Mediterranean blue carbon strategy

Ana Hidalgo, Alba Prieto, Marina Cobos

Emmi Lindqvist, Mercedes Muñoz Cañas (Editors)

First edition

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Executive summary

The Mediterranean blue carbon strategy aims to establish a comprehensive framework for the protection, restoration, and sustainable management of blue carbon ecosystems, such as *Posidonia oceanica* meadows and other seagrasses. These ecosystems are vital for climate change mitigation, carbon storage, and providing essential services like biodiversity, coastal protection, and sustainable livelihoods. The strategy outlines a roadmap from 2025 to 2030 to safeguard the Mediterranean's natural heritage by integrating scientific, economic, and community efforts.

Key objectives include:

- Protection and restoration of blue carbon ecosystems
- Long-term research and knowledge promotion
- Development of certification and financing schemes for blue carbon projects
- Encouraging community participation and supportive public policies

Challenges identified include:

- Knowledge gaps: outdated mapping and insufficient communication about ecosystem importance
- Pressures: climate change, tourism, fisheries, coastal infrastructure, and invasive species
- Unequal regulatory framework: while EU Mediterranean countries are advanced in policies, other countries lack specific regulations
- Financial mechanisms: limited, but carbon credits show promise

The strategy proposes 30 measures across six strategic lines:

- **Strategic Line 1: Conservation, protection, and restoration of blue carbon ecosystems** aims to safeguard and restore critical blue carbon ecosystems, including Posidonia and other seagrass meadows across the Mediterranean.
- **Strategic Line 2: Progressing long-term blue carbon research and knowledge** seeks to advance long-term research and knowledge on blue carbon ecosystems, focusing on their role in climate change mitigation, carbon storage and ecosystem services.
- **Strategic Line 3: Blue carbon certification schemes (quantification and financing)** aims to establish a standardised framework for Mediterranean blue carbon ecosystem certification, build stakeholder capacity and design adaptive certification systems for ecological integrity.
- **Strategic Line 4: Facilitate financing and investment in blue carbon** seeks to promote financing and investment in blue carbon projects, fostering cross-sector collaboration by developing inclusive financial mechanisms.
- **Strategic Line 5: Involvement of local communities** aims to engage local communities through public education campaigns and training programs to foster ownership and effective conservation.
- **Strategic Line 6: Policy framework and planning, management strategies** looks to create a coordinated Mediterranean policy framework for blue carbon, integrating it into national and international policies while streamlining processes for more effective project implementation.

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1 Introduction

Climate change is one of the greatest environmental and socio-economic challenges globally, with the Mediterranean being among the most vulnerable regions. In this context, the concept of blue carbon – referring to the capture and storage of carbon in marine and coastal ecosystems such as *Posidonia oceanica* seagrass meadows – has gained prominence as a key strategy for mitigating greenhouse gas emissions. These ecosystems not only regulate climate but also support biodiversity, fisheries and coastal protection.

The strategy presented in this document is based on a comprehensive review of scientific literature (drawn from diverse sources, including scientific articles, manuals, methodological frameworks and carbon credit certification guides), and complemented by interviews and questionnaires with key stakeholders in blue carbon conservation. It also analysed policies and projects focused on restoring and protecting blue carbon ecosystems, integrating insights from pioneering initiatives that have successfully implemented projects, with the goal of identifying knowledge gaps and developing a unified Mediterranean strategy for the long-term conservation of blue carbon ecosystems. Also, this document synthesises key findings on blue carbon in the Mediterranean, addressing challenges faced by experts, gaps in policy and societal awareness, monitoring systems, funding sources and other critical considerations.

The strategy is divided in six strategic lines. The protection of these ecosystems is included in Strategic Line 1: Conservation, protection and restoration of blue carbon ecosystems, which requires the actions of the Strategic Line 6: Policy framework and planning, management strategies given that all countries need to have a regulatory framework to establish the legal framework in which blue carbon projects will be developed.

Strategic Lines 2: Progressing long-term blue carbon research and knowledge, 3: Blue carbon certification schemes (quantification and financing), 4: Facilitate financing and investment in blue carbon and 5: Involvement of local communities, are necessary to articulate the strategy and enable its implementation correctly.

The final goal is to present a clear roadmap to advance evidence-based research and initiatives while unlocking investment potential through financial mechanisms such as carbon credits ensuring the implication of all relevant stakeholders and the development of the most appropriated policy frameworks.

2 Regulatory frameworks for blue carbon in the Mediterranean

The Barcelona Convention and its associated Mediterranean Action Plan (MAP) provide the primary legal framework for the protection of marine and coastal environments in the Mediterranean. Within this framework, the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) plays a key role in safeguarding critical blue carbon ecosystems such as *Posidonia* seagrass meadows and coastal wetlands. While the convention does not explicitly regulate blue carbon, its provisions support conservation efforts that contribute to carbon sequestration and climate change mitigation.

Currently, there is no specific regulatory framework for blue carbon at Mediterranean level beyond the Barcelona Convention. However, voluntary initiatives such as the Blue Carbon Initiative are working towards developing standards and methodologies for blue carbon accounting, which could eventually be integrated into national strategies and carbon markets. Also, it is important to mention the Mediterranean Posidonia Network, which strengthens regional efforts by fostering collaboration among scientists, conservation practitioners, and policymakers to enhance the protection and management of *Posidonia oceanica* meadows. By promoting knowledge exchange and best practices, this network contributes to the long-term sustainability of blue carbon ecosystems in the Mediterranean, complementing existing regulatory and policy frameworks. Together, these efforts help bridge the gap between science, policy, and conservation, ensuring that blue carbon ecosystems receive the recognition and protection they deserve.

As the significance of blue carbon ecosystems continues to be acknowledged, Mediterranean countries are increasingly developing legal and policy measures to enhance their protection. The following section provides an overview of national policies, highlighting key approaches to safeguarding and leveraging these vital ecosystems.

2.1 Mediterranean countries' national frameworks

The Mediterranean basin includes many countries with diverse legislation. While EU member states follow common regulations adapted to their national contexts, several countries outside the EU have developed frameworks that tackle climate change while protecting and restoring key marine ecosystems.

Below is an analysis of the main regulatory frameworks of Mediterranean countries, which focus on the conservation and sustainable management of marine environments:

Albania

The main regulatory framework for the conservation and sustainable management of marine environments in Albania is the **Law on the Protection of the Marine Environment (2017)**. This law serves as the cornerstone of Albania's efforts to protect its marine and coastal areas, including the establishment of Marine Protected Areas (MPAs). While this law primarily focuses on preventing marine pollution and protecting marine biodiversity, it also contributes to the preservation of coastal and marine ecosystems, such as seagrasses and salt marshes.

Algeria

Algeria's **National Climate Change Strategy** develops actions to enhance climate change mitigation and adaptation. It promotes ecosystem conservation to improve adaptation to climate change and increase carbon sequestration. Furthermore, the strategy places a focus on emission reductions, with a particular emphasis on the protection of marine ecosystems. Given the importance of Algeria's coastal areas in the Mediterranean, the strategy integrates actions to safeguard marine biodiversity while addressing the broader goal of reducing the country's carbon footprint. Though the strategy is still developing, it outlines significant steps to address climate impacts on vulnerable coastal ecosystems.

Bosnia and Herzegovina

Bosnia and Herzegovina's **Law on Environmental Protection (2013)** establishes the foundation for environmental protection in the country, including the protection of habitats that contribute to carbon sequestration. Although it does not explicitly address blue carbon, it does indirectly support the protection of key blue carbon ecosystems.

Croatia

Croatia's **National Biodiversity Strategy** emphasises the protection and restoration of marine ecosystems, with specific reference to blue carbon ecosystems such as seagrass meadows. It focuses on protecting marine biodiversity areas and MPAs and supports them as tools for marine biodiversity protection and climate adaptation. The **National Climate Change Adaptation Plan** addresses the vulnerability of coastal ecosystems and promotes adaptation strategies to safeguard marine and coastal biodiversity from climate impacts. It outlines measures to adapt coastal wetlands and marine areas to climate change, with a particular focus on coastal wetlands.

Cyprus

Cyprus has integrated marine ecosystem protection into its **National Climate Change Strategy**, focusing on both adaptation and mitigation. The strategy seeks to safeguard the resilience of marine ecosystems and promote their role in sequestering carbon.

Egypt

Egypt's **National Climate Change Strategy** includes a balanced approach of both adaptation and mitigation, with a specific focus on the Nile Delta and coastal marine ecosystems. The strategy outlines actions to protect marine environments in the Nile Delta, which is particularly vulnerable to the effects of sea-level rise and salinity intrusion. The strategy incorporates ecosystem restoration as a measure to improve climate change adaptation and mitigation, including the restoration of ecosystems in deltas and coastal areas. The protection of coastal ecosystems is seen as a critical component in maintaining socioeconomic stability in these regions, as they support both local livelihoods and serve as important carbon sinks.

European Union (EU)

The EU has established several key policies directly related to blue carbon and the protection of marine ecosystems. The **EU Biodiversity Strategy for 2030** and the **EU Blue Economy Strategy (2021)** prioritize the conservation and restoration of blue carbon habitats such as seagrass meadows and coastal wetlands. The **European Green Deal** and the **European Climate Law (2021)** also recognize the role of marine ecosystems in carbon sequestration, integrating them into broader climate mitigation efforts. The **Land Use, Land Use Change and Forestry (LULUCF) Regulation (2023)** explicitly

includes coastal and marine ecosystems as carbon sinks, strengthening their protection within the EU's climate strategy. Finally, the **Marine Strategy Framework Directive (MSFD) (2008)** remains a fundamental regulation for protecting marine environments, requiring EU member states to implement measures that ensure the health of marine ecosystems, including those critical for blue carbon storage. These frameworks collectively support the EU's efforts to integrate blue carbon into climate policies and enhance the resilience of coastal ecosystems.

France

France's **National Biodiversity Strategy** aims to conserve marine biodiversity, promoting the restoration of ecosystems like seagrass meadows and wetlands. It focuses on climate change adaptation and prioritising the restoration of degraded ecosystems, including the restoration of coastal ecosystems for improved resilience of the coastline. The **National Climate Change Adaptation Plan** includes specific measures for the protection of marine ecosystems, ensuring that climate change adaptation efforts address both ecological and socio-economic impacts in vulnerable coastal regions. The **Plan Régional Climat-Air-Énergie** emphasises emissions reduction and ecosystem resilience particularly in the Provence-Alpes-Côte d'Azur region, supporting regional actions for marine ecosystem conservation and carbon capture.

Greece

Greece's **National Climate Change Adaptation Strategy** focuses on emissions reduction, with specific actions dedicated to protecting marine ecosystems and strengthening the resilience of the coastal zone. The **National Biodiversity Protection Plan** highlights the conservation of marine ecosystems, with a focus on blue carbon habitats. The **Marine Biodiversity Protection Strategy** focuses on protecting marine biodiversity and mitigating climate impacts through the establishment of MPAs.

Israel

Israel's **National Climate Change Strategy** emphasises the integration of marine ecosystem protection into national climate policies. The strategy specifically targets the conservation of marine and coastal areas, with an eye on ensuring that these ecosystems continue to provide vital services such as carbon storage, biodiversity preservation and protection against coastal erosion. This framework also highlights the need to mitigate climate change impacts on marine resources that are essential for Israel's economy and food security.

Italy

Italy's **Climate Change Law** emphasises the decarbonisation of the economy and the protection of natural ecosystems, including marine habitats. The **National Biodiversity Protection Plan** targets the creation of MPAs and the restoration of marine ecosystems, aligning with blue carbon objectives by focusing on both biodiversity conservation and carbon sequestration. The **National Climate Change Adaptation Plan** focuses on climate change adaptation and includes measures for protecting coastal ecosystems, considering them key components of national adaptation strategies. The **National Strategy for Coastal Ecosystem Restoration** focuses on restoring blue carbon ecosystems for climate benefits, including the development of strategies to protect and restore coastal blue carbon ecosystems.

Lebanon

Lebanon's **National Climate Change Strategy** is centred on the integration of marine ecosystem protection into national climate policies. Lebanon's coastal areas are particularly vulnerable to sea-level rise, pollution and habitat degradation, making marine conservation an important aspect of its climate adaptation and mitigation efforts. The strategy highlights the need to protect Lebanon's marine biodiversity and coastal ecosystems, which serve critical roles in both carbon sequestration and the overall ecological health of the region. The **National Biodiversity Strategy and Action Plan** focuses on biodiversity conservation and climate resilience, promoting the integration of coastal ecosystems into national policies.

Libya

Libya's **National Climate Change Adaptation Strategy** takes a similar approach, integrating the protection of marine ecosystems within the broader framework of climate adaptation. The strategy emphasises the importance of marine and coastal ecosystems in reducing the impacts of climate change on coastal communities and infrastructure. Libya has been taking initial steps towards identifying vulnerable marine habitats and developing policies that can enhance their resilience to the effects of climate change.

Malta

Malta's **National Biodiversity Action Plan** prioritises the protection and restoration of marine and coastal ecosystems, with a specific emphasis on blue carbon ecosystems. The plan supports the restoration of seagrass meadows and other critical coastal habitats, recognising their importance in mitigating climate change.

Monaco

Although Monaco does not have a regulatory framework specifically supporting blue carbon, as a contracting party to the Barcelona Convention, the Protocol concerning Specially Protected Areas and Biological Diversity (SPA/BD) guides the conservation of marine and coastal biodiversity, including key blue carbon ecosystems such as seagrasses, wetlands and MPAs.

Montenegro

Montenegro's **Law on Environmental Protection (2016)** provides the main regulatory framework for environmental protection in the country, including the protection of air, water and biodiversity. While it does not specifically address blue carbon, it contributes to the broader protection of ecosystems, including coastal and marine ecosystems vital for carbon sequestration. The **Law on Nature Protection (2016)** provides a framework for nature and biodiversity conservation, including the protection of endangered species and ecosystems. It includes provisions for the establishment of protected areas, including MPAs, which could play a role in protecting coastal and marine habitats that store carbon, such as seagrass beds and salt marshes.

Morocco

Morocco's **National Climate Change Strategy** is a cornerstone in the country's efforts to mitigate greenhouse gas emissions and increase resilience to climate impacts. One of its significant goals is to incorporate the conservation of marine ecosystems, particularly those in the Mediterranean and Atlantic coasts, into broader climate adaptation and mitigation strategies. The strategy outlines various

measures to protect coastal areas, which include the management of blue carbon ecosystems. Additionally, Morocco's **National Biodiversity Plan** complements this by aiming to protect marine and coastal biodiversity across both the Mediterranean and Atlantic coastlines. This plan is directly aligned with global biodiversity goals and supports the conservation of ecosystems that have the potential to sequester carbon, contributing to climate change mitigation. Furthermore, the Moroccan **National Climate and Biodiversity Plan** focuses on climate adaptation and biodiversity, which objectives include protecting marine and coastal biodiversity and ecosystems as part of climate strategies. Finally, the **Wetlands Conservation Strategy** promotes the integration of wetland restoration into climate mitigation strategies.

Slovenia

Slovenia's **Environmental Protection Act (2004, amended in 2017)** provides a general framework for environmental protection, including the protection of ecosystems, biodiversity and air and water quality. It indirectly supports the protection of ecosystems such as coastal wetlands, seagrasses and other marine habitats that are important for carbon sequestration, even though blue carbon is not explicitly mentioned. The **Nature Conservation Act (2004, also amended in 2017)** provides the foundation for the conservation of biodiversity in Slovenia, including the protection of marine and coastal ecosystems that could contribute to blue carbon. It supports the creation of protected areas, including MPAs.

Spain

Spain's **Law 7/2021 on Climate Change and Energy Transition** is a key piece of legislation that establishes ambitious decarbonisation goals, including the protection of marine ecosystems. The **National Climate Change Adaptation Strategy** specifically addresses the adaptation of marine ecosystems, recognising their importance in climate resilience. Furthermore, Spain has implemented a **Coastal Biodiversity Action Plan** that focuses on protecting marine and coastal ecosystems along the Mediterranean coast, with a particular emphasis on blue carbon habitats. Also key is the **National Climate Change Adaptation Plan**, which sets priorities for climate adaptation in Spain, including measures for coastal and marine ecosystems. It highlights the need to adapt coastal ecosystems to climate change.

In Spain, the **Andalusian Blue Carbon Standard** is a pioneering initiative developed by the Junta de Andalucía. This standard provides a framework for the certification of blue carbon projects along the Andalusian coast. It aims to establish methodologies for measuring and verifying the carbon sequestration potential of coastal ecosystems such as seagrass meadows and wetlands. The initiative seeks to promote the restoration of these ecosystems and create a financial mechanism for investing in their protection. By providing a standardised approach to blue carbon, this framework facilitates the mobilisation of finance for restoration and conservation projects, which is crucial for scaling up blue carbon efforts.

Syria

Syria's National Climate Change Strategy also incorporates the protection of marine ecosystems into its broader climate goals. The strategy outlines actions for the conservation and restoration of key coastal and marine ecosystems as part of a comprehensive adaptation and mitigation approach. The focus is on protecting marine biodiversity and enhancing the resilience of coastal communities, which rely on these ecosystems for livelihoods and food security.

Tunisia

Tunisia's **National Climate Change Adaptation Plan** highlights the protection of coastal and marine ecosystems as a key priority to improve adaptation to climate change. The plan emphasises the importance of these ecosystems for sustaining biodiversity, livelihoods and providing climate resilience. Tunisia is particularly focused on protecting its coastal zones, which are home to important blue carbon ecosystems that play an essential role in carbon sequestration. These ecosystems are also crucial for protecting coastal communities from climate change-induced threats like sea-level rise and extreme weather events.

Türkiye

Türkiye's **National Climate Change Strategy** emphasises the integration of marine ecosystems into both adaptation and mitigation strategies. It aims to restore degraded blue carbon ecosystems and integrate them into climate policies. Also, its **Coastal Ecosystem Mitigation Strategy** is important as it focuses on marine ecosystems' role in mitigating climate impacts. Türkiye's coastal regions along the Aegean and Mediterranean Seas are rich in biodiversity and blue carbon ecosystems. The strategy outlines specific measures for the protection and restoration of these ecosystems, recognising their importance in sequestering carbon, protecting coastal areas from erosion and supporting local economies. Türkiye is focused on developing programmes that promote the sustainability of its marine resources while contributing to the overall climate change agenda.

After analysing the main international and national frameworks aligned with the Mediterranean blue carbon strategy, it can be concluded that most of them are focused on the protection of the marine environment and its ecosystems, as well as on the development of policies, plans and programmes to improve the adaptation of these spaces to climate change, through management and restoration actions, among others.

Across the Mediterranean, countries are increasingly recognising the importance of marine ecosystems as key components of climate change adaptation and mitigation strategies. These national and regional climate strategies all reflect a growing understanding of the need to protect coastal and marine ecosystems to ensure long-term environmental sustainability and climate resilience. As these frameworks evolve, there is potential for greater collaboration and the development of joint initiatives to promote the protection of these valuable ecosystems and ensure their contribution to global climate goals.

3 Analysis of the current framework

One of the objectives of the Mediterranean blue carbon strategy is to promote the conservation of blue carbon ecosystems through the implementation of conservation and regeneration projects.

The following is an analysis of the interrelationships of the Mediterranean blue carbon strategy with the main regulatory frameworks related to blue carbon ecosystems and planning instruments at the international, Mediterranean and EU country levels. It presents the principal findings of the analysis of bibliographic information and the consultation phase, which involved surveys and personal interviews with relevant entities and experts within the blue carbon sector at the Mediterranean level.

3.1 Literature review

The literature review for this study systematically analyses existing research and publications related to blue carbon ecosystems, with a specific emphasis on seagrass meadows and wetlands, as well as the restoration of *Posidonia oceanica* meadows. The goal of this review is to provide a comprehensive understanding of current knowledge on blue carbon strategies, focusing on the Mediterranean region while also integrating global perspectives where applicable.

3.1.1 Scope and selection criteria

The literature included in this review spans a broad temporal range, focusing on works published from 2012 to 2024. This period was selected due to significant advancements in blue carbon science and policy over the last decade, reflecting growing interest in the role of coastal and marine ecosystems in climate change mitigation. The selection criteria prioritised reviewed scientific articles, reports from reputable organisations, and official manuals and guidelines, with a particular focus on those that provided empirical data or methodological frameworks for blue carbon restoration and carbon credit certification.

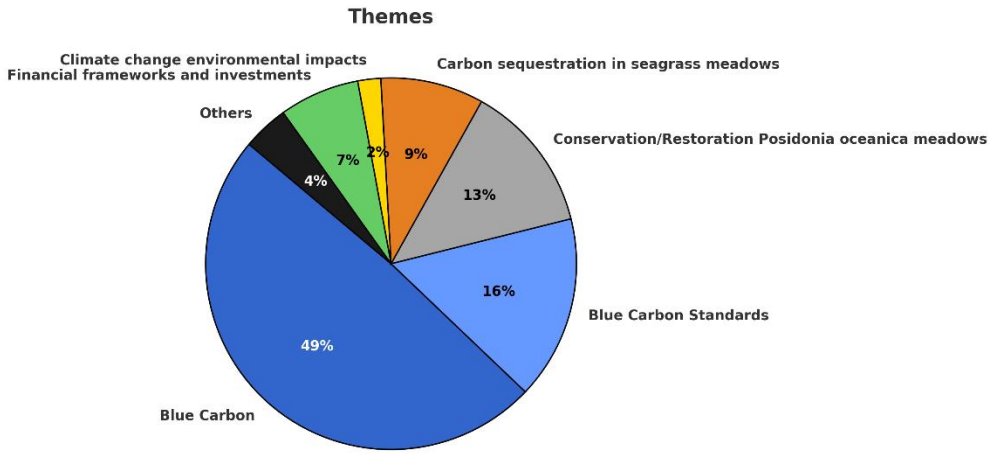

Figure 1. Topics covered in the reviewed literature. Source: authors

3.1.2 Geographical focus

While the primary focus of this review is on the Mediterranean region, the literature also includes studies and projects from other global coastal regions to provide a more comprehensive perspective. This geographical scope allows for the comparison of Mediterranean blue carbon initiatives with those in other regions, highlighting both shared challenges and region-specific strategies.

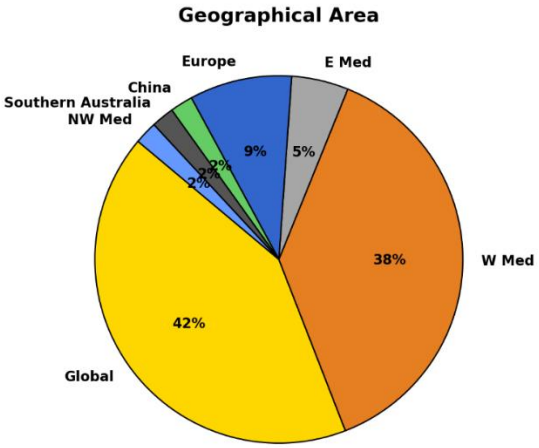

Figure 2. Distribution of reviewed literature by geographical region. Source: authors

3.1.3 Types of sources reviewed

The sources reviewed fall into several categories, with the majority consisting of scientific studies (approximately 45%), followed by manuals and guidelines (about 13%), project development (around 11%) and standards for carbon credit certification (18%). This distribution reflects the multifaceted nature of blue carbon research, which spans ecological restoration techniques, carbon stock quantification, economic models and governance frameworks.

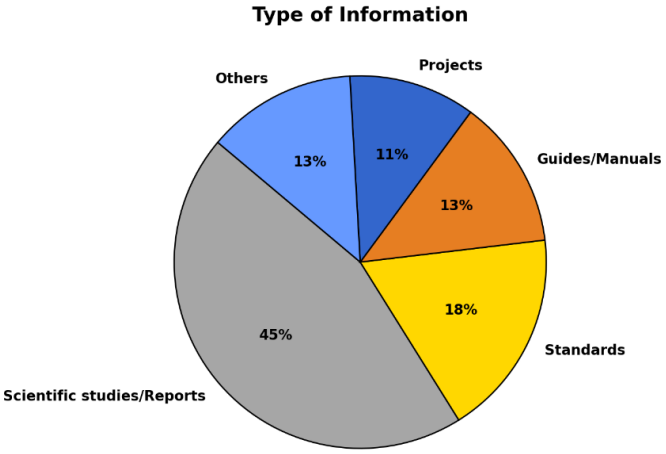

Figure 3. Percentage distribution of information types consulted for the literature review. Source: authors

3.1.4 Key themes

From the literature, several prominent themes emerged, which were categorised to provide a clear structure for understanding the current state of blue carbon science and practice. These themes include:

1. **Ecosystem restoration and conservation**

   Much of the research focuses on the restoration of specific blue carbon ecosystems, particularly *Posidonia oceanica* seagrass meadows, which are highlighted for their high carbon sequestration potential. Key manuals and guidelines, such as the *Practical Guide for Planting Posidonia* (Red Eléctrica de España, 2018) and *Guidelines for the Active Restoration of Posidonia oceanica* (Pergent-Martini et al., 2024), provide detailed protocols for restoration, often emphasising the use of seeds and fragments for active restoration. Additionally, efforts to restore wetlands are discussed, with methodologies such as VM0033 and VM0024 offering certification frameworks for these activities (Verra, 2021, 2014).

2. **Methodologies for carbon stock assessment and certification**

   Several studies provide frameworks for assessing the carbon stocks in blue carbon ecosystems. Notable contributions include the *Coastal Blue Carbon: Methods for assessing carbon stocks and emissions factors in mangroves, tidal salt marshes, and seagrasses* report (Blue Carbon Initiative, 2014), which offers techniques for measuring carbon in wetlands and seagrass meadows. Additionally, certification methodologies such as the **Gold Standard for Blue Carbon** and the **Andalusian Blue Carbon Standard** (The Gold Standard Foundation, 2024; Junta de Andalucía, 2021) are critical for ensuring the credibility of blue carbon offset projects.

3. **Financing mechanisms and economic models**

   Research has also explored how to finance blue carbon projects, with a focus on sustainable investment models. Studies such as the *McKinsey & Company Blue Carbon Report* (Claes et al., 2022) analyse strategies for unlocking financial support, while feasibility studies like the *Blue Carbon Feasibility Assessment for Andalusia* (IUCN, 2021a) provide practical insights into the economic viability of blue carbon projects in specific regions.

4. **Policy frameworks and institutionalisation**

   Another significant theme is the integration of blue carbon principles into national and international policies. Documents such as the *Mediterranean Blue Carbon Initiative* (UNFCCC, 2007) and the *Global Ocean Accounts Partnership* (Vanderklift et al., 2022) emphasise the importance of collaborative efforts at both regional and international levels to promote blue carbon strategies as part of broader climate change mitigation efforts. The review also highlights efforts within the European Union to institutionalise blue carbon, such as through the *EU Maritime Forum's Blue Carbon Report* (European Marine Board, 2023).

5. **Emerging challenges and future directions**

   Lastly, the review discusses emerging challenges in blue carbon research, particularly related to the variability of carbon sequestration across different ecosystems. Studies such as *Drivers of Variability in Blue Carbon Stocks* (Mazarrasa et al., 2023) highlight the challenges posed by ecosystem-specific factors, such as ocean acidification and pollution, which may affect the long-term viability of carbon storage. Furthermore, research on the role of macroalgal forests in blue carbon sequestration (Krause-Jensen et al., 2018) suggests that these ecosystems, often overlooked, should be incorporated into future carbon accounting methodologies.

3.1.5 Main findings

The extensive review of literature on blue carbon ecosystems and their restoration reveals several key findings that significantly enhance our understanding of their ecological, methodological, and policy-related dimensions. While the body of research on blue carbon has made notable strides, it also highlights gaps and inconsistencies that must be addressed to further advance the field.

Importance of blue carbon ecosystems

The literature consistently emphasises the vital role that blue carbon ecosystems, particularly seagrass meadows, wetlands and macroalgal forests, play in carbon sequestration and storage. As highlighted by the Blue Carbon Initiative (2014) and studies such as *Quantification of Blue Carbon Stocks Associated with Posidonia oceanica Seagrass Meadows in Corsica* (Monnier et al., 2022), these ecosystems are critical carbon sinks, significantly contributing to the mitigation of climate change.

The importance of macroalgal forests, as detailed in *Role of Macroalgal Forests within Mediterranean Shallow Bays in Blue Carbon Storage* (Moreda et al., 2024), further emphasises their dual function not only as carbon storage systems but also in enhancing biodiversity and providing coastal protection. The integration of these findings demonstrates a multifaceted value of blue carbon ecosystems, which extends beyond carbon sequestration to include their roles in ecosystem health and resilience.

1. **Methodological advances and challenges**

   Significant methodological advancements have been reported, particularly in the spatial mapping of blue carbon ecosystems. One such innovation is the use of high-resolution seismic reflection imaging for assessing carbon storage in seagrass meadows, as described by Monnier et al. (2021) in *Sizing the Carbon Sink Associated with Posidonia oceanica Seagrass Meadows*. This technique represents a substantial leap in the precision of carbon sink mapping. However, despite these innovations, the literature reveals considerable methodological inconsistencies. There is a notable lack of standardised protocols for assessing carbon stocks and emissions factors across different ecosystems. This inconsistency is a barrier to scaling up blue carbon initiatives and complicates the comparability of results, as emphasised by *Drivers of Variability in Blue Carbon Stocks and Burial Rates* (Mazarrasa et al., 2023). Further research is required to establish universally accepted methods that could enhance global coordination and implementation of blue carbon projects.

2. **Policy frameworks and certification standards**

   The growing recognition of the importance of blue carbon ecosystems in climate mitigation has led to the development of various policy frameworks aimed at integrating blue carbon into national and international climate agendas. Notable contributions include *A Guide to International Climate Mitigation Policy and Finance Frameworks* (Vanderklift et al., 2022) and the *Andalusian Blue Carbon Standard* (Junta de Andalucía, 2021), which seek to provide guidance on the integration and certification of blue carbon initiatives. However, the review highlights ongoing challenges in the certification of blue carbon credits. Disparities in regional standards and certification processes pose significant barriers to investment and the widespread implementation of blue carbon projects. Such discrepancies hinder the effective global expansion of blue carbon strategies, as indicated by the *Andalusian Blue Carbon Standard* (Junta de Andalucía, 2021), which addresses certification challenges at the local level.

3. **Gaps and controversies**

   Several critical gaps and controversies emerge from the reviewed literature, particularly in relation to environmental impact studies, variability in carbon storage, and the inclusion of local communities:

   - **Environmental impact studies**: While much of the research focuses on the carbon storage capacity of blue carbon ecosystems, there is a lack of long-term studies investigating the ecological impacts of restoration projects. The effects of additional stressors, such as plastic pollution, are

underexplored, despite being highlighted in *Plastics in Blue Carbon Ecosystems: A Call for Global Cooperation on Climate Change Goals* (Adyel & Macreadie, 2022). Future research should prioritise comprehensive assessments that consider cumulative impacts from multiple stressors on ecosystem health and carbon storage capacity.

- **Variability in carbon storage**: The literature identifies significant variability in carbon storage and burial rates across different ecosystems, as discussed in *Drivers of Variability in Blue Carbon Stocks and Burial Rates* (Mazarrasa et al., 2023). This variability underscores the need for more detailed studies that account for geographical and ecological differences, allowing for more accurate predictions of carbon sequestration potential.
- **Inclusion of local communities**: While the involvement of local communities in blue carbon projects is often acknowledged, empirical research exploring effective models for community participation and benefit-sharing remains limited. Projects such as the *LIFE Blue Natura Project* and the *Mediterranean Blue Carbon Initiative* emphasise local engagement, but there is a lack of detailed studies exploring how such involvement can be structured to maximise benefits for both ecosystems and communities.

3.1.6 Conclusions from the analysed bibliography

The review of literature on blue carbon and seagrass restoration highlights a diversity of theories, methodologies, and approaches. Therefore, after an exhaustive analysis of bibliographic information related to blue carbon, it is possible to conclude:

1. **Methodological diversity:** Blue carbon research employs a wide range of both quantitative and qualitative methodologies, each with distinct strengths and limitations. Some studies, such as the *Coastal Blue Carbon Methods* report (Blue Carbon Initiative, 2014), employ robust quantitative methodologies to measure carbon stocks, while others, like *OperatiSonalizing Blue Carbon Principles in France* (Comte et al., 2024), adopt a more qualitative approach, focusing on institutionalisation and public policy:
   - **Quantitative approaches** study employing remote sensing and spatial modelling techniques for quantifying carbon, such as *Quantification of Blue Carbon Stocks Associated with Posidonia oceanica Seagrass Meadows* (Monnier et al., 2022), which provides a solid foundation for measuring and comparing carbon stocks across different ecosystems. However, these methodologies may overlook social and economic factors that influence the restoration of these ecosystems.
   - **Qualitative approaches** focus on institutional and policy frameworks, essential for incorporating blue carbon into national and international climate policies. While approaches, such as *A Guide to International Climate Mitigation Policy and Finance Frameworks* (Vanderklift et al., 2022), are crucial for integrating blue carbon into national and international policies, they tend to be less precise in measuring the direct impacts of restoration interventions.

     A critical gap in current research is the lack of integration between these methodologies. A combined approach could provide a more holistic understanding of the ecological, social and economic outcomes of restoration interventions.
2. **Certification challenges:** The certification of blue carbon projects is another complex issue. Standards such as those found in the *Andalusian Blue Carbon Standard* (Junta de Andalucía., 2021), are crucial for ensuring the credibility of carbon credits. However, there is an ongoing debate regarding the flexibility and applicability of these standards, particularly in the Mediterranean region, which is characterised by highly diverse ecosystems. A more adaptable certification framework is needed to account for this variability.
3. **Financing mechanisms:** While existing mechanisms aim to attract investment, many do not adequately consider the equitable participation of local communities. To ensure the long-term

sustainability of blue carbon initiatives, it is essential to develop innovative, inclusive financial structures that incentivise both investors and local stakeholders, as discussed in *How to Incentivize Bank Credit Development in Blue Carbon Projects* (Zhang et al., 2022).

4. **Impact of environmental stressors:** Emerging research highlights how external factors such as plastic pollution and climate change impact the carbon storage potential of ecosystems. This issue demands further investigation, as these stressors could reduce the effectiveness of restoration efforts and undermine the reliability of carbon credit certification. Future strategies must incorporate these environmental risks to ensure the resilience of blue carbon projects (Adyel & Macreadie, 2022).
5. **Variability in carbon storage:** There is significant variability in carbon stocks and burial rates across different ecosystems, as mentioned in *Drivers of Variability in Blue Carbon Stocks and Burial Rates* (Mazarrasa et al., 2023). Understanding the factors that drive this variability is crucial for improving carbon stock assessments and informing ecosystem management strategies. A more nuanced understanding of these drivers will enhance the precision of carbon storage estimates and restoration outcomes.
6. **Community Involvement:** One of the most pressing gaps in current blue carbon research is the lack of focus on community engagement. For the Mediterranean strategy to succeed, the involvement of local communities in the restoration and management of blue carbon ecosystems is essential. Ensuring that these communities actively participate and benefit from such projects will not only promote social equity but also contribute to the sustainability and success of the initiatives.

Having stated these conclusions, this strategy aims to address the diversity of methodological approaches, adapt certification processes to the unique Mediterranean context and establish equitable financial models. Furthermore, it must account for environmental stressors like pollution and climate change, while ensuring the active participation of local communities. By addressing these key areas, the strategy can provide a robust and adaptable framework for restoring and managing blue carbon ecosystems in the Mediterranean.

3.2 Participation of experts and organisations

To complete the information obtained through the bibliographic analysis, a participation phase was carried out in which more than 40 experts and organisations were able to contribute their vision and knowledge on the subject through various channels including online questionnaires and individual online interviews.

In this way, relevant information has been obtained from those who carry out their daily work in the field of conservation, restoration and protection of marine ecosystems and are involved in blue carbon projects.

The information provided by the different experts in the data gathering process consisted of the following sections:

- Type and size of the company/organisation of employment, as well as the geographical area covered;
- Conservation of blue carbon ecosystems: actions carried out and their effectiveness, proposals for improvement, monitoring systems used, etc.;
- Financial frameworks: identification of main financial sources that are present in every Mediterranean region, interest of public and private sector in the development of projects related to blue carbon ecosystems and methodology used in the case that development the economic valuation of them;
- Current situation of certification projects in interviewee's area of expertise;
- Recommendations and suggestions for next steps.

3.2.1 Knowledge gaps

The first point to address in the development of this strategy is existing **knowledge gaps**.

These gaps can be categorised into two main types: (1) the lack of social and informational knowledge to communicate the challenges faced by these ecosystems to society, and (2) the lack of up-to-date (and historical) cartography in each region, which are essential for identifying areas suitable for project development.

Lack of updated cartography

In some areas, projects are being developed using outdated cartography or satellite images and the application of artificial intelligence process or analyse the information, potentially to make predictions or identify patterns. The application of this methodology introduces an element of uncertainty, dependent on the quality of the underlying data. While accurate outcomes can be achieved in some situations, this is not always the case. The lack of updated cartography is a common issue in many Mediterranean countries, largely due to a lack of government investment in conducting the necessary cartographic surveys of the seabed and its ecosystems. This data is crucial for assessing ecosystem conservation, anthropogenic impacts, seagrass meadow decline and other similar factors, and thus enabling the development of policies, conservation plans and optimal blue carbon project sites.

It is essential to conduct a thorough initial diagnosis of these ecosystems to ensure the success of subsequent actions.

It is estimated that the largest areas of Posidonia seagrass meadows are found in southern Mediterranean countries. However, there is currently an overall lack of data regarding the actual surface area they occupy as well as their state of conservation. Furthermore, there is a need to understand the human pressures they face. This information is essential for the design of effective management plans and the development of blue carbon projects.

It is crucial to raise awareness among social groups about the importance of ecosystems and their role in maintaining key economic activities such as fishing. This will help society understand the need to conserve these ecosystems and limit actions that endanger them.

An informed society is better placed to influence political decision-makers and request the design of policies that protect ecosystems and allow the development of economic activities.

3.2.2 Key pressures on blue carbon ecosystems

Following the research carried out, it can be concluded that the main pressures to which blue carbon ecosystems are exposed include:

- **Climate change**: This phenomenon is one of the major pressures that seagrass meadows face and includes water temperature rise, increased storm surges, ocean acidification, etc. Therefore, climate change can be considered a major threat to the functionality of these ecosystems. In contrast, these ecosystems have great potential for combatting the effects of climate change, including coastal protection, enhancement of biological diversity, carbon sequestration and reduction of greenhouse gas (GHG) emissions.
- **Tourism:** In most Mediterranean regions, recreational boats as well as companies offering water-based activities in coastal and marine areas are generally not required to obtain any kind of permit for their activities nor are they held financially responsible (e.g., via fines) for any potential damage caused to these ecosystems. Furthermore, unregulated anchoring poses a significant threat to seagrass meadows and is an important contributor to their damage and loss.
- **Fishing:** In much of the region, fishing boats often anchor wherever is most convenient, regardless of the marine life found on the seabed below. Seagrass meadows in particular offer shelter and refuge for a wide variety of marine species, including many of commercial value,

and therefore often overlap with areas of fishing interest where not only are anchors thrown but destructive fishing practices may take place.

- **Treated water outfalls:** The regenerated waters that are discharged into the sea from underwater outfalls enter with such velocity that they are capable of uprooting ecosystems adjacent to their locations. Furthermore, they often contain pollutants that can accumulate in nearby ecosystems and nutrient excess that may lead to eutrophication.
- **Coastal infrastructure:** Increased construction of coastal infrastructures built to meet the needs of growing populations and mass tourism in coastal areas put additional pressures on the habitats surrounding them as their natural dynamics are often negatively impacted, including the ecosystem services they provide.
- **Invasive species:** At the ecosystem level, invasive species pose a threat to blue carbon habitats as they compete with native species and can alter or change natural ecosystem functions or introduce new pathogens. In some Mediterranean regions, invasive species are fished and sold at markets for their economic value or as part of management strategies. While this is an interesting measure for protecting native habitats from invasive species and simultaneously generating economic revenue, clearer regulations are necessary to ensure vulnerable blue carbon ecosystems are not further destroyed as a byproduct of this practice.

3.2.3 Regulatory frameworks

While the current regulatory frameworks developed at the European level with regards to blue carbon ecosystems can be considered somewhat extensive, this is often not the case for southern and eastern Mediterranean countries.

The Mediterranean blue carbon strategy strongly encourages that all countries within the basin make a commitment to adhere to it as well as promote its adoption and implementation.

The international frameworks on nature conservation and natural resources, and particularly the Barcelona Convention, are the basis for the commitments that countries will make at the Mediterranean level to implement the blue carbon strategy for the Mediterranean.

This strategic framework provides Mediterranean countries with the opportunity to implement actions to promote the protection and recovery of blue carbon ecosystems, while also promoting the development of the blue economy, identifying and improving scientific knowledge, unlocking financial mechanisms to enable the development of projects, and so on.

In countries where the regulatory framework requires further development, it is crucial for governments to recognise the importance of these ecosystems and integrate them into the political agenda. This integration should be reflected in the development of plans and programmes with allocated budgets to address many of the identified issues.

3.2.4 Bureaucratic complexity

As established previously, up-to-date mapping of blue carbon ecosystems is a priority for advancing the conservation of these ecosystems and mainstreaming efforts when launching blue carbon projects and developing more effective policies and management plans.

The administrative procedures required for seabed mapping projects vary depending on the country, with some procedures being more complex and time-consuming than others. Regardless, there is a general need to streamline bureaucratic processes for obtaining accurate and up-to-date mapping data. It is essential that the granting of permits by the administration to carry out marine mapping is not an obstacle when launching blue carbon projects.

To address the key issues with the legal framework, it is crucial to integrate the latest scientific findings to ensure regulations are regularly updated. Improved communication between the scientific community

and administrations is essential, with the establishment of working groups of experts to guide governments and support faster decision-making. Climate change policies must recognise the importance of blue carbon ecosystems in mitigating climate change and protecting coastal areas, while also considering adaptation measures to minimize the impacts these ecosystems face. The decline of blue carbon ecosystems threatens biodiversity, the fishing sector, carbon storage, and coastal protection.

3.2.5 Legal certainty

There are areas of the maritime public domain that are protected for their high ecological value, such as Special Areas of Conservation (SACs) and MPAs, which often coincide with the presence of blue carbon ecosystems and where for-profit activities are highly restricted or even prohibited.

The growing interest in blue carbon by, for example, large private companies and investment funds makes it necessary to regulate and set limitations for their use. Profit and speculation based on these ecosystems and the generation of carbon credits for sale on the voluntary market must be monitored. For example, the Junta de Andalucía (Spain) does not currently allow these credits to go to the voluntary credit market, only allowing them to be used for self-compensation by the companies that develop them.

In other countries, there is a regulatory system of paying taxes on each project implemented, so that the balance of benefits is reduced.

Another aspect is the length of time of the concessions for use in the public maritime domain and the guarantee period for the correct execution of these projects. For example, in the case of *Posidonia oceanica*, a minimum of 50 years is considered sufficient to assess their carbon sequestration potential as these ecosystems generally take several decades to establish and reach optimum carbon sequestration levels. This discrepancy results in a lack of legal certainty when it comes to the implementation of blue carbon projects particularly by private companies and is often a hinderance for long-term financing of blue carbon projects.

3.2.6 Methodology for quantifying carbon impacts and benefits

The individual sequestration rates of key Mediterranean seagrasses under optimal conditions are currently known. In addition, it is important to identify the specific pressures these habitats face that may hinder their ability to function as healthy blue carbon ecosystems, particularly at the local level.

Based on the experiences of the interviewed experts, the effectiveness of the restoration projects implemented until now has generally been very good and with high survival rates. However, despite these promising results, projects have typically been developed at a small and local scale, so the results obtained can not necessarily be reflected to the region.

Quantification mechanisms, both in terms of carbon and monetary units, consider the individual species, its ecosystem value and protection status, location, current state and existing pressures, and allow for the analysis of each human-based impact as well as the quantification of atmospheric carbon and emissions avoided through their protection.

The critical issue to consider is that, if undisturbed, these habitats hold within them large amounts of sequestered carbon and, if damaged, can release significant quantities of carbon into the atmosphere. Therefore, it is essential to quantify the benefits of restoration actions, both in terms of units and economic value, as well as the consequences of carbon losses.

To understand the impact, studies should be tailored to estimate losses and gains in terms of CO_2 equivalent (CO_2e) or greenhouse gases, as this is the globally accepted terminology when dealing with carbon terms. When mentioning CO_2e, it is important to also consider the impact value in terms of N_2O (nitrous oxide) and CH_4 (methane), as well carbon footprint calculations. According to interviewed experts, it is relevant to quantify the amount of both N_2O and CH_4 emitted in restoration projects. The Verra Standard, for example, assumes that environments with 14-15% salinity won't produce N_2O.

However, with regards to CH_4, another methanogenic pathway exists that – at low levels – can generate a great impact due to the high global warming potential that is present.

3.2.7 Key species for Mediterranean blue carbon ecosystems

Key species in Mediterranean blue carbon ecosystems include marine phanerogams such as *Posidonia oceanica, Cymodocea nodosa, Zostera noltii* and *Zostera marina*, all of which can be found in the photic zone, between 5-40 meters' depth. If the sediment isn't exposed to disturbances, the entire area comprising that zone will eventually be colonised by seagrasses.

Studies on marine sediments show that most of the carbon sequestered within it is in the subsurface zone. If we focus the analysis on seagrass meadows, we find that more than 50% of the carbon sequestered in these meadows corresponds to the carbon found in the sediment. For this reason, it is much more efficient and beneficial to maintain meadows that are alive and in optimal conditions and have been capturing and storing carbon for hundreds or even thousands of years, than the regeneration (or planting) of new meadows. In addition, the presence of this vegetation prevents the remineralisation of the old sinks.

Remineralisation refers to the natural processes by which organic carbon, stored in marine ecosystems such as seagrasses, salt marshes and mangroves, is gradually broken down and returned to the water column as inorganic forms, such as carbon dioxide (CO_2). This process typically occurs when organic material, such as plant or animal matter, decays or decomposes over time, releasing carbon back into the environment. As a result, when these sinks are eliminated or disturbed, not only does their absorption capacity decrease or disappear altogether, but the carbon sequestered within them is remineralised.

To increase survival rates, restoration and regeneration projects should generally be carried out primarily in areas where the species in question have previously been known to exist. It is also important to consider that many seagrasses are slow growing (e.g. Posidonia, which is estimated to grow only 2 mm per year). Therefore, estimating success rates can often require several years or even decades, which needs to be considered during the project's planning phase. Furthermore, the implementation of restoration projects is often cost-intensive, particularly as the scale and depth increases.

Furthermore, restoration projects should aim to return degraded or damaged ecosystems to a state where they can provide essential ecosystem services such as biodiversity support, carbon sequestration, coastal protection, water quality improvement and resilience to climate change, rather than a justification for validating destructive, human-induced behaviours. It is important to note that when restoration takes place, the new seagrasses do not have the same immediate density as those that have not been affected, nor do they provide the same ecosystem services for several years, potentially even decades. In addition, these new meadows are often not able to sequester any carbon until they have reached an optimal state, generally after approximately 50 years, as is the case for *Posidonia oceanica*.

3.2.8 Financing mechanisms

The final point to note is the importance of developing funding mechanisms to enable further research, the creation of detailed maps and the monitoring of results. The EU provides opportunities for financing and participation in European projects also for non-European countries, which could be a potential source of funding and support for actions related to blue carbon. The generation of blue carbon credits has been considered a very good way to finance these kinds of projects, but it is important to determine the financial value of the ecosystem. Some experts consider that the financing of blue carbon projects through the generation of carbon credits for restoration or regeneration of *Posidonia oceanica* habitats will not be profitable due to the time periods required.

3.2.9 Conclusions

After analysing the information provided through these interviews, it is possible to draw the following conclusions:

1. Knowledge gaps need to be addressed, both to enable information to be disseminated and to identify which areas need to be addressed.
2. The strategic methodology to be implemented must be multidisciplinary and encompass specific local needs, pressures and socio-economic conditions, knowledge of species biology, guidelines for action and protection, etc.
3. Each country needs to adapt its regulations to support blue carbon initiatives, streamline project processing and establish legal certainty for developers while establishing restrictions on use and management.
4. To carry out the creation of blue carbon credits for possible research and restoration funding through projects, the ecosystem and monetary values must be carefully established so that these ecosystems are not harmed in any way. Through its development, the attractiveness of financing by both public and private companies will be enhanced.
5. Prior to restoring areas with dead or damaged meadows, priority should be given to conserving existing, living meadows by removing, or at minimum addressing, current pressures (e.g., tourism, fishing, recreational boats, coastal construction, etc.).
6. *Posidonia oceanica* is the species with the highest ecosystem value in the Mediterranean as it stores carbon in a way that does not remineralise in the event of disturbance. Furthermore, it is endemic to the area. However, there are also other important species for blue carbon, such as *Cymodocea nodosa, Zostera marina* and *Zostera noltii.*

4 Action plan

The Mediterranean region, renowned for its rich biodiversity and unique ecosystems, is facing significant challenges due to climate change, habitat degradation and the ongoing pressures of human activity. Among the most valuable and underappreciated assets in the fight against climate change are the coastal and marine ecosystems that play a crucial role in capturing and storing carbon – so-called "blue carbon" ecosystems. These include *Posidonia* and other seagrass meadows and other coastal wetlands, which not only sequester large amounts of organic carbon but also provide essential services for biodiversity, coastal protection and sustainable livelihoods.

The importance of blue carbon in climate change mitigation and adaptation has gained increasing recognition, and the Mediterranean, with its diverse and threatened marine habitats, stands at the forefront of these efforts. However, despite their potential, many of these ecosystems are being lost at alarming rates, with significant implications for both carbon storage capacity and the overall health of marine and coastal environments.

This Mediterranean blue carbon strategy aims to provide a comprehensive framework for the protection, restoration and sustainable management of these critical ecosystems. By identifying key actions, stakeholders and funding opportunities, the strategy plan contributes to both national and regional efforts to enhance carbon sequestration, safeguard biodiversity and strengthen climate resilience in the Mediterranean basin. It recognises the urgency of integrating blue carbon into national and international climate policies and environmental strategies and provides a roadmap for collective action to ensure the long-term sustainability of these invaluable ecosystems.

The implementation of this action plan will not only help to mitigate the impacts of climate change but also foster sustainable development, improve ecosystem services and promote the restoration of vital coastal and marine habitats across the Mediterranean region.

The aim of this action plan is:

- To protect, restore and enhance the capacity of blue carbon ecosystems in the Mediterranean region to mitigate climate change, protect biodiversity and promote sustainable coastal development, ensuring their long-term sustainability through coordinated action, financial mechanisms and robust governance.
- To support the development of evidence-based projects and research to protect and conserve key blue carbon ecosystems such as *Posidonia* and other seagrass meadows.
- Unlock the investment potential of blue carbon projects through financial mechanisms such as carbon credits, promoting the conservation and protection of these fundamental ecosystems as well as building resilience to climate change.

To this end, the actions included in the strategy have been structured into six different strategic lines, each of them focused on a different theme with the aim of addressing all the challenges identified during the diagnostic phase.

Also, indicators can be found in the Annexes of the strategy (Annexes 2, 3), to provide measurable data for tracking the effectiveness of policy development, governance, and management strategies aimed at protecting and restoring blue carbon ecosystems across the Mediterranean region. They ensure that efforts are aligned with international climate goals and that blue carbon initiatives are governed transparently and inclusively.

5 Conclusions

Blue carbon ecosystems, including *Posidonia oceanica* meadows and other coastal habitats, play a critical role in mitigating climate change due to their ability to sequester and store carbon. These ecosystems also provide essential services such as coastal protection, water quality enhancement, and biodiversity support. However, they are increasingly threatened by human activities and climate change, which underscores the urgent need for comprehensive protection and restoration efforts.

Governance of blue carbon ecosystems in the Mediterranean remains inconsistent. While EU member states have incorporated blue carbon into their regulations, many non-EU countries in the region lack specific policies. This disparity creates challenges for regional cooperation and highlights the necessity for non-EU Mediterranean countries to strengthen their environmental policies. Fostering international collaboration and aligning policies on blue carbon will be crucial to addressing these gaps.

The Mediterranean blue carbon strategy (Annex 1) is the cornerstone of addressing these challenges. This strategy must adopt a multidimensional approach, integrating ecological, social, economic, and political dimensions. It requires advancing scientific research, implementing inclusive policies, and mobilizing financial resources. The success of the Mediterranean blue carbon strategy depends on political commitment, regional cooperation, and the engagement of governments, local communities, the private sector and international and non-governmental organizations. By aligning efforts across these sectors, the strategy represents a transformative opportunity to address the interconnected issues of climate change, biodiversity conservation, and sustainable development in the Mediterranean region.

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Annex 1. THE STRATEGY

The blue carbon strategy focuses on conserving and restoring marine ecosystems vital for carbon sequestration. Key actions include seabed mapping, prioritising critical areas, establishing Marine Protected Areas (MPAs) and targeted restoration efforts to enhance ecosystem resilience and climate change mitigation.

The strategy is structured around six main strategic lines that cover the following topics: (1) Conservation, protection and restoration of blue carbon ecosystems, (2) Development of blue carbon certification schemes, (3) Advancing long-term research and knowledge, (4) Implementation of financial mechanisms, (5) Strengthening governance and policy frameworks, and (6) Enhancing stakeholder engagement and capacity building. Overall, the strategy integrates conservation with scientific research, financial incentives, regulatory frameworks, and stakeholder participation to ensure long-term effectiveness.

For further information on the terminology used, please refer to the glossary provided in Annex 2.

A monitoring framework tracks ecological, financial and policy impacts, supporting data-driven decision-making. The full set of indicators, detailed in Annex 3, provides insights into progress and guides adaptive management for optimal results.

Strategic Line 1. Conservation, protection and restoration of blue carbon ecosystems

Objective: Safeguard and restore critical blue carbon ecosystems, including *Posidonia* and other seagrass meadows across the Mediterranean basin.

The protection of current blue carbon ecosystems must be prioritised over restoration actions. Mechanisms must therefore be put in place to allow this and prevent the degradation of ecosystems that are currently in good condition. Similarly, ecosystems that are under pressure must be protected and the uses that put their conservation at risk must be regulated to maintain them in the long term. Active restoration projects (e.g., replanting), although important, must be considered in a lesser order of priority given that by diverting resources and attention to the implementation of active restoration projects that may not always have a guarantee of success can come at the cost of the further degradation of ecosystems currently in a good state of conservation and with more potential to maintain their optimal state.

To ensure that protection, conservation and restoration actions are carried out in an orderly manner and with guarantees of success, it is necessary to implement a series of actions that allow:

- Identifying the current state of blue carbon ecosystems through the creation of updated maps.
- Identifying the pressures that these ecosystems suffer in each of the mapped areas to develop management policies and plans adapted to the needs of the environment in each region, that in turn allow anthropogenic pressures to be eliminated or reduced.
- Prioritising areas of action based on their current state of conservation so as to ensure that (1) ecosystems that are currently in a good state of conservation continue to maintain this state; (2) ecosystems that suffer pressure see their pressures reduced or eliminated, and improvement in their state of conservation; (3) establishing an order of priority regarding the restoration actions of blue carbon ecosystems, which takes into account the criteria defined by scientists when selecting those places with the greatest potential for success.
- Expansion of Marine Protected Areas (MPAs) at the Mediterranean level, that allow the protection of blue carbon ecosystems.
- Large-scale restoration projects aimed at rehabilitating degraded blue carbon ecosystems to improve their function as carbon sinks, increasing biodiversity, coastal protection, water quality, etc.

The first step in developing this strategic line is to address the gaps in knowledge identified, including obtaining updated maps of the seabed and working with interest groups through communication and awareness-raising actions.

Once this step has been completed, actions will be developed to provide solutions to the conservation of existing living meadows, trying to tackle the problems of pressures to which they are currently exposed.

Action 1.1 Seabed mapping

Preparation of updated seabed mapping in different areas to enable a diagnosis of the current state of blue carbon ecosystems to be made, as a basis for working on planning protection, conservation and restoration actions.

Priority HIGH

Execution period	**2025-2028**
Problems identified	• **Knowledge gaps**: Lack of precise data on the current and past distribution of blue carbon ecosystems. • **Human and environmental pressures**: Need to identify disturbances affecting their health and resilience. • **Restoration challenges**: Difficulty in determining areas suitable for conservation, active restoration, or passive recovery.
Implementation programme	**Phase 1**: Review existing data and official reports to establish a knowledge base for upcoming actions. **Phase 2**: Identify areas covered by existing maps and highlight unmapped regions. **Phase 3**: Plan the mapping extension and execution periods based on the reviewed information. **Phase 4**: Conduct mapping of blue carbon ecosystems to update their ecological status and extent.
Scale of responsibility	• National and regional levels
Responsible entities	• Public administrations supported by scientific organizations

Action 1.2 Prioritisation of key areas

Identify and prioritise Mediterranean blue carbon ecosystems with high sequestration potential or under significant threat. Assessing their condition, pressures and restoration potential will guide targeted actions, from protection and mitigation to active or passive recovery.

Priority HIGH

Execution period	**2025-2028** **The execution of this action will depend on the state of development of the mapping.**
Problems identified	• Lack of updated information on the current state, extent, and status of marine ecosystems. • Absence of a clear framework for prioritising conservation and restoration actions. • Difficulty in determining which areas require immediate protection, mitigation or restoration efforts.
Implementation programme	Classification and Prioritization of Areas for Action • Areas to protect: Regions with existing blue carbon ecosystems requiring conservation. • Areas to restore: Damaged/lost blue carbon habitats with potential for recovery (e.g., areas with dead matter). • Non-priority areas: Zones where blue carbon ecosystems have never been present.
Scale of responsibility	• National and regional levels
Responsible entities	• Public administrations

Action 1.3 Establishment of Marine Protected Areas (MPAs)

Expand the network of MPAs in the Mediterranean, focusing on areas rich in blue carbon ecosystems, and ensuring legal protection from overexploitation and degradation, particularly from tourism and fishing pressures.

Priority MEDIUM

Execution period	**2025-2028** **The execution of this action will depend on the state of development of the mapping and knowledge of the areas**
Problems identified	• Threat of further destruction of seagrass meadows. • Vulnerability of certain areas due to degradation of seagrass ecosystems.
Implementation programme	**Phase 1:** Map areas with seagrass (Action 1.1). **Phase 2:** Identify pressures and prioritise actions (Action 1.2). **Phase 3:** Establish protected areas, define their status and assign priority levels, focusing on areas with living seagrass meadows.
Scale of responsibility	• National and local levels
Responsible entities	• Public administrations and CSOs

Action 1.4 Restoration projects, including passive restoration efforts

Launch large-scale restoration projects in degraded blue carbon ecosystems, such as replanting *Posidonia* and other seagrasses. Priority areas for regeneration will be identified through Actions 1.1, 1.2 and 1.3, focusing on MPAs with high self-recovery potential. In cases of limited funding, priority will be given to areas where pressures can be removed to promote ecosystem recovery.

Priority MEDIUM

Execution period	**2026-2030**
Problems identified	• Feasibility of restoration depends on the historical presence of the ecosystems in question.
Implementation programme	Based on previous work (mapping, prioritisation, protection, etc.), strategies for each area should be defined. **Phase 1:** Identify ecosystems for passive restoration and the measures needed (e.g., regulation of uses, removal or reduce of current pressures through plans and programmes). **Phase 2:** Identify ecosystems for active restoration actions. **Phase 3:** Identify the financial resources required for these projects. **Phase 4:** Implement restoration projects based on available funds, personnel and facilities, prioritising passive restoration followed by active restoration.
Scale of responsibility	• National and local levels
Responsible entities	• Public administrations and CSOs

Strategic Line 2. Progressing long-term blue carbon research and knowledge

Objective: Advance long-term research and knowledge on blue carbon ecosystems, focusing on their role in climate change mitigation, carbon storage and ecosystem services. This includes:

- Funding research on blue carbon ecosystems, including restoration practices, carbon storage rates, and biodiversity impacts.
- Developing standardised methodologies for measuring and monitoring ecosystem health and carbon sequestration across the Mediterranean region.
- Creating an integrated ecological assessment framework that combines ecological, economic and social data to evaluate the impact of human actions on these ecosystems.
- Utilising AI-based predictive models to simulate the effects of environmental conditions and restoration practices on blue carbon ecosystems.
- Establishing a long-term monitoring programme to assess conservation effectiveness and the impact of environmental pressures, such as pollution.
- Organising training and workshops for local communities and developers on sustainable restoration practices.
- Promoting regional networks and interdisciplinary platforms, such as the Mediterranean Blue Carbon Initiative, to facilitate data sharing, collaboration and the exchange of best practices.

This Strategic Line 2 will ensure that blue carbon ecosystems are properly managed, restored and protected to enhance their contribution to climate change mitigation and to support the livelihoods of coastal communities.

Action 2.1 Creation of an Integrated Ecological Assessment Framework

Develop a framework integrating ecological, economic and social data to assess the impact of human actions on blue carbon ecosystems. This framework will include a cost-benefit analysis to quantify ecosystem services and use multi-criteria analysis and simulation modelling to evaluate different scenarios and their long-term effects on ecosystem health.

Priority HIGH

Execution period	**2025-2026**
Problems identified	• **Environmental damage caused by human activities**: Physical damage to ecosystems is often recognised, but remedial measures may not fully restore the system to its original state. • **Need for monetisation of damage**: To raise awareness and secure funding for full ecosystem restoration, it is essential to quantify the economic value of the damage.
Implementation programme	**Phase 1**: Identify all ecosystems and services to be considered. **Phase 2**: Assign economic value using a multicriteria approach. **Phase 3**: Apply these values to projects and businesses causing environmental damage.
Scale of responsibility	• National and regional levels
Responsible entities	• Public administrations supported by research institutions and NGOs

Action 2.2 AI-based predictive models

This measure proposes using artificial intelligence (AI) models to simulate the effects of various restoration practices on blue carbon ecosystems. Machine learning algorithms will continuously update with new data, improving the accuracy of simulations and identifying the most effective and sustainable restoration strategies.

Priority MEDIUM

Execution period	**2026-2030**
Problems identified	• **Room for improvement:** There is still potential for enhancing AI systems to achieve even better outcomes. • **Need for continued development:** This measure aims to address and improve the limitations of current systems.
Implementation programme	**Phase 1:** Identify international or Mediterranean organisations interested in participating in the development of the algorithm. **Phase 2:** Develop the algorithm and apply machine learning techniques. **Phase 3:** Execute the algorithm and use it to simulate restoration practices on blue carbon ecosystems.
Scale of responsibility	• National and International levels
Responsible entities	• AI research labs, research institutions, technological partners

Action 2.3 Training on restoration practices

Organise training programs for local communities and developers to build a qualified workforce capable of effectively implementing restoration projects.

Priority HIGH

Execution period	**2025-2030**
Problems identified	• **Lack of qualified personnel:** Without proper training, local communities may lack the necessary skills to participate in restoration efforts. • **Integration and awareness:** The absence of local community involvement reduces awareness of the importance of restoration projects. • **Economic and social benefits:** Lack of trained personnel limits economic opportunities and the full potential of restoration projects.
Implementation programme	**Phase 1:** Identify relevant materials and best practices. **Phase 2:** Develop teaching materials and recruit instructors. **Phase 3:** Promote and deliver trainings.
Scale of responsibility	• National and local levels
Responsible entities	• Public institutions, NGOs, universities

Action 2.4 Long-term ecological monitoring

Establish a long-term monitoring programme to evaluate the effectiveness of conservation efforts and the impact of environmental pressures, including plastic pollution. Create a regional network for monitoring blue carbon ecosystems, integrating satellite imagery, field surveys and participatory data collection methods.

Priority MEDIUM

Execution period	**2027-2028**
Problems identified	• **Limited application of monitoring systems:** Monitoring systems to assess blue carbon ecosystem regeneration in the Mediterranean are not widely applied due to a lack of funding. • **Lack of common methodologies:** There are no unified methodologies to ensure consistent and comparable results across projects and stakeholders in the region.
Implementation programme	**Phase 1:** Develop a standardised methodology for monitoring blue carbon or restoration projects across Mediterranean countries, including key parameters, values and data collection methods. **Phase 2:** Share the methodology and organise training sessions. **Phase 3:** Initiate monitoring and follow-up activities for ongoing projects and analyse the collected data.
Scale of responsibility	• National and regional levels
Responsible entities	• Public institutions, NGOs, research institutions

Action 2.5 Blue carbon research

Fund research on the role of blue carbon ecosystems in climate change mitigation, carbon storage and ecosystem services. This will enhance understanding of their function as carbon sinks, their restoration potential and broader environmental and societal benefits. Research should focus on restoration techniques, carbon sequestration, biodiversity impacts and economic valuation, integrating marine, climate and social sciences.

Priority HIGH

Execution period	**2027-2030**
Problems identified	• **Uncertainty and limited knowledge:** The benefits of blue carbon ecosystems are not yet fully understood, and the extent to which society will benefit from blue carbon projects in climate change mitigation remains unclear. • **Unclear outcomes:** The overall impact of blue carbon on climate change mitigation remains undefined.
Implementation programme	**Phase 1:** Select regeneration projects to initiate research providing comparable data across the region. **Phase 2:** Develop research to establish the average carbon capture rate and the CO_2 benefits of each action and the relationship between blue carbon data and existing climate change indicators (e.g., carbon footprints) to demonstrate its importance.
Scale of responsibility	• National and international levels
Responsible entities	• NGOs, research institutions

Action 2.6 Standardisation of methodologies

Develop and standardise methodologies for measuring the health and carbon sequestration of blue carbon ecosystems, ensuring consistent data across the region. By combining satellite imagery, remote sensing, field surveys and local knowledge, this system will generate essential information to guide management efforts and evaluate conservation and restoration effectiveness.

Priority MEDIUM

Execution period	**2027-2028**
Problems identified	• Mediterranean sub-regions and countries differ in terms of knowledge, resources and criteria. • This diversity leads to inconsistencies in the approaches and criteria applied to related works and projects.
Implementation programme	**Phase 1:** Gather and organise all available information on the subject. **Phase 2:** Align the data with a validated regional methodology. **Phase 3:** Share the methodology and monitor its application (assess its effectiveness for potential improvements).
Scale of responsibility	• National and international levels
Responsible entities	• NGOs, research institutions

Action 2.7 Regional networks and interdisciplinary collaboration platform

Create a digital platform for researchers, policymakers and local communities to collaborate, share data and exchange best practices to address blue carbon challenges. This platform can be strengthened by promoting the Mediterranean Blue Carbon Initiative and the Mediterranean Posidonia Network, enhancing visibility and fostering regional collaboration on blue carbon issues.

Priority MEDIUM

Execution period	**2025-2028**
Problems identified	• Lack of access to knowledge about blue carbon varies across Mediterranean regions. • Policies and restrictions differ between regions. • Gathering relevant information requires consulting multiple sources.
Implementation programme	**Phase 1:** Establish cooperation mechanisms with the Mediterranean Blue Carbon Initiative and the Mediterranean Posidonia Network. **Phase 2**: Identify and implement platform needs and required improvements. **Phase 3:** Promote the platform and encourage its adoption by organisations. **Phase 4:** Conduct communication activities to facilitate knowledge exchange.
Scale of responsibility	• International levels
Responsible entities	• NGOs, Mediterranean Posidonia Network, Mediterranean Blue Carbon Initiative

Strategic Line 3. Blue carbon certification schemes (quantification and financing)

Objective: Implementing blue carbon certification schemes is crucial for incentivising and scaling up the protection and restoration of Mediterranean blue carbon ecosystems. These schemes can provide economic value to ecosystems like seagrass meadows, supporting climate and biodiversity goals. This includes:

- **Regional certification standard:** Establish a standardised framework for certifying carbon credits from Mediterranean blue carbon ecosystems, collaborating with international bodies to adapt existing standards and align with global markets.
- **Stakeholder capacity building:** Equip local governments, businesses, communities and NGOs with the knowledge and tools to engage in certification schemes through training programs, workshops and collaboration with academic institutions.
- **Blue carbon registry and market platform:** Create a centralised platform for real-time tracking, registration and trading of blue carbon credits, fostering regional and global integration into carbon markets.
- **Integration into carbon pricing mechanisms:** Promote the inclusion of blue carbon credits in national and regional carbon pricing schemes, offering financial incentives for conservation and restoration efforts.
- **Standardised methodologies:** Develop and adopt methodologies to quantify carbon stocks in Mediterranean ecosystems like *Posidonia* meadows, ensuring data comparability and scalability.
- **Open data platforms:** Create an open-access platform for aggregating and standardising carbon storage data across different blue carbon ecosystems, aiding data-driven decision-making for researchers and project developers.
- **Adaptive certification:** Design a flexible certification system that adapts to the ecological characteristics of Mediterranean ecosystems, ensuring targeted certification while maintaining ecological integrity.

Action 3.1 Develop a regional blue carbon certification standard

The objective of this action is to establish a standardised framework for certifying carbon credits from Mediterranean blue carbon ecosystems, ensuring consistency and transparency in carbon accounting. This requires collaboration with international certification bodies (e.g., Verra, Gold Standard) to adapt existing carbon standards to the region, develop specific criteria for Mediterranean blue carbon certification and align the certification with international markets, enabling global trade of Mediterranean blue carbon credits.

Priority MEDIUM

Execution period	**2027-2028**
Problems identified	• Lack of a standardised framework for certifying carbon credits from Mediterranean blue carbon ecosystems. • Limited alignment with international carbon markets for Mediterranean blue carbon credits.
Implementation programme	**Phase 1:** Project development, either by each Mediterranean country or coordinated through e.g., the Mediterranean Blue Carbon Initiative to create a unified regional standard. **Phase 2:** Engage with already existing initiatives, e.g. the Andalusian Blue Carbon Standard to understand the process and challenges. **Phase 3:** Develop a standardised framework for each Mediterranean country.
Scale of responsibility	• National and regional levels
Responsible entities	• Regional certification bodies, carbon market experts, Mediterranean Blue Carbon Initiative

Action 3.2 Strengthen certification capacity

Equip stakeholders, including local governments, coastal communities, businesses and NGOs, with the knowledge and tools to engage in blue carbon certification schemes. This can be done through training programs, technical assistance for small-scale projects and collaboration with universities to integrate blue carbon certification into curricula.

Priority MEDIUM

Execution period	**2027-2028**
Problems identified	• Lack of uniform knowledge and tools on blue carbon certification schemes across Mediterranean countries. • Limited capacity in some regions to implement blue carbon certification schemes.
Implementation programme	**Phase 1:** Design a training program focused on implementing blue carbon projects, including a component on blue carbon certification. **Phase 2:** Provide the training programme to local organisations working on the topic.
Scale of responsibility	• Local and regional levels
Responsible entities	• Carbon market experts, Mediterranean Blue Carbon Initiative

Action 3.3 Create a regional blue carbon registry and market platform

Create a centralised platform for tracking, registering and trading blue carbon credits within the Mediterranean, fostering both regional and global participation in carbon markets. The platform can be tailored for use at the Mediterranean level or adapted for individual countries

Priority LOW

Execution period	**2027-2030**
Problems identified	• Lack of common platform at national or Mediterranean levels for registering blue carbon projects. • Absence of a centralised system for tracking and trading blue carbon credits across the Mediterranean region.
Implementation programme	**Phase 1:** Propose the creation of a common registry to Mediterranean countries. **Phase 2:** Assess the interest of countries in a shared or national registry. **Phase 3:** If a common registry is supported, promote its development. **Phase 4:** If national registries are preferred, engage with leading organisations, such as the Andalusian Regional Government (Spain), to learn from their experiences. **Phase 5:** Launch the registry.
Scale of responsibility	• International and national levels
Responsible entities	• Carbon market experts, public institutions

Action 3.4 Facilitate the inclusion of blue carbon in national carbon pricing mechanisms

Integrating blue carbon into carbon pricing mechanisms assigns monetary value to its sequestration potential through taxes, or voluntary markets. A robust framework aligning regulation, markets, and incentives can position blue carbon as a key tool for climate mitigation while driving conservation and restoration.

Priority LOW

Execution period	**2027-2030**
Problems identified	• Lack of integration of blue carbon credits in national and regional schemes.
Implementation programme	**Phase 1. Recognition:** Governments acknowledge blue carbon ecosystems as sources of tradable carbon credits within pricing mechanisms, quantifying their GHG reduction through conservation or restoration. **Phase 2. Market inclusion:** Blue carbon credits enter national or regional systems, allowing entities to purchase them to offset emissions. **Phase 3. Tax incentives:** Carbon tax deductions or exemptions encourage investment in blue carbon protection and restoration. **Phase 4. Policy integration:** Blue carbon is incorporated into NDCs and national policies as part of emission reduction strategies under the Paris Agreement. **Phase 5. Standardisation and Certification:** Developing methodologies and certification standards (e.g., Verra, Gold Standard) ensures credibility and market integration.
Scale of responsibility	• National levels
Responsible entities	• Carbon market and pricing experts, public institutions

Action 3.5 Developing standardised methodologies for blue carbon certification

This action focuses on developing standardised methodologies to quantify carbon stocks in *Posidonia* and other seagrass ecosystems. Uniform assessment protocols will enhance data comparability across projects and regions, facilitating scalability and alignment with global best practices.

Priority MEDIUM

Execution period	**2027-2030**
Problems identified	• Lack of standardised data on current carbon stocks in seagrasses, hindering comparability across regions and projects.
Implementation programme	**Phase 1:** Establish a working group to develop a methodology for quantifying CO_2 capture across different environments and species. **Phase 2:** Gather relevant data and validate it with scientific experts. **Phase 3:** Consolidate findings into a standardised methodology. **Phase 4:** Share the finalised methodology with all Mediterranean countries for implementation.
Scale of responsibility	• International and national levels
Responsible entities	• Mediterranean Blue Carbon Initiative, standardisation organisations, research institutes, public bodies

Action 3.6 Open data platforms

Create an open-access platform that centralises and standardises data on carbon storage in blue carbon ecosystems, enabling researchers and project developers to compare, share and make data-driven decisions.

Priority MEDIUM

Execution period	**2027-2030**
Problems identified	• Limited access to comparable data.
Implementation programme	**Phase 1:** Design the platform and consult stakeholders. **Phase 2:** Collect and integrate data from existing sources. **Phase 3:** Launch the platform and provide user training.
Scale of responsibility	• Mediterranean level
Responsible entities	• Mediterranean Blue Carbon Initiative

Action 3.7 Adaptive certification for blue carbon projects

Develop a flexible certification standard tailored to the unique ecological characteristics of Mediterranean ecosystems, ensuring targeted certification that attracts investment while maintaining ecological integrity. By incorporating adaptable methodologies, safeguards and stakeholder input, this approach aligns regional features with global carbon market demands, positioning Mediterranean countries as leaders in sustainable blue carbon management.

Priority MEDIUM

Execution period	**2027-2030**
Problems identified	• The high ecological diversity of Mediterranean ecosystems makes it challenging to create a standardised approach for blue carbon certification. • Differences in carbon sequestration capacities and ecological dynamics require a flexible approach tailored to each habitat.
Implementation programme	**Phase 1. Define Objectives and Scope:** Clarify purpose (carbon crediting, national accounting or project evaluation) and set geographical/temporal boundaries. **Phase 2. Establish measurement protocols:** • Baseline assessment: Measure carbon stocks in biomass and soil. • Reference scenario: Define outcomes. • Quantify carbon pools (aboveground and belowground biomass, and soil organic carbon) and fluxes (sequestration rate and emissions). **Phase 3. Develop standardized data collection techniques:** • Use remote sensing (satellite, drone) and field sampling (biomass, soil) for data collection. • Analyse samples in laboratories using standardised methods. **Phase 4. Define procedures:** • Set monitoring intervals and indicators (biomass, ecosystem health). • Create reporting templates and engage third-party certifiers for validation. **Phase 5. Address methodological challenges:** • Quantify uncertainties and ensure accuracy through repeated measurements.

	• Assess leakage and risks to carbon permanence (e.g., ecosystem degradation, climate events). **Phase 6. Align with international standards:** • Follow e.g., IPCC Guidelines, Verra's VM0033 and Gold Standard Blue Carbon Principles. • Ensure compatibility with national and international climate systems. **Phase 7. Build capacity and stakeholder engagement:** • Train local communities in data collection and project implementation. • Collaborate with scientific institutions for technical support.
Scale of responsibility	• International and national levels
Responsible entities	• Mediterranean Blue Carbon Initiative, research centres, carbon market specialists, certification bodies, public institutions

Strategic Line 4. Facilitate financing and investment in blue carbon

Objective: To effectively facilitate financing and investment in blue carbon projects, it is crucial to foster collaboration across sectors, establish inclusive financing mechanisms and ensure accountability through innovative solutions like Digital Carbon Tokens (DCTs). These efforts should prioritise equitable benefit distribution, local community involvement and clear governance frameworks. This includes:

- Foster partnerships between public entities, the private sector, international climate funds and philanthropic organisations, ensuring fair benefit-sharing mechanisms in blue carbon projects.
- Develop green funds and financial incentives (e.g., tax benefits) specifically designed for blue carbon initiatives, enabling local community participation in both financing and benefits.
- Implement inclusive financing mechanisms to support community-driven resource management and revenue-sharing.
- Establish a blockchain-based system for the issuance and exchange of digital carbon tokens to ensure transparency and accountability in carbon credit transactions for blue carbon projects.

Action 4.1 Collaboration with the private sector

This action seeks to build trust and encourage private sector investment in blue carbon projects in the Mediterranean. By addressing concerns about reliability and long-term sustainability, it aims to create a favourable environment for private sector involvement. Activities will focus on promoting transparency, showcasing successful case studies and establishing mechanisms for equitable benefit distribution, thereby boosting investor confidence and attracting sustainable financing for blue carbon initiatives.

Priority HIGH

Execution period	**2025-2028**
Problems identified	• Lack of trust and security among investors in blue carbon projects. • Concerns about the reliability and long-term viability of blue carbon initiatives.
Implementation programme	**Phase 1:** Develop Public-Private Partnerships (PPPs). **Phase 2:** Implement investment assurance mechanisms. **Phase 3:** Launch pilot projects.
Scale of responsibility	• International and national level
Responsible entities	• Private companies, public bodies, NGOs

Action 4.2 Creation of green funds, blue carbon credits and inclusive financing mechanisms

This action aims to establish green funds, blue carbon credits, and inclusive financing mechanisms to attract investment in blue carbon projects across the Mediterranean. By addressing gaps in investment opportunities and regulatory frameworks, it seeks to engage a diverse range of investors, including the private sector, governments and local communities. These mechanisms will ensure equitable access to funding and support long-term climate change mitigation and ecosystem restoration.

Priority MEDIUM

Execution period	**2027-2028**
Problems identified	• Lack of investment avenues: Insufficient channels for funding blue carbon projects. • Lack of regulation: Absence of regulatory frameworks governing investments in blue carbon projects.
Implementation programme	**Phase 1. Creation of green funds:** • Identify funding needs: Assess financial requirements of blue carbon projects and prioritise those with high sequestration, biodiversity and community impact. • Fund management entity: Establish a centralised or regional green fund, managed by governments, NGOs or public-private partnerships, with clear governance and oversight. • Mobilize initial capital: Seek funding from national governments, climate adaptation budgets and international institutions (e.g., GCF, GEF). Engage private sector investors focused on sustainability. • Grant and loan mechanisms: Offer grants for ecosystem restoration and capacity building. Provide low-interest loans to incentivise private sector involvement. • Monitoring and reporting: Ensure transparency in fund allocation and track project performance. **Phase 2. Establishment of blue carbon credit markets:** • Certification standards: Develop region-specific standards for measuring and certifying blue carbon credits, aligned with international frameworks like Verra and Gold Standard. • Blue carbon registry: Create a digital registry to track and verify blue carbon credits, ensuring transparency and preventing double-counting.

- Pilot projects: Implement pilot projects to generate blue carbon credits, test certification and market processes and demonstrate project potential to attract investors.
- Buyer engagement: Partner with corporations committed to sustainability to create demand for blue carbon credits, highlighting co-benefits like biodiversity and community development.
- Pricing mechanisms: Establish fair pricing for blue carbon credits based on sequestration potential, costs, and market dynamics.

Phase 3. Development of inclusive financing mechanisms:

- Payment for Ecosystem Services (PES): Implement PES schemes where beneficiaries, e.g., tourism and the fisheries sectors, pay for ecosystem services provided by blue carbon projects.
- Revenue-sharing models: Ensure equitable revenue sharing from blue carbon credits with local communities and stakeholders.
- Microfinancing programmes: Provide microloans or grants to small-scale fishers, coastal farmers and community groups for participation in blue carbon projects.
- Public-Private Partnerships (PPPs): Foster collaborations between governments, companies and communities to co-invest in projects.
- Capacity building: Train local communities in project implementation, monitoring and sustainable management to ensure long-term participation.

Phase 4. Regulatory frameworks and policy advocacy:

- National and regional policies: Develop policies that recognise blue carbon ecosystems as critical assets for climate mitigation and adaptation. Include them in Nationally Determined Contributions (NDCs) under the Paris Agreement.
- Incentives for investment: Offer tax benefits or subsidies for companies investing in blue carbon credits or restoration projects.
- Legal protections: Enact laws to protect blue carbon ecosystems from threats like overfishing, land reclamation, and pollution.
- Harmonise standards: Align national frameworks with global initiatives such as the Blue Carbon Initiative and Article 6 of the Paris Agreement.
- Advocate in global forums: Promote blue carbon in international climate finance mechanisms, securing funding and technical support.

	• Monitor policy impact: Regularly assess the effectiveness of policies and regulations in promoting blue carbon conservation and attracting investments.
Scale of responsibility	• International and national level
Responsible entities	• Private investors, financial institutions, environmental funds

Action 4.3 Digital Carbon Tokens

This action aims to implement Digital Carbon Tokens (DCTs) as a transparent and scalable solution for blue carbon financing in the Mediterranean. By linking tokens to verified carbon credits from blue carbon projects, the mechanism will improve funding access and liquidity in the carbon credit market. DCTs will standardise carbon credits across the region, reduce biases and promote a unified approach to investment and project scaling.

Priority LOW

Execution period	**2025-2027**
Problems identified	• Lack of existing Digital Carbon Tokens (DCTs). • Need to develop a system to combine items, scales and values applicable to the entire Mediterranean region. • Elimination of biases and competition among stakeholders.
Implementation programme	**Phase 1:** Design the Digital Carbon Token framework. **Phase 2:** Establish partnerships with technology providers. **Phase 3:** Implement verification and certification processes. **Phase 4:** Launch pilot projects.
Scale of responsibility	• International level
Responsible entities	• Blockchain technology companies, market regulators, public bodies

Strategic Line 5. Involvement of local communities

Objective: The involvement of local communities is crucial for the long-term success and sustainability of blue carbon projects. Engaging local stakeholders not only ensures the projects' effectiveness but also creates a sense of ownership, increasing the chances of success. The following measures are proposed to enhance community participation and benefits in these initiatives. This includes:

- Launch public education campaigns on the value of blue carbon ecosystems for climate change mitigation and biodiversity conservation, involving local communities in their protection and restoration.
- Implement training programs for local communities, focusing on the importance of blue carbon ecosystems and their role in conservation and restoration.
- Organise practical workshops in local ecosystems to provide hands-on learning about their ecology, functions and conservation methods.
- Host community events (e.g., workshops, talks) to present blue carbon materials and create a space for community members to share their ideas and feedback.
- Ensure community participation in projects through adaptable processes such as applications, online tools and in-person workshops.

Action 5.1 Awareness campaigns and practical training programmes

This action aims to connect blue carbon projects with local communities through targeted awareness campaigns and practical training. The focus is on empowering local stakeholders – such as fishermen, farmers and community leaders – by providing them with the knowledge and tools to actively contribute to the preservation of coastal and marine ecosystems. By building their capacity to monitor and manage these ecosystems, we can promote more sustainable and inclusive blue carbon initiatives. Additionally, this action seeks to create replicable models of community engagement that can foster broader support for blue carbon strategies across the Mediterranean region.

Priority MEDIUM

Execution period	**2025-2028** **The ongoing support phase will continue as long as necessary, adapting to the community's evolving needs**
Problems identified	• Lack of empirical research on effective models for community engagement and benefit-sharing in blue carbon projects. • Absence of specific studies exploring practical models for inclusive and equitable collaboration. • Need for research on the effectiveness and sustainability of community participation models in blue carbon initiatives.
Implementation programme	**Phase 1. Stakeholder mapping and assessment of needs:** Identify stakeholders and assess their needs for effective engagement. **Phase 2. Awareness campaigns and training:** Launch awareness campaigns and practical workshops for local communities. **Phase 3. Ongoing support:** Provide continuous support and capacity building for long-term involvement.
Scale of responsibility	• National and local levels
Responsible entities	• NGOs, CSOs

Action 5.2 Community event organisation for blue carbon awareness and engagement

This action aims to engage local communities in blue carbon initiatives by organising events that raise awareness, foster connections and encourage collective action for the conservation and sustainable management of coastal and marine ecosystems. Activities will include educational workshops, participation in local restoration projects and expert-led discussions on the importance of blue carbon ecosystems like mangroves, seagrasses and salt marshes. The goal is to install a sense of ownership and responsibility, empowering communities to become stewards of their local Blue Carbon ecosystems.

Priority MEDIUM

Execution period	**2025-2026**
Problems identified	• Lack of community engagement and awareness of blue carbon projects. • Limited opportunities for active involvement in conservation efforts. • Existing events are not tailored to diverse community needs, reducing participation. • Inadequate engagement strategies limit the impact on conservation outcomes.
Implementation programme	**Phase 1:** Stakeholder identification and event planning. **Phase 2:** Creation of educational materials and awareness campaigns. **Phase 3:** Design and implementation of practical activities.
Scale of responsibility	• Local level
Responsible entities	• NGOs, CSOs, public bodies

Action 5.3 Integrating economic incentives

This action focuses on integrating economic interest to align with community interests and conservation goals. By bringing together residents, government representatives and environmental organisations, this integration will create opportunities for developing economic activities that could actively protect and manage local blue carbon ecosystems while providing economic benefits to the local communities.

Priority MEDIUM

Execution period	**2025-2026**
Problems identified	• Local communities are often disconnected from blue carbon sustainable economic options due to lack of awareness. • There are insufficient incentives engaging communities in blue carbon practices. • Many communities are unaware of their critical role in protecting coastal and marine ecosystems while keeping sustainable economy.
Implementation programme	**Phase 1:** Practical conservation workshops to incentivise sustainable economic opportunities. **Phase 2:** Building collaboration and networking opportunities.
Scale of responsibility	• Local and regional levels
Responsible entities	• NGOs, CSOs, local companies

Strategic Line 6. Policy framework and planning, management strategies

Objective: This strategic line focuses on creating a coordinated policy framework for blue carbon in the Mediterranean region, addressing individual country needs while ensuring blue carbon integration into national and international climate policies. It aims to streamline processes as well as develop legal management and incentive frameworks to protect and restore blue carbon ecosystems. This includes:

- Develop a coordinated Mediterranean policy framework for blue carbon, considering national variations.
- Integrate blue carbon into national climate strategies, including NDCs and adaptation plans.
- Create or update management plans for blue carbon ecosystems to protect and regulate them.
- Include blue carbon ecosystems in regional land and water management plans.
- Develop legal frameworks that support blue carbon projects and provide incentives for conservation.
- Streamline permit processes for easier implementation of blue carbon projects.
- Introduce policy measures to encourage the conservation and restoration of blue carbon ecosystems.

Action 6.1 Establishment of regional blue carbon policies

This action aims to develop regional blue carbon policies for the Mediterranean, providing a strategic framework for the protection and restoration of blue carbon ecosystems. The policies will integrate blue carbon into national and regional climate change and biodiversity strategies, ensuring proper recognition and protection. The development process will involve consultations with stakeholders, including governments, environmental organisations, local communities and scientific experts, to ensure the policies are evidence-based, inclusive and aligned with regional frameworks like the Mediterranean Action Plan (MAP) and the Barcelona Convention.

Priority HIGH

Execution period	**2025-2030**
Problems identified	• Lack of cohesive, region-wide policies addressing blue carbon ecosystems in the Mediterranean. • Fragmented local and national initiatives with no alignment across borders. • Limited political support, capacity and expertise to develop and implement effective Blue carbon policies.
Implementation programme	**Phase 1:** Stakeholder engagement and consultation. **Phase 2:** Policy research and analysis. **Phase 3:** Policy framework development and cross-border coordination. **Phase 4:** Policy endorsement and adoption. **Phase 5:** Monitoring and evaluation.
Scale of responsibility	• Regional level
Responsible entities	• Regional policy organisations, public bodies, intergovernmental bodies

Action 6.2 Incorporating blue carbon into national climate policies

This action seeks to integrate blue carbon into national climate policies across Mediterranean countries, recognising these ecosystems as crucial for both climate change mitigation and adaptation. The process will involve engaging government bodies, policymakers and experts to incorporate blue carbon into Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs) and other climate and environmental policies. Additionally, it will include developing monitoring, reporting and verification (MRV) mechanisms for blue carbon sequestration and promoting its inclusion in carbon market schemes.

Priority HIGH

Execution period	**2027-2030**
Problems identified	• Many Mediterranean countries lack specific policies integrating blue carbon ecosystems, limiting their role in climate change mitigation. • The absence of blue carbon in national climate frameworks reduces its potential for greenhouse gas emission reduction and climate adaptation. • There is insufficient data on the carbon sequestration potential of blue carbon ecosystems. • Technical expertise on managing blue carbon ecosystems is lacking. • Environmental and climate change policies are often misaligned, hindering effective integration.
Implementation programme	**Phase 1:** Stakeholder engagement and collaboration. **Phase 2:** Workshops for policy integration. **Phase 3:** Creation of guidelines and strategic frameworks.
Scale of responsibility	• National level
Responsible entities	• Carbon policy advisors, public bodies

Action 6.3 Blue carbon ecosystem management plans and programmes

This action aims to develop national and regional blue carbon ecosystem management plans to provide a clear a framework for the protection, restoration and sustainable management of coastal ecosystems in the Mediterranean. The plans will incorporate scientific research on carbon sequestration, alongside strategies for habitat protection, restoration and monitoring. They will also include guidelines for funding, capacity building and monitoring and reporting systems to track the effectiveness of blue carbon programs. The plans will establish governance frameworks, integrate blue carbon into national and regional policies, and promote cross-border cooperation. They will also address migratory species and include strategies for public awareness and community involvement in blue carbon management.

Priority HIGH

Execution period	**2025-2027**
Problems identified	• Lack of coordinated regional plans for blue carbon ecosystem management, conservation and restoration. • Many countries lack integrated management plans for blue carbon habitats. • Degradation of ecosystems due to urbanisation, pollution and climate change. • Absence of effective programs to monitor and manage these ecosystems.
Implementation programme	**Phase 1:** Conduct scientific research, gather data and engage stakeholders. **Phase 2:** Develop blue carbon plans, restoration strategies and management programmes. **Phase 3:** Establish a monitoring and evaluation framework for ongoing assessment.
Scale of responsibility	• Regional, national and local levels
Responsible entities	• Public bodies, NGOs

Action 6.4 Establishing legal frameworks for blue carbon projects

The legal frameworks will recognise blue carbon ecosystems as carbon sinks, define protection and restoration responsibilities as well as create incentives for conservation. Developing these frameworks will involve consultations with national governments, NGOs, legal experts and local communities. The process will include reviewing existing laws to identify gaps and opportunities for integrating blue carbon into national policies, aligning with international climate agreements and carbon market standards. This framework will provide a clear legal pathway for blue carbon projects, attracting investment and ensuring long-term environmental and social benefits.

Priority HIGH

Execution period	**2025-2027**
Problems identified	• Many Mediterranean countries lack legal frameworks for blue carbon ecosystems, such as seagrasses and wetlands. • This limits access to funding mechanisms, including carbon markets, and hinders alignment with national climate and environmental goals.
Implementation programme	**Phase 1:** Legal assessment and gap analysis. **Phase 2:** Drafting legal frameworks. **Phase 3:** Stakeholder consultation and feedback. **Phase 4:** Legislative review and approval.
Scale of responsibility	• National level
Responsible entities	• Public bodies, legal experts

Action 6.5 Simplifying permit procedures

This action aims to simplify and harmonise permit procedures for blue carbon projects across Mediterranean countries, creating a more efficient approval process. It will review existing procedures, identify bottlenecks and propose standardised guidelines that align with environmental protection regulations. Close collaboration with national and regional authorities, local stakeholders and legal experts will ensure compliance with environmental standards while supporting long-term sustainability.

Priority MEDIUM

Execution period	**2025-2027**
Problems identified	• Complexity and delays in permit processes hinder the timely initiation of blue carbon projects. • Fragmentation across multiple regulatory authorities adds inefficiency. • Slow permitting discourages investors and stakeholders, resulting in missed opportunities. • Local communities and smaller organisations struggle with bureaucratic hurdles.
Implementation programme	**Phase 1:** Evaluation of existing permitting systems and stakeholder consultation. **Phase 2:** Development of streamlined guidelines. **Phase 3:** Coordination and alignment of regulatory frameworks.
Scale of responsibility	• National and regional levels
Responsible entities	• Public bodies

Action 6.6 Promoting the conservation and restoration of blue carbon ecosystems

This action aims to develop and implement a variety of financial, policy, and market-based incentives to promote the conservation and restoration of blue carbon ecosystems in the Mediterranean. Incentives may include carbon credit markets, government grants, public-private partnerships and incentive-based regulations.

Priority HIGH

Execution period	**2027-2028**
Problems identified	• Blue carbon ecosystems are often undervalued or not prioritised in policy and economic frameworks. • There is a lack of clear economic incentives for stakeholders to invest in their sustainable management.
Implementation programme	**Phase 1:** Evaluation of current incentives and stakeholder engagement **Phase 2:** Development of financial and policy mechanisms **Phase 3:** Implementation of pilot projects
Scale of responsibility	• National level
Responsible entities	• Public bodies, financial institutions

Support policy development and governance

A robust governance model is crucial for managing the Mediterranean blue carbon strategy, as the region hosts a diverse range of coastal and marine ecosystems vital for carbon sequestration, biodiversity conservation, and coastal protection. This strategy aims to have the Barcelona Convention serve as the key governance framework, with this document being used as an informative tool for the Convention's contracting parties.

By aligning this strategy with the Barcelona Convention, we ensure coordinated efforts across Mediterranean countries, integrating diverse sectors and stakeholders, attracting necessary funding, promoting transparency and accountability, and facilitating scientific research. This approach will safeguard the long-term sustainability of blue carbon initiatives, ensuring their contribution to climate change mitigation and biodiversity conservation, while supporting local communities and coastal development in a balanced and equitable manner.

Annex 2. Glossary

Active restoration: Direct and planned human interventions to rehabilitate a damaged or degraded ecosystem, such as replanting vegetation, removing invasive species or restoring critical habitats.

Blue carbon credits: Certificates representing one tonne of carbon dioxide (CO_2) or its equivalent captured and stored in coastal and marine ecosystems, such as mangroves, seagrass and salt marshes. These credits are traded in carbon markets to finance the conservation and restoration of these ecosystems.

Blue carbon stocks: The amount of carbon stored in coastal and marine ecosystems, such as soils, roots and biomass of mangroves, salt marshes and seagrass beds. These ecosystems act as natural reservoirs that help mitigate climate change by sequestering carbon from the atmosphere.

Blue economy funds: Financial mechanisms aimed at supporting sustainable economic activities in marine and coastal environments.

Burial rate: Rate at which organic carbon is deposited and permanently stored in the sediments of marine or coastal ecosystems. It is an indicator that assesses the carbon sequestration potential of blue carbon ecosystems.

Carbon credit certification: A process that ensures a project meets defined standards for reduction or capture of carbon emissions.

Carbon sequestration: Process of capturing and storing carbon dioxide from the atmosphere in natural systems like forests, soil or oceans to help slow climate change.

Carbon storage variability: Differences in how much carbon various ecosystems can hold, depending on their location and condition.

Digital Carbon Tokens (DCTs): Blockchain-based digital representations of carbon credits, which allow the transparent registration, transfer and verification of rights associated with emission reductions or carbon storage.

Drivers of variability: Factors that cause differences in carbon storage, e.g., water temperature, plant health or human activities.

Ecosystem-based Adaptation (EbA): The use of biodiversity and ecosystem services to help communities adapt to the impacts of climate change.

Ecosystem resilience: The ability of an ecosystem to resist or recover from disturbances while maintaining its essential functions.

Ecosystem services: Direct and indirect benefits that ecosystems provide to human societies, including climate regulation, biodiversity and coastal protection.

Environmental stressors: External factors, like pollution or extreme weather, that harm ecosystems and reduce their ability to store carbon.

EU Green Deal: The European Union's action plan to make Europe climate-neutral by 2050, focusing on reducing emissions, preserving nature and promoting sustainable development.

Financing mechanisms: Methods for funding projects, including loans, grants and investments, ensuring enough resources to restore and protect ecosystems.

Green funds: Investment funds focused on projects and activities that promote environmental sustainability, such as renewable energy, energy efficiency, ecosystem conservation and low-carbon technologies.

Greenhouse gases (GHG): Gases that trap heat in the atmosphere, contributing to the greenhouse effect and climate change. The main greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and fluorinated gases such as hydrofluorocarbons.

Holistic approaches: Methods that consider ecological, social and economic factors together to address complex problems like ecosystem restoration.

Inclusive financing mechanisms: Financial instruments designed to ensure that vulnerable people and communities, especially in developing countries, have access to resources for sustainable projects. This includes microcredit, crowdfunding and grants aimed at promoting equity and sustainability.

Loss of carbon sinks: The process by which ecosystems release stored carbon, turning into sources of emissions instead of sinks.

Marine Protected Areas (MPAs): Specific zones in oceans or seas where activities like fishing and drilling are limited to protect marine life and habitats.

Marine Strategy Framework Directive (MSFD): A European Union law aimed at protecting and improving the health of marine environments by setting goals to achieve sustainable seas.

Mediterranean Marine Protected Areas Network (MedPAN): A collaborative network that supports MPAs in the Mediterranean by sharing knowledge, resources and best practices for conservation.

Monitoring protocols: A set of standardised procedures for collecting, analysing and reporting data on ecosystem conditions.

Ocean acidification: A change in seawater chemistry due to the absorption of atmospheric carbon dioxide (CO_2), affecting marine ecosystems.

Passive restoration: Restoration strategies based on the elimination of stress factors to allow an ecosystem to recover naturally, without active human interventions such as replanting or habitat reconstruction.

Payment for Ecosystem services (PES): Schemes in which the beneficiaries of ecosystem services (such as clean water, carbon sequestration or biodiversity) pay those who manage or conserve the ecosystems that provide these services, providing incentives for environmental sustainability.

***Posidonia oceanica* meadows:** Marine ecosystems formed by this seagrass species, endemic to the Mediterranean, which act as important carbon sinks.

Quantitative methodologies: Research methods focused on collecting numerical data, e.g., measuring carbon levels in ecosystems, to analyse patterns or outcomes.

Qualitative methodologies: Research methods that explore non-numerical aspects, such as policies and community perspectives, to understand the broader impacts of an issue.

Sedimentary dynamics: Processes related to the transport, accumulation and erosion of sediments in marine and coastal ecosystems.

Voluntary carbon market: A system where companies and organisations purchase carbon credits to offset their greenhouse gas emissions on a non-mandatory basis.

Annex 3. Monitoring indicators

Effective monitoring is essential for assessing the progress and impact of blue carbon conservation and restoration initiatives. This table provides a structured overview of key indicators that track various aspects of blue carbon projects, including habitat protection, ecosystem health, policy implementation, financial investments and stakeholder engagement. By systematically measuring these indicators, decision-makers can evaluate successes, identify areas for improvement and ensure that conservation efforts align with long-term sustainability goals.

Each indicator is categorised based on its relevance to specific actions, ensuring alignment with strategic objectives. The table includes essential details such as the periodicity of measurement, data sources, and unit of measurement, facilitating data collection and analysis. These metrics serve as a foundation for transparent reporting, enabling stakeholders to make informed decisions and adapt strategies to enhance the effectiveness of blue carbon initiatives.

Strategic Line 1. Conservation, protection and restoration of blue carbon ecosystems					
Action	**Indicator**	**Description**	**Periodicity of Measurement**	**Unit of Measurement**	**Data Source**
Action 1.1 Seabed Mapping	Extension of seabed mapping executed	Measures the progress of mapping blue carbon habitats.	Annual	km²	National marine survey organizations, geospatial data platforms
Action 1.2 Prioritization of key areas	Number of areas	Measures the progress of improvement of data.	Annual	Reports	Marine spatial databases, institutional reports
Action 1.3 Establishment of MPAs	Extension of Marine Protected Areas	Tracks the expansion of Marine Protected Areas (MPAs) with blue carbon ecosystems.	5 years	%	Satellite imagery, ecological monitoring reports, national authorities
Action 1.3 Establishment of MPAs & 1.4 Restoration projects, including passive restoration	Improvement or decline of protected/restored areas	Tracks changes in ecosystem health and carbon sequestration.	5 years	m²	Satellite imagery, ecological monitoring, MPA reports
Action 1.4 Restoration projects, including passive restoration efforts	Extension of restored area	Measures progress in restoring degraded marine habitats.	5 years	%	Field surveys, restoration project reports, governmental datasets
Action 1.4 Restoration projects, including passive restoration efforts	Cost-efficiency of restoration efforts	Evaluates financial investment vs. ecological benefits.	5 years	€/m²	Financial reports, restoration databases

Strategic Line 2. Development of blue carbon certification schemes					
Action	**Indicator**	**Description**	**Periodicity of Measurement**	**Unit of Measurement**	**Data Source**
Action 2.1 Creation of an Integrated Ecological	Number of ecosystem services quantified	Quantifies ecosystem services assessed in	Annual	Count	Research studies, ecological valuation frameworks

Assessment Framework		marine conservation.			
Action 2.2 AI-based predictive models	Models and reports developed with AI by country	Evaluates the accuracy of AI-based predictive models.	Annual	Count	Environmental monitoring reports, satellite imagery
Action 2.3 Training on restoration practices	Results of different trainings developed	Tracks the outcomes of training and awareness campaigns.	Annual	Number of campaigns	Event records, participant surveys
Action 2.4 Long-term ecological monitoring	Monitoring campaigns and ecological outcomes	Tracks success of training and ecosystem monitoring.	Annual	Number of campaigns	Monitoring reports, field surveys
Action 2.4 Long-term ecological monitoring	Status of seagrasses and developed actions	Monitors the health of seagrass ecosystems and interventions.	Annual	%	Field surveys, ecological monitoring programs
Action 2.4 Long-term ecological monitoring	CO_2e reduction from interventions	Measures the amount of CO_2e reduced through conservation efforts.	Annual	Metric tons of CO_2e	Long-term monitoring systems, field surveys, remote sensing
Action 2.5 Blue carbon research	Blue carbon indices established in terms of CO_2e	Develops indices to quantify blue carbon sequestration.	Annual	tn CO_2e	Carbon stock measurements, academic research
Action 2.6 Standardisation of methodologies	Number of countries using the standardisation	Tracks adoption of standardised methodologies.	Every two years	Count	Policy guidelines, technical standards
Action 2.7 Regional networks and interdisciplinary collaboration platform	Number of experts/stakeholders/studies in platform	Monitors engagement in a blue carbon collaboration platform.	Annual	Count	Platform registration logs, user profiles

Strategic Line 3. Blue carbon certification schemes (quantification and financing)					
Action	**Indicator**	**Description**	**Periodicity of Measurement**	**Unit of Measurement**	**Data Source**
Action 3.1 Develop a regional blue carbon certification standard	Number of blue carbon projects launched	Tracks the implementation of certification criteria.	Annual	Count	Monitoring reports
Action 3.2 Strengthen certification capacity	Number of courses/people registered	Tracks the implementation of the capacity buildings.	Annual	Count	Reports
Action 3.3 Create a regional blue carbon registry and market platform	Carbon credits registered	Tracks the number of certified carbon credits.	Every two years	Count	Carbon credit registry, project reports
Action 3.3 Create a regional blue carbon registry and market platform	Economic return on certified projects	Evaluates the financial benefit of blue carbon projects.	Annual	Count	Financial reports, project evaluations

Action 3.4 Facilitate the inclusion of blue carbon in national carbon pricing mechanisms	National carbon pricing mechanism integrating blue carbon	Measures integration of blue carbon credits in national policies.	Annual	Count	Government policy documents, carbon pricing reports
Action 3.5 Developing standardised methodologies for blue carbon certification	Number of references in projects of the methodology	Tracks the use of the methodology.	Annual	Count	Reports
Action 3.6 Open data platforms	User access and downloads and number of data integrated	Tracks the use of the platform.	Annual	Count	Report
Action 3.7 Adaptive certification of blue carbon projects	Number of certified projects	Tracks the use of the certification	Annual	Count	Report

Strategic Line 4. Facilitate financing and investment in blue carbon					
Action	**Indicator**	**Description**	**Periodicity of Measurement**	**Unit of Measurement**	**Data Source**
Action 4.1 Collaboration with the private sector	Number of projects supported	Tracks certified projects benefiting from financial mechanisms.	Annual	Count	Funding agency records, project reports
Action 4.2 Creation of Green funds, blue carbon credits and Inclusive financing mechanisms	Number of projects supported, and amount mobilised	Tracks financial mechanisms.	Annual	€	Reports
Action 4.3 Digital Carbon Tokens	Number of tokens issued	Tracks digital carbon tokens created under a blockchain system.	Annual	Count	Blockchain transaction records, platform reports

Strategic Line 5. Involvement of local communities					
Action	**Indicator**	**Description**	**Periodicity of Measurement**	**Unit of Measurement**	**Data Source**
Action 5.1 Awareness and practical training programs	Number of participants	Tracks training efforts.	Annual	Count	Project reports
Action 5.2 Community event organisation for blue carbon awareness and engagement	Number of events and participants	Tracks engagement of community.	Annual	Count	Reports
Action 5.3 Integrating economic incentives	Number of initiatives	Tracks the incentives.	Annual	Count	Reports

Strategic Line 6. Policy framework and planning, management strategies					
Action	**Indicator**	**Description**	**Periodicity of Measurement**	**Unit of Measurement**	**Data Source**
Action 6.1 Establishment of regional blue carbon	Number of policies adopted	Tracks policy advancements	Annual	Count	Policy drafts, governmental reports

policies & Action 6.2 Incorporating blue carbon into national climate policies		for blue carbon integration.			
Action 6.3 Blue Carbon Ecosystem management plans and programmes	Number of plans	Tracks policy advancement.	Annual	Count	Policy drafts, governmental reports
Action 6.4 Establishing legal frameworks for blue carbon projects	Number of legal frameworks developed	Tracks legislative support for blue carbon projects.	Annual	Count	Government agencies, policy-making bodies
Action 6.5 Simplifying permit procedures	Number of streamlined permits issued	Tracks permits issued for blue carbon projects.	Annual	Count	Government records, environmental authorities
Action 6.6 Promoting the conservation and restoration of blue carbon ecosystems	Number of Mechanisms developed	Tracks the implementation of restoration projects.	Annual	Count	Government records

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