider compliance with environmental law as a prerequisite for restoration action, prioritize passive restoration and secure enforcement

Restoration efforts should be underpinned by compliance with environmental protection legislation, including rules governing anchoring, bottom-contact fishing, coastal development, and other activities that directly or indirectly damage *P. oceanica* habitats, and provisions on

pollution control and environmental impact assessment. **Ensuring compliance with existing legal obligations is a prerequisite for creating conditions that enable both passive and active restoration.**

While existing legal obligations offer a solid protection scheme for Posidonia meadows, many sectoral policies have yet to fully integrate these provisions into practice. Hence, sectors, such as tourism, fisheries, aquaculture, shipping and port operations, lack action lines that can safeguard and support the recovery of Posidonia meadows. With removal of pressures being a prerequisite for restoration comes the opportunity to **improve cross-sectoral integration, adopt best practices and, if needed, proceed to improve legal provisions**. Such provisions will support conservation and restoration objectives.

Passive restoration, primarily through pressure removal, should be prioritized wherever ecological conditions allow. Passive restoration should be recognised not only as a legitimate restoration pathway in its own right, but also as a prerequisite for active restoration in many contexts. The synergies between passive and active restoration should therefore be made explicit. Removing pressures and enabling natural recovery processes creates the ecological and governance conditions under which active interventions can become more viable, more effective, and more sustainable over the long term. Active restoration should not be pursued where the underlying drivers of degradation remain unaddressed.

This sequencing is especially important for *P. oceanica*, given its slow growth, sensitivity to disturbance, and the high costs and long time-horizons associated with active restoration interventions. Policymakers should therefore frame passive restoration as the first step in many restoration pathways, while using active measures strategically where natural recovery alone is unlikely to deliver desired outcomes.

Whether relating to compliance with protection provisions or to safeguarding restoration actions, securing enforcement is key to effective results.

Recommendation 8: Embed structured stakeholder engagement in restoration planning and implementation

As provided in Article 14 (7) of the NRR, the development of the NRPs must be "*open, transparent, inclusive and effective*" and based on a participatory approach. In line with this requirement, the draft NRPs that will be submitted to the European Commission for review by September 1, 2026, **should be made publicly available** in a timely and accessible manner.

Transparency in the publication of Plans, including underlying data, prioritisation criteria, and proposed measures, is essential to ensure accountability, enable stakeholder participation, and support scientific scrutiny. Public access to NRPs can strengthen trust, facilitate coordination across governance levels, prepare stakeholders and the public for their implementation, and allow for continuous feedback and improvement towards their final adoption.

Structured stakeholder participation should be formally integrated not only into the drafting of NRPs, but also into site-level implementation processes. Even where awareness of Posidonia's ecological value is high, as observed in the ARTEMIS pilot sites, roles and responsibilities among stakeholders often remain unclear. Clear participatory procedures are therefore needed to define responsibilities, improve coordination and strengthen institutional ownership of restoration objectives. Stakeholder engagement should extend beyond consultation and be embedded in the **co-design and implementation phases** of restoration activities at site level. This approach can enhance transparency, improve compliance, reduce conflicts and increase long-term social acceptance of restoration measures.

To design and implement restoration measures effectively, one must first identify all relevant stakeholders, that is, everyone who can influence these measures, contribute to them, or be affected by them, whether positively or negatively. It is also essential to gain a thorough understanding of the needs, values and socio-economic contexts of all stakeholders, including local communities and the wider public, who are often 'silent'. This involves identifying the power dynamics and potential conflicts between them. These assessments should be carried out systematically from the onset during the drafting of NRPs and ahead of any site-specific restoration effort to improve the overall effectiveness of the process.

Recommendation 9: Strengthen institutional capacity

Strengthen institutional and technical capacity for *P. oceanica* restoration by supporting **training programmes, capacity-building workshops, knowledge transfer initiatives,** and the development of **operational guidance** for implementation. Restoration capacity remains largely concentrated in research institutions and short-term project initiatives, while public authorities often lack sustained expertise for restoration planning, selecting passive vs active restoration, monitoring, enforcement and adaptive management. Hence, this imbalance needs to be addressed in order to ensure continuity and the ability to scale restoration beyond pilot actions.

Particular attention should be given to the shortage of **trained restoration practitioners**, which remains a practical bottleneck for scaling restoration efforts. This includes building the skills of divers and field practitioners in site preparation, transplantation methods, seed and shoot handling, restoration maintenance, and monitoring protocols adapted to different restoration contexts. **Institutional capacity and knowledge** should be addressed as related but distinct needs. Public authorities, protected area managers, scientific institutions, and practitioners require different forms of support to perform their respective roles effectively.

Recommendation 10: Promote restoration knowledge transfer and innovation in the Mediterranean

Structured **peer-learning mechanisms across Mediterranean regions** should be systematically supported, building on pilot experiences, such as those of the ARTEMIS project, as reference models for restoration planning, implementation and monitoring. Knowledge transfer should extend beyond technical methodologies to include governance arrangements, permitting procedures, financing approaches and monitoring systems. Sharing practical lessons learned can reduce duplication of effort, improve ecological effectiveness and accelerate the operationalization of restoration frameworks across countries.

The Mediterranean dimension of restoration cooperation should be further strengthened to promote policy coherence, methodological harmonization and coordinated implementation, including beyond EU borders. For instance, while the Mediterranean Posidonia Network (MPN) provides a platform for Mediterranean practitioners and the scientific community, the Barcelona Convention provides an institutional and political framework to advance seagrass restoration cooperation in the region.

Innovation and development of solutions for *P. oceanica* restoration, such as the establishment of nursery cultivation and seed banks or the continuous improvement of seagrass mapping and anchoring tools (e.g. Donia[191]), should be promoted by public and private sector investments. Results and lessons learned from testing innovative activities can improve decision making and sustain both passive and active restoration efforts.

[191] Donia is a community-driven navigation and anchoring app designed to help users anchor away from fragile ecosystems. It allows all users to access accurate nautical charts enriched with a wealth of information, both on land and at sea. Donia promotes and raises awareness about environmental conservation by providing extremely accurate maps of marine ecosystems that allow users to anchor away from underwater seagrass beds, in compliance with the law.

6.3. Public Financing Architecture

Recommendation 11: Ensure reliable and adequate core public funding for restoration

As restoration, especially of marine and seagrass ecosystems, is a new activity with high costs, there is a need to **ensure core public funding** in a reliable and adequate manner. Public funding, whether national, regional or EU, can take various forms. Dedicated budget lines or earmarked multi-year allocations within national or regional budgetary frameworks is a straightforward option to ensure that countries support restoration activities. Such provisions will allow for binding, multi-year funding that is aligned with restoration objectives that have long timelines of ecological recovery. In this context, sustained financial support to MPAs is key to translate governments' international commitments on marine conservation and restoration at national and local level.

It is equally important to ensure that public authorities identify harmful subsidies that damage marine ecosystems and implement the necessary **reforms to phase out these subsidies**, whilst adopting more effective economic instruments to support the restoration and sustainable development of maritime sectors. **Fiscal measures** such as tax benefits, subsidies and preferential procurement policies are important leverage for public authorities to ensure reliable and adequate funding for restoration.

Recommendation 12: Secure predictable and adequate public financing under the Multiannual Financial Framework (MFF) 2028–2034

As the **new MFF** coincides with the first phase of the implementation of the NRR, **dedicated horizontal funding for Posidonia restoration** must be ensured. The most transparent way to secure this commitment would be to reintroduce a distinct biodiversity target, as in the MFF 2021–2027. Even if not fully achieved, such a target created incentives for increased investment and improved biodiversity funding tracking. If a separate target is not reinstated, a sub-target for nature conservation and restoration should be integrated within the minimum 35% climate and environment spending allocation.

The proposed structure of the new MFF no longer includes a separate LIFE programme as the main dedicated EU environmental fund. If this new structure is maintained, the final MFF regulations must ensure that Posidonia restoration remains eligible under the new funding instruments, including the EU Facility and the EU Competitiveness Fund, reflecting its dual nature and climate benefits.

Given that the new **National and Regional Partnership Plans (NRPPs)** will consolidate previously separate EU funds, they must be designed **to ensure that Posidonia restoration** can continue to draw from multiple funding streams, maintaining the diversity of instruments available under the current MFF.

Interreg has played a key role in supporting cross-border cooperation, including through the Natural Heritage Mission, and this function should be preserved in the new MFF. Similarly, sustained funding under the next **Horizon Europe** cycle is essential to address knowledge gaps and further refine restoration methodologies through research and pilot actions.

6.4. Responsible Development of Market-Based and Private Financing Instruments

Recommendation 13: Establish enabling governance and market conditions for nature-based financing instruments

Private financing instruments can be critical in bridging the funding gap for restoration. However, in order for innovative schemes to materialize and investment to take place, **enabling conditions must be provided for**. Clear legal and governance foundations must be defined before scaling market-based instruments, such as PES and marine nature credit schemes. This includes defining property and tenure rights, ecosystem service ownership, clear permitting pathways for restoration, and credit eligibility rules (see Recommendation 4). A robust and coherent regulatory framework is needed, aligned with EU and national policies.

Standardised ecosystem valuation methods and a full credit lifecycle approach, from pre-restoration assessments to long-term follow-up, are essential. These are important tools that ensure that the value of ecosystems is integrated in decision-making and the real value are reflected in pricing schemes.

Together, these measures create the conditions for credible, investable, and high-integrity nature markets across Europe.

Synergies between corporate disclosure frameworks (CSRD, TNFD), due diligence frameworks (CSDDD), and sustainable activity classification systems such as the EU Taxonomy should also be identified in order to create predictable entry points for complementary private investment, while preserving the central role of public funding in fulfilling legally binding restoration obligations.

Recommendation 14: Safeguard ecological integrity and financial credibility in marine nature credit markets

The development of **marine nature credit markets must be firmly grounded in verified ecological outcomes, rather than restoration activity alone**. Credit issuance should rely on validated indicators of seagrass extent, condition, and ecosystem service delivery, supported by comprehensive baseline assessments and strict additionality requirements.

High-quality ecological data and strong monitoring, reporting, and verification (MRV) systems must underpin all crediting schemes to ensure additionality and environmental integrity. All marine credits should be subject to mandatory independent certification and third-party verification, supported by transparent public reporting.

Given the slow growth of *Posidonia oceanica*, **regulatory and financial frameworks must explicitly account for long restoration timelines**, typically at least 20 years, before outcomes can be independently verified. Premature credit issuance risks undermining both ecological integrity and market credibility.

Nature credits must not be used to compensate for non-compliance with environmental legislation or function as biodiversity offsets. They should be strictly limited to activities that demonstrably generate additional, measurable, and nature-positive outcomes aligned with legal obligations.

Climate risk must be systematically integrated into project design and certification. Marine heatwaves, ocean acidification, and rising sea temperatures can jeopardise restoration outcomes; therefore, standards should require climate risk assessments, permanence safeguards, buffer mechanisms, and, where appropriate, risk-sharing instruments such as parametric insurance.

Financial credibility is equally critical. Projects participating in credit schemes should be required to present **robust financial plans** covering costs, revenues, cash flow, and risk contingencies as a condition for approval and access to blended finance. EU funding programmes should explicitly recognise certified seagrass and blue carbon credits as complementary co-financing mechanisms, with clear guidance on compatibility with state aid rules and public marine ownership regimes.

Public financing should be used strategically by integrating it into blended finance models to de-risk private investment and accelerate market development. Strong demand signals, such as binding biodiversity

and climate targets, are crucial for market uptake, complemented by targeted capacity-building for authorities, land managers, and investors.

Finally, **targeted efforts are needed to stimulate demand**. A coordinated EU-level communication strategy should engage key sectors, such as tourism, ports, maritime transport, and energy, highlighting the ecological, reputational, and regulatory value of high-integrity seagrass credits.

Recommendation 15: Propose an EU legislative framework for nature credits and include provisions for Posidonia credits
A **robust EU-level framework on nature credits** is needed to ensure consistency, transparency, and trust. In line with the European Commission's Roadmap Towards Nature Credits, this should include harmonised standards, definitions (including claim codes), and clear oversight mechanisms to prevent greenwashing, double counting, and perverse incentives.

The Commission, supported by the relevant Expert Group, should consider **proposing a dedicated legislative framework by 2027** to ensure alignment with the EU environmental *acquis* and the internal market. Lessons from voluntary carbon markets must be addressed through strict additionality, science-based methodologies, clear baselines, and mandatory independent third-party verification.

The **EC must ensure that marine ecosystems and particularly *P. oceanica* is integrated in the proposed nature credits scheme**. Lessons learned from the ARTEMIS project can offer important guidance to ensure that the specific requirements of this unique ecosystem are provided for in the proposed scheme.

6.5. Conclusion

The core challenge for *P. oceanica* restoration is no longer one of normative recognition, but of systemic implementation and sustained, long-term commitment across all levels of governance.

The ARTEMIS report and experience demonstrate that the urgency to address the ecological decline of marine ecosystems, the legislative framework and the financial architecture required for the restoration of *P. oceanica* need to be translated into practical implementation through the NRR. **Science for restoration has advanced, governance and funding need to evolve to match altogether the ambition set in the NRR**. The

transition from project-based restoration to systematic and programmatic ecosystem restoration requires the establishment of national restoration frameworks, with clear institutional responsibilities and validated standardised protocols. Adopting a Systematic Conservation Planning (SCP) approach would improve the overall effectiveness of restoration objectives, which need to be integrated into all relevant sectoral governance instruments, including MPAs and Marine Spatial Plans. Long term and predictable funding complemented by private investments grounded in science must be ensured.

As this report demonstrates, effective and successful restoration efforts depend on a set of interdependent enabling conditions: coherent and aligned legal frameworks, standardized and adaptive operational procedures, robust scientific methodologies, predictable and adequate financing, strengthened institutional capacity, climate–biodiversity policy integration, and responsible private-sector engagement. Among these, securing and strategically deploying financial resources emerges as a critical prerequisite for scaling restoration efforts.

The policy recommendations outlined in this report provide a structured pathway to address these challenges, highlighting the need for coordinated action across governance, implementation, and financing domains. Only through the combined and consistent strengthening of these conditions can restoration move beyond fragmented, project-based interventions toward sustained, large-scale ecological recovery across the Mediterranean. Achieving seagrass restoration at scale will have not only environmental gains, but also long-term socio-economic and climate resilience benefits.