Policy Brief

REST-COAST

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Unlocking the potential of coastal restoration to strengthen climate action

Opportunities for the Nationally Determined Contributions

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Summary

The upcoming Nationally Determined Contributions (NDCs) revision cycle under the Paris Agreement presents a critical window to strengthen climate commitments and further align national policies with the internationally agreed 1.5°C goal. **Given the vital contribution of coastal ecosystems in carbon sequestration and their key role in climate adaptation and resilience, they hold significant potential to contribute to climate action**. Unfortunately, they are highly vulnerable to multiple stressors, including climate change. The degradation of coastal and marine ecosystems will further threaten to the physical, economic and food security of coastal communities, which are home to around 40% of the world's population (IUCN, 2017). Coastal ecosystem restoration is therefore an essential pathway for strengthening climate policy and to ensure a sustainable future for coastal areas and society at large.

This policy brief highlights the potential of Blue Carbon Ecosystems (BCEs) and their restoration for climate action and examines the extent to which these ecosystems are recognised and accounted for in current NDCs. The brief further identifies a window of opportunity for their inclusion in the NDCs revision cycle in 2025, as well as in future planning and decision-making for climate and biodiversity objectives. In this context, recommendations are provided to fully unlock the potential of coastal restoration for climate mitigation and adaptation.

Recommendations Summary for Policy-Makers

POLICY COHERENCE

When developing national commitments, it is key to consider synergies across policy domains and governance levels (local to international) for the inclusion of coastal ecosystem restoration measures in future NDC submissions and in their National Adaptation Plans (NAP).

SCIENTIFIC DATA

Specific and quantifiable restoration targets should be set for each coastal ecosystem type within NDCs and national policies, based on comprehensive scientific data and monitoring tools provided by coastal restoration initiatives and their local conditions.

HIGHLIGHT CO-BENEFITS

Identify and leverage the co-benefits of coastal restoration, such as improving water quality, supporting fisheries, promoting ecotourism, and enhancing food security, to align with broader societal goals and support funding opportunities.

PLANNING FOR THE FUTURE

It is recommended that future climate scenarios and changing socio-economic conditions are better considered during the planning of coastal restoration activities at case study level.

STAKEHOLDER ENGAGEMENT

Consider leveraging existing pathways to enhance stakeholder engagement and strengthen the scientific foundation of NDCs and other climate and biodiversity strategies at different levels of governance.

The REST-COAST project aims to explore the opportunities for the upscaling and outscaling of coastal restoration initiatives, including their potential for climate mitigation and adaptation. With nine Pilot Sites across the EU (Bulgaria, Denmark, France, Germany, Italy, the Netherlands, Poland, and Spain) and Israel, the project contributes to a better understanding of how this can be done in different national contexts. The Pilot Sites cover a wide range of intertidal habitats, with restoration activities focussing mainly on restoring salt marshes and natural flow dynamics and improving hydraulic connectivity. The project aims to support the integration of coastal restoration into climate and related policies by demonstrating how coastal restoration initiatives can support carbon sequestration and avoidant further emissions, improve coastal protection, enhance biodiversity conservation and restoration and provide additional co-benefits for coastal communities such as improved food security.

Box 1. Policies and the added value of REST-COAST

List of abbreviations

BCE	Blue Carbon Ecosystems
EEA	European Environmental Agency
EU	European Union
GBF	Kunming- Montreal Global Biodiversity Framework
GHG	Green House Gas (emissions)
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IUCN	Internation Union for Conservation of Nature
LULUCF	Land Use, Land Use Change, and Forestry Regulation
NDC	Nationally Determined Contribution
NECP	National Energy and Climate Plan
REST-COAST	Large scale RESToration of COASTal ecosystems through rivers to sea connectivity
SDG	Sustainable Development Goal
UNFCCC	United Nations Framework Convention on Climate Change

1 Coastal ecosystems as critical components to climate action

The 2023 Global Stocktake[1] has shown some good progress towards the global climate action goals adopted under the Paris Agreement (Box 2) in 2015. In February 2025, signatories were required to submit their updated NDCs, outlining their climate targets up to 2035. It is estimated that the previous round of NDCs would limit global temperature increases to a minimum of 2.1°C, falling short of the 1.5°C goal outlined in the agreement (UNFCCC, 2024). Global temperatures are likely to rise further as currently there is a significant implementation gap between the objectives outlined in the NDCs and other policies in place at the national level (UNFCCC, 2023a). Opportunities exist now for countries to strengthen or add new commitments in these next generation of NDCs and further enhance ambition in future submission cycles. This provides signatories with the opportunity to align their NDCs with the global goal of 1.5°C and implement the urgent measures needed to achieve this objective.

Coastal ecosystems hold significant potential to contribute to climate action, given their substantial capacity for carbon sequestration and their key role in climate adaptation and resilience. The United Nations Framework Convention on Climate Change (UNFCCC) has recognised and endorses the importance of conserving and restoring coastal ecosystems to enhance climate action. For **mitigation**, coastal ecosystems are recognised as effective natural carbon sinks, while for **adaptation**, their role as natural buffers against climate-induced risks is emphasised. The inclusion of conservation tools such as ecosystem-based adaptation measures and Nature-based Solutions in NDCs are promoted, as they offer solutions to several climate change related impacts on coastal ecosystems and biodiversity, while strengthening the resilience of infrastructure and communities in coastal regions (UNFCCC, 2024). For example, **30% of the cost-effective mitigation needed by 2030 could be achieved through concrete and quantified targets for nature-based solutions and ecosystem-based approaches** (IUCN, 2020).

The Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change that was adopted in 2015 under the UNFCCC (UN Framework Convention on Climate Change). It has been signed by 195 parties, including the European Union and its Member States, and Israel. NDCs are central to this treaty, serving as national climate plans where signatory parties detail their planned mitigation and adaptation actions. This to contribute to the global commitment of limiting global temperature rises to 1.5°C and staying well below 2.0°C compared to pre-industrial levels. NDCs are to be updated every 5 years, following the treaty's five-year cycle. The current 'third generation' NDCS are expected to build on previous commitments with stronger ambition, incorporating the insights from the 2023 Global Stocktake and presenting a well-reasoned investment plan to secure the necessary funding for implementation (SWP, 2024).

Box 2. The Paris Agreement and Nationally Determined Contributions

[1] The Global Stocktake is a process that allows countries and stakeholders to assess their collective progress towards achieving the goals of the Paris Agreement, as well as identifying areas where they are falling short. The first global stocktake (2023) affirmed that we are not on track to limit global warming to 1.5°C and the window for meaningful change is quickly closing. For detailed contents, see Decision 1/CMA.5 "Outcome of the first global stocktake", in the UNFCCC CoP report.

Currently, 56% of the NDCs submitted between 2019 and 2023 have outlined coastal Nature-based Solutions for climate mitigation and/or adaptation (UNFCCC, 2023b). **Noticeably, the EU and its coastal Member States, as well as Israel, have yet to include coastal ecosystems in the climate actions outlined in their NDCs**. This in contrast with other continents and signatory parties, who have made greater reference to coastal Nature-based Solutions in the second NDC submission cycle compared to the first (Lecerf *et al.*, 2023). To emphasise the value of coastal ecosystems for climate action and promote their uptake in the next NDCs, this policy brief identifies current challenges and opportunities and offers valuable insights from the REST-COAST project. The coastal restoration activities being carried out at the nine RESTCOAST Pilot Sites are expected to deliver multiple ecosystem services, including carbon sequestration, erosion control and reducing flood risk, which can contribute to climate action. These contributions are summarized in Table 1.

Table 1 Restoration interventions being implemented at each of the RESTCOAST nine pilot sites and their expected contributions to climate mitigation and adaptation.

PILOT SITE	RESTORATION INTERVENTIONS	EXPECTED CONTRIBUTION TO CLIMATE
ARCACHON BAY	This Pilot is pioneering a new approach to seagrass meadow restoration which has lost approximately 50% of their cover over the past 30 years, focusing on hydrodynamics.	**Mitigation:** Healthy meadows could play a crucial role in trapping sediment, enhancing their capacity as natural carbon sinks. **Adaptation:** The restoration of seagrass meadows also strengthens coastal protection by attenuating wave energy, reducing storm impacts and controlling coastal erosion. Additionally, restored seagrass meadows are expected to improve water quality.
EBRO DELTA	This Pilot is implementing innovative restoration actions including restoring connectivity between the Alfacada coastal lagoon and the sea by removing an artificial dyke, as well as restoring coastal embryonic dunes and a sand barrier through nourishment techniques.	**Mitigation:** Restoring connectivity at the site will improve hydrodynamics and ecological function, enhancing sediment transport and retention, which is expected to deliver co-benefits including carbon sequestration. **Adaptation:** The restoration of dunes and a sand barrier is expected to support coastal resilience by reinforcing natural defences against erosion and storm surges, contributing to flood risk reduction. In addition, restoration will enhance ecological function and habitat condition thereby reinforcing the delta's natural resilience.
NAHAL DALIA	This Pilot is implementing a comprehensive ecological restoration approach for a variety of habitats found in estuarine and coastal wetland areas, including groundwater-fed marshlands, dense hydrophilic vegetation, a flowing and connected river, and a functioning estuary connected to the sea.	**Mitigation:** Fishpond rewilding, wetland restoration and flow enhancement are expected to support the natural carbon sequestration and storage abilities of healthy coastal wetland and estuarine ecosystems. Additionally, the conversion of chosen fishponds into wetlands will further enhance their role in carbon sequestration. **Adaptation:** The restoration of coastal ecosystems in the area is expected to enhance water retention and resilience to extreme weather events. In addition, restoration actions aiming to improve water quality are expected to reduce climate change impacts on water resources and natural systems.
FOROS BAY	This Pilot is applying an in-situ method for seagrass restoration. The experimental set-up consists of three test plots where sods of seagrass were transplanted to test their ability to recolonize area. The soft bottom in the bay is likely to be recolonized down to about 6 m depth.	**Mitigation:** Seagrass restoration is expected to enhance climate change mitigation potential by enhancing carbon accumulation rate. **Adaptation:** Restoration activities are expected to reduce flooding and erosion risk through bed stabilization. Additionally, water quality is expected to improve resulting in benefits for biodiversity and ecosystem resilience.

PILOT SITE	RESTORATION INTERVENTIONS	EXPECTED CONTRIBUTION TO CLIMATE
 SICILY LAGOON	This Pilot is implementing several actions to restore the area´s coastal lagoon system including the construction of islands to favour nesting and breeding of target species of birds, the dredging of channels to foster hydraulic and ecological connectivity between lagoons, the restoration of saltmarshes restoration and the construction of barriers between Longarini lagoon and the sea to control water levels. In addition, the pilot is assessing the potential for restoring degraded seagrass meadows through the small-scale restoration of a seagrass meadow patch. The potential of dune revegetation and beach nourishment is also being assessed.	**Mitigation:** By restoring salt marshes, it is expected to enhance ability to sequester carbon. Additionally, improving hydraulic connectivity will help sustain wetland habitats, ensuring continued carbon accumulation and storage. Moreover, seagrass meadows will also contribute significantly to blue carbon storage. Opportunities for low-carbon restoration practices, such as minimizing fossil fuel use in sediment management and leveraging nature-based stabilization techniques, are being explored to further reduce the carbon footprint of restoration activities. **Adaptation:** Improved habitat quality and hydrodynamic processes at the site are expected to mitigate the impacts of climate change and improve ecosystem resilience to climate stressors, such as sea level rise and increased storm intensity. Restoration of seagrass is also expected to contribute to coastal protection.
 VENICE LAGOON	This Pilot is restoring artificial saltmarshes located in the central/southern lagoon by reversing the degradation processes occurring in the area and improving some of the features that hindered naturalization processes. By mitigating saltmarsh border erosion and fostering conditions suitable to the colonization of vegetation and wildlife, the project expects to expand priority habitat surfaces and bolster biodiversity.	**Mitigation:** The restoration of saltmarshes is expected to enhance the natural carbon storage and sequestration capacities of these ecosystems.
 VISTULA LAGOON	This Pilot is erecting an artificial island to establish connectivity to the Baltic Sea. The island is accommodating sediment from dredged channels and providing habitat for birds hatching on meadows. Second, long-term improvement of water quality could be effectuated by installation of many floating islands, whose vegetation will be harvested and physically removed from the lagoon.	**Mitigation:** The pilot is not expected to result in additional carbon sequestration potential as the vegetation in the artificial island will be maintained by periodic mowing to prevent natural emergence of trees. **Adaptation:** The pilot is not expected to deliver additional climate adaptation benefits.
 RHONE DELTA	The ecological restoration in this Pilot focused on re-establishing hydrosaline equilibrium through the restoration of hydraulic continuity, as part of a realignment strategy. The main objectives are to restore the former saltworks by reducing salinity, improving water quality, and enhancing connectivity.	**Mitigation:** Hydro-connectivity restoration is expected to deliver carbon sequestration benefits due to improved water renewal, which helps reduce hypoxia limiting carbon emission. In addition, the progressive restoration of saltmarsh and seagrass habitats is expected to enhance the carbon sequestration capacity of these ecosystems. **Adaptation:** The site is expected to mitigate the effects of sea level rise by creating new natural barriers through the abandonment of former dikes.
 WADDEN SEA	This Pilot is developing a sustainable sediment management strategy to protect the estuary's ecological health, as well as the region's financial prosperity. The estuary is highly turbid due to land reclamation and dredging, preventing sediment from settling. This excess sediment is being managed to promote land accretion and mudflat formation. Measures to facilitate sediment deposition include brushwood groynes (low-carbon intensive) and reopening dikes to create new intertidal areas.	**Mitigation:** The promotion of land accretion and mudflat formation is expected to result in long-term carbon sequestration. These areas naturally accumulate excess sediment, burying organic matter and carbon for long-term storage in the soil. Moreover, as vegetation establishes, carbon uptake is expected to increase, further enhancing sequestration. **Adaptation:** Improved ecological conditions thanks to restoration interventions in the estuary is expected to deliver a range of co-benefits including flood mitigation.

2 The impact of climate change on coastal ecosystems and the value of restoration for climate action

Despite their importance, coastal ecosystems are under growing pressure from climate change and other human activities. According to the UNFCCC, **20% to 50% of key coastal ecosystems – namely mangroves, tidal marshes and seagrass meadows – have already been lost or degraded globally**. Coastal development, population growth, pollution and other human-driven changes have been identified as the main drivers, and climate change is expected to exacerbate these pressures (Isensee *et al*., 2019; Barbier *et al*., 2011). These ecosystems are particularly vulnerable to climate-induced changes, such as ocean warming, sea level rise, oxygen loss, acidification, intensified marine heatwaves, and salinity intrusion. The rising temperatures are expected to lead to further disruptions in their ecological balance and to accelerate biodiversity decline (IPCC, 2022). This has implications for the ecosystem services they provide, putting at risk these key services urgently needed to limit the impact of climate change and increase resilience in coastal areas.

Blue Carbon Ecosystems or BCEs (Box 3) are estimated to account for more than 50% of the ocean's carbon sequestration (IPBES, 2024), storing more than 30,000 teragrams of carbon in their soils and biomass worldwide. Their conservation could prevent emissions of an estimated 304 teragrams of CO_2e per year, while large-scale restoration is estimated to be able to store an additional 841 teragrams of CO_2e per year. Together, the conservation and restoration of BCEs could lead to the potential abatement of up to 3% of global carbon emissions (Macreadie *et al*., 2021). **This indicates that they have a significant capacity to act as natural carbon sinks, thereby contributing to the mitigation of climate change.**[2]

BCEs play a key role in climate change mitigation (Malerba *et al*., 2023). Conserving and restoring them offers an efficient and long-term solution to climate mitigation, also avoiding additional emissions from their further degradation. These ecosystems also function as natural defences against climate-related risks in coastal areas, such as storms, floods, and sea-level rise, while also trapping sediment, reducing erosion and limiting saltwater intrusion, making the coast more resilient to the impacts of climate change (Sutton-Grier *et al*., 2015). **Restoring them provides a cost-effective way of adapting to climate change, build long term resilience and reducing future vulnerabilities of coastal areas, with additional co-benefits as already identified such as coastal protection, improved water quality and contribution to food security**. Beyond climate and environmental benefits, healthy coastal ecosystems also provide a wide range of social, economic and cultural opportunities to coastal communities (Quevedo and Kohsaka, 2024), these could also help to create valuable financial pathways (e.g., carbon credits) to sustain their contribution to national climate policies.

Blue Carbon Ecosystems

Blue Carbon Ecosystems (BCEs) are defined as coastal ecosystems that have the potential to sequester substantial quantities of carbon over time, thereby functioning as natural carbon sinks. This term is commonly used to address mangroves, seagrass meadows, and tidal marshes (IUCN, 2021). As scientific knowledge evolves, there is potential to include additional coastal and marine ecosystems in blue carbon frameworks, such as kelp forests, oyster reefs, and unvegetated marine sediments. However, more research is needed to understand their long-term carbon sequestration capacity and the extent to which they can be managed at national and local levels, to become effective climate mitigation solutions (Lovelock & Duarte, 2019). Nevertheless, these additional coastal ecosystems may play a crucial role in maintaining the carbon cycle of the ocean and provide other services, such as coastal protection, biodiversity conservation and food security, which already make a compelling case for their restoration (Howard *et al*., 2017).

Box 3. Blue carbon ecosystems framework

In this context, **it is suggested that the EU and Israel consider the value of incorporating the conservation and restoration of coastal ecosystems within their respective climate action strategies, including in their updated NDCs and NAPs**. It is also important to acknowledge that delays in restoring BCEs could reduce their effectiveness in providing essential ecosystem services as climate change continues to impact them (IPCC, 2022). The upcoming NDC submission cycle is therefore a key moment to include a focus on coastal ecosystem restoration to enhance their ambition (Figure 1).

[2] There is a natural variability for carbon sequestration rates and storage capacity across ecosystems, which further depends on location-specific factors. In addition, there is variability in current knowledge and measurement tools, with geographical mapping and estimates of carbon storage globally more advanced for mangroves, while they would need to be more developed for seagrass meadows, tidal marshes, and macroalgal forests to fully grasp their contribution to climate action.

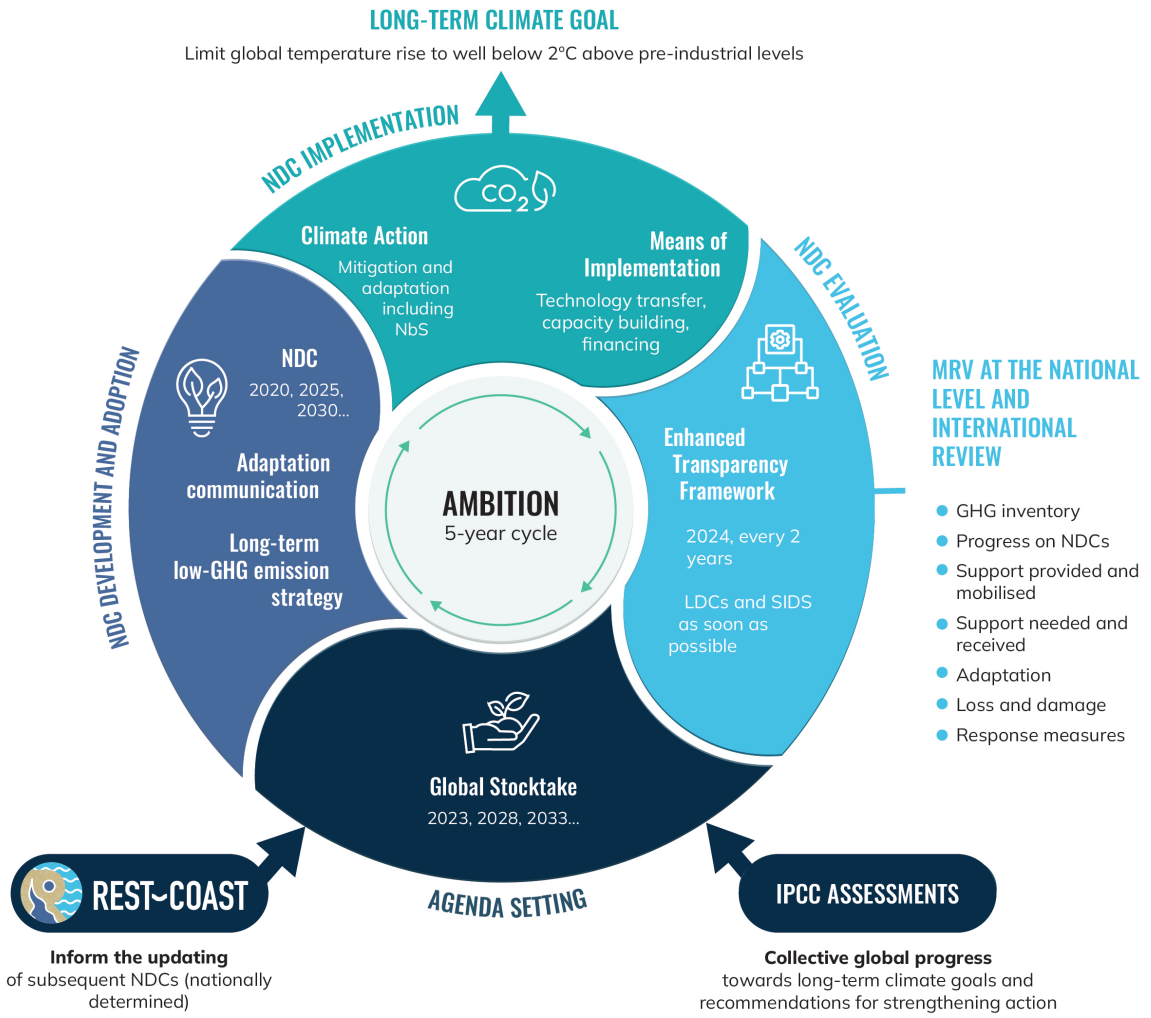

Figure 1. The NDC cycle under the Paris Agreement and entry points for the RESTCOAST Project. Based on Thomas *et al.*, 2023.

3 Relevance of coastal restoration for NDCs and national climate strategies

3.1 Current coverage of coastal ecosystems and their restoration in NDCs

The REST-COAST project conducted an analysis of the current NDCs of the countries where its Pilot Sites are located to assess how coastal ecosystems are addressed in their NDCs and related national climate policies.[3] This analysis looked at the extent to which (coastal) ecosystems and specific restoration objectives are incorporated into these strategies and whether specific mitigation and adaptation targets or measures are proposed. The goal was to identify challenges and explore opportunities for enhancing climate ambitions through coastal restoration. For EU Member States, the analysis was based on the EU's NDC submission, complemented by a review of the National Energy and Climate Plans (NECPs), which detail individual Member States' contributions to the climate and energy objectives set at EU-level. The results show how ecosystems in general are recognised compared to coastal ecosystems, summarized for clarity using a simple traffic light coding system.

The REST-COAST analysis showed the EU's commitment to accelerate its climate ambition and its increasing recognition of nature's role in reaching its climate targets. Regarding specific policies, the revised Land Use, Land Use Change, and Forestry Regulation (2023/839) (LULUCF) adds a specific focus on ecosystems to the EU's NDC, **requiring EU Member States to meet national targets and report on Green House Gas emissions and removals for different ecosystems, including managed wetlands**. However, the LULUCF Regulation applies only to managed wetlands, with no specific provisions for coastal wetlands and other key coastal ecosystems.

[3] The analysis in this policy brief was based on Deliverable 5.5 of the REST-COAST project, which could be used as a further reference for information and the used methodology.

The EU Biodiversity Strategy to 2030 also provides a comprehensive plan to address biodiversity loss across the EU, including the commitment to protect 30% and restore 20% of its land and seas by 2030. This strategy **emphasises the conservation and restoration of carbon-rich ecosystems**, thus recognising the link between biodiversity loss and climate. As part of this strategy, the EU recently adopted the **EU Nature Restoration Regulation** to address the urgent need to restore degraded ecosystems within its territory. This regulation **introduces legally binding restoration targets for EU Member States, including the restoration of 30% of their degraded coastal and marine ecosystems by 2030**. This regulation requires EU Member States to set concrete **restoration targets, measures, and monitoring for key BCEs** as part of the National Restoration Plans that they are required to develop**.** This regulation further promotes synergies with other key EU policies to support them in achieving these ambitious restoration goals. The REST-COAST project has also produced a **policy brief** on the implications and opportunities of this new regulation for coastal ecosystem restoration using the important contribution of the Pilot Sites.

In light of the results of the analysis (Table 2), several considerations could help to support the inclusion of BCEs in NDCs and NECPs in the countries where REST-COAST Pilot Sites are located. Additional findings from the NECPs indicated that **EU Member States tend to prioritise inland wetlands associated with agricultural use in their national climate strategies, while important BCEs are not always given due consideration.** Furthermore, the definitions and categories for BCEs vary across EU Member States. This suggests that the EU could benefit from a harmonised approach for their effective integration into EU-wide climate strategies. As the table illustrates, some EU Member States are more advanced in integrating BCEs into their national climate strategies than others. Meanwhile, although Israel has implemented some initiatives to protect and restore coastal ecosystems, its national climate policies seem to lack explicit references, targets and measures for their conservation and restoration. **Both EU Member States and Israel could thus benefit from the insights from coastal restoration initiatives to strengthen their climate ambitions and ensure that their coastal areas are adapting to climate change and build for long-term resilience**.

The Handbook for the revised LULUCF Regulation, recently published by the European Environmental Agency (EEA), emphasizes the importance of improving the understanding for each BCE type on their carbon sequestration potential, human impacts, and restoration effectiveness for them to be fully integrated in future NDCs (EEA, 2024). **Notably, current references to BCE restoration address primarily mitigation actions, with fewer mentioning of its role in climate adaption.** This highlights the opportunity to broader the focus of coastal restoration efforts to maximize both mitigation and adaptation benefits.

Table 2. The inclusion of coastal ecosystems in NDCs and NECPs in REST-COAST countries. This table summarises whether the role of nature in general and coastal ecosystems is fully (green), partially (orange), or not (red) acknowledged.

DOCUMENT (YEAR)	ECOSYSTEMS IN GENERAL			COASTAL ECOSYSTEMS		
	MENTION	MITIGATION (targets/ measures)	ADAPTATION (targets/ measures)	MENTION	MITIGATION (targets/ measures)	ADAPTATION (targets/ measures)
EU, NDC (2023, 2020)						
BULGARIA, NECP (2024)						
DENMARK, NECP (2023)						
FRANCE, NECP (2024)						
FRANCE, Overseas Territories NDC (2021, 2016)						
GERMANY, NECP (2023)						
ITALY, NECP (2024)						
THE NETHERLANDS, NECP (2024)						
POLAND, NECP (2024)						
SPAIN, NECP (2023)						
ISRAEL, NDC (2015, 2021)						

3.2 Supportive policies and guidelines for the upscaling and outscaling of coastal restoration in NDCs

Global and regional institutions are working to support the consideration of BCE into climate and biodiversity strategies and to promote synergies among them. Key multilateral environmental agreements like the Paris Agreement and the Kunming-Montreal Global Biodiversity Framework (Convention on Biological Diversity) **have incorporated objectives and specific targets to prioritise coastal restoration for advancing on both biodiversity and climate objectives**. For instance, Target 8[4] of the Kunming-Montreal Global Biodiversity Framework focuses on minimising climate change impacts on biodiversity. Similarly, different Sustainable Development Goals under the 2030 Agenda place an emphasis on restoring ecosystems, including BCEs, and promote synergies between climate and biodiversity objectives. **Therefore, existing international commitments could help policy-makers at the national level to strengthen synergies between local contexts and global frameworks. This may lead to accelerated action, a better mainstreaming of climate and environmental priorities, and it could optimise the delivery of coastal ecosystem restoration benefits**.

More marine and coastal-focused conventions, such as the **Ramsar Convention** and the **Regional Seas Conventions**, have also started to advance coastal restoration by incorporating climate mitigation and adaptation into their programmes. **Recognising the importance of coastal restoration, these conventions are working to improve the understanding of the climate change impacts on BCEs, to contribute to the development of monitoring tools, including those measuring their carbon sequestration capacity, to identify effective restoration measures and to ensure their effective management and sustainable use**. They also support regional cooperation and provide a platform for sharing knowledge, data, and best practices among their contracting parties.

[4]Target 8: Minimize the impacts of climate change on biodiversity and build resilience: "*Minimize the impact of climate change and ocean acidification on biodiversity and increase its resilience through mitigation, adaptation, and disaster risk reduction actions, including through nature-based solution and/or ecosystem-based approaches, while minimizing negative and fostering positive impacts of climate action on biodiversity*"

4 Strengthening coastal NDCs: Insights from coastal restoration initiatives for stronger climate action

Countries are required to develop NDCs that reflect their highest possible ambition, including specific targets, measures, implementation strategies and timeframes to achieve their outlined objectives. This is an opportunity for governments to drive climate action forward by providing clear policies and prioritizing coastal restoration initiatives. Despite the recognized importance of these ecosystems in helping address climate change, many countries, including those in **Europe and Israel, could further develop climate and biodiversity policies that address BCEs alongside other coastal priorities and challenges to strengthen their NDCs and enhance climate action**.

Coastal restoration initiatives, such as those covered by the REST-COAST project, can inform and advance NDCs and other national climate policies by elevating the profile of BCEs as valuable climate solutions. Several of the RESTCOAST Pilot Sites are already showing promising results that demonstrate the potential of coastal restoration action as cost-effective measures for climate action, and the long-term resilience of coastal areas (Table 3). They can support by advancing scientific knowledge, improving conservation tools, and by responding to communities' needs and considerations. In doing so, they lay the groundwork for the inclusion of BCEs as cost-effective climate solutions into the NDCs.

When effectively implemented, coastal restoration delivers critical climate services while providing co-benefits to coastal communities and society at large.

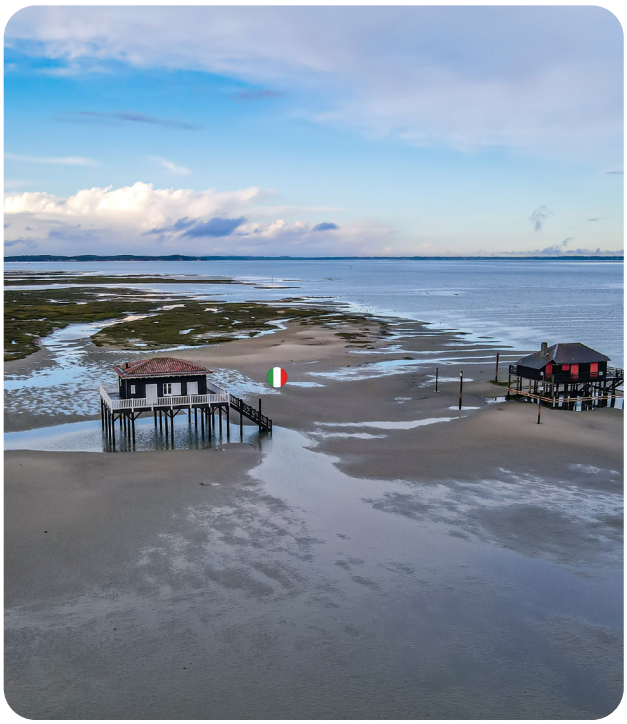

Table 3. RESTCOAST Pilot Site efforts to demonstrate and quantify climate mitigation benefits.

PILOT SITE	DEMONSTRATED CLIMATE MITIGATION BENEFITS
ARCACHON BAY	Restored seagrass areas are being compared with bare seabeds to better understand the relationship between sediment trapping and the carbon sequestration potential of these ecosystems over time. Initial analysis shows promising results, with potential carbon gains of around 0.42 tonnes of carbon per hectare per year.
EBRO DELTA	While data are not yet available, monthly monitoring of GHG emissions and changes in vegetation cover and composition will provide essential data to quantify the climate benefits of restoration. Numerical modelling of sediment transport, coastal erosion and inundation is also being developed to assess how restoration interventions influence sediment dynamics, shoreline stability, and dune sustainability, helping to optimize future management strategies for enhanced coastal resilience and carbon sequestration.
FOROS BAY	The site is currently assessing climate change mitigation potential by comparing the carbon accumulation rate of existing/restored seagrass areas with seabed not occupied by meadows. While data are not yet available, this will help better understand the contribution of restoration.
SICILY LAGOON	Data on carbon sequestration are not available, as carbon sequestration is not a targeted ecosystem service for the Sicily pilot site. Efforts to reduce the climate impact of the transport of sediment needed for island reconstruction have been estimated to result in 10x less emissions.
VENICE LAGOON	While data is not yet available, the site is monitoring the carbon sequestration and GHG emissions at the saltmarshes.
RHONE DELTA	The effectiveness of the measures in terms of their climate mitigation potential is under analysis meaning data are not yet available.
WADDEN SEA	The use of restoration approaches that minimise emissions, namely the application of re-used sediment, is estimated to mitigate 57,752 tons of CO_2 over the project's lifetime.

Building on the ongoing work and progress of the REST-COAST project, EU Member States and Israel are encouraged to consider the following recommendations in the upcoming NDC submission cycle and in future national climate and biodiversity strategies:

SCIENTIFIC DATA

Consider setting specific and quantifiable restoration targets for each coastal ecosystem type within NDCs and national policies, based on comprehensive scientific data and monitoring tools of coastal restoration initiatives and their added understanding of local conditions. Progress on scientific data on the potential contribution of each type of coastal ecosystem to climate change mitigation and adaptation is crucial for their inclusion in NDCs and NAPs and other national climate strategies. This information would especially be crucial at the European scale for the development and implementation of EU policies. Coastal restoration initiatives can contribute by researching which ecological parameters underlie the natural variability in carbon sequestration rates and storage capacity across ecosystems and provide additional location-specific factors to consider. This is especially key for certain BCEs, such as tidal marshes and macroalgal forests, since clear information on geographic mapping and carbon storage estimates would need to be further developed to understand their contribution to climate mitigation and adaptation. These initiatives can also help to improve monitoring frameworks to understand the effectiveness of restoration activities to climate mitigation and adaptation and the provision of additional ecosystem services that could help to acquire long-term support for coastal restoration initiatives.

GOVERNANCE AND POLICY COHERENCE

When developing national commitments, it is key to consider synergies across policy domains and governance levels (local to international) for the inclusion of coastal ecosystem restoration in future NDCs submissions and in their NAPs. Policy coherence and coordination across sectors and governance levels is particularly important for coastal restoration initiatives, which face multiple pressures from various sectors and aspects of society. When developing national strategies, alignment with other international and EU commitments can help to identify priorities, accelerate action and foster collaboration among stakeholders. Signatories, for instance, are encouraged to finalise their NAPs by 2025 and to ensure that the policies and priorities outlined therein are also reflected in the updated NDCs (IUCN, 2024). These comprehensive and coordinated national objectives can then further support clear lines of responsibilities at each governance level to reach these. At local level, a better understanding of the policy landscape can improve clarity, coordination and effectiveness of coastal restoration initiatives on the ground.

The EU could consider providing guidance on the definition and categorisation of BCEs across the Union to promote harmonisation and ease their inclusion in key climate and biodiversity strategies, such as the LULUCF regulation. The EU Nature Restoration Regulation could provide an opportunity to initiate this process.

HIGHLIGHT CO-BENEFITS

Identify and leverage the co-benefits of coastal restoration, such as improving water quality, supporting fisheries, promoting ecotourism, and enhancing food security, to align with broader societal goals and support funding opportunities. Restoring BCEs provides multiple benefits to coastal communities and society at large. These benefits extend beyond the cross-cutting local to global benefits to climate mitigation and adaption. Highlighting co-benefits of coastal restoration – such as improved livelihoods, food security, and biodiversity conservation – could be used to elevate coastal ecosystem restoration as a political priority and unlock valuable financial opportunities (e.g. carbon credits) to sustain their contribution to national climate policies, as well as foster local support by building trust in coastal restoration initiatives and their contribution to their communities.

ADAPTATION AND FUTURE-PLANNING

It-is recommended that future climate scenarios and changing socio-economic conditions are considered during the planning of coastal restoration activities at case study level. This information can guide the selection of habitats to be restored, identify suitable restoration measures, and determine the optimal sequencing and timing of implementation. Similarly, recognising that socio-economic conditions may change over time allows coastal restoration initiatives to be responsive to local consideration and needs. This will also be useful for coastal restoration initiatives to anticipate and plan for expected future pressures on BCEs. This forward-looking approach will ensure that coastal restoration initiatives remain appropriate, resilient and fully effective over time.

This is particularly important to promote specific BCE targets, measures, and initiatives to enhance climate adaptation and coastal resilience, since these are currently underrepresented in the NDCs of the EU and Israel.

STAKEHOLDER ENGAGEMENT

Consider leveraging existing pathways to enhance stakeholder engagement and strengthen the scientific foundation of NDCs and other climate and biodiversity strategies at different levels of governance. Platforms that gather extensive data and offer new tools to relevant stakeholders - including scientists, managers, policy makers, conservationists, and investors – can play a crucial role in fostering collaboration and engagement across all levels. The Coastal Restoration Platforms (CORE-Plats) created within the REST-COAST framework present a valuable opportunity to demonstrate the benefits of restoration to coastal stakeholders, while also engaging civil society and attracting funding that can be useful for the development and implementation of coastal restoration initiatives. This can help to both ensure the delivery of cross-cutting benefits for climate mitigation and adaptation from the local to the global level, as well as additional co-benefits for coastal communities and society at large.

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6 References

Barbier EB, Hacker SD, Kennedy C, Koch EW, Stier AC, and Silliman BR. 2011. The value of estuarine and coastal ecosystem services. *Ecological monographs*, 81, p. 169-193. DOI: 10.1890/10-1510.1

Christianson AB, Cabré A, Bernal B, Baez SK, Leung S, Pérez-Porro A, & Poloczanska E. 2022. The promise of blue carbon climate solutions where the science supports ocean-climate policy. *Frontiers in Marine Science*, 9. DOI: 10.3389/fmars.2022.851448

European Environment Agency. 2024. Handbook on the updated LULUCF Regulation EU 2018/841 - Guidance and orientation for the implementation of the updated regulation - Version 2. Copenhagen, Denmark: EEA.

Howard J, Sutton-Grier A, Herr D, Kleypas J, Landis E, Mcleod E, ... & Simpson S. 2017. Clarifying the role of coastal and marine systems in climate mitigation. *Frontiers in Ecology and the Environment*, *15*(1), 42-50.

IPBES. 2024. Summary for Policymakers of the Thematic Assessment Report on the Interlinkages among Biodiversity, Water, Food and Health of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. McElwee PD, Harrison PA, van Huysen TL, Alonso Roldán V, Barrios E, Dasgupta P, DeClerck F, ... and Obura D (eds.). IPBES secretariat, Bonn, Germany. DOI: https://doi.org/10.5281/zenodo.13850289

IPCC. 2022. Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Pörtner H-O, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A. Craig M, ... and Rama B. (eds.). Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA. DOI: 10.1017/9781009325844.

Isensee K, Herr D, Howard J, Megonigal P. 2019. Coastal Blue Carbon Ecosystems Nature-Based Solutions. Intergovernmental Oceanographic Commission of UNESCO, International Union for Conservation of Nature. Conservation International. Smithsonian Environmental Research Center. available at: https://unfccc.int/sites/default/files/resource/3.%20IOC%20Coastal%20blue%20carbon%20ecosystems.pdf

IUCN. 2017. THE ocean and climate change: Issues brief. Retrieved from: https://iucn.org/sites/default/files/2022-07/the_ocean_and_climate_change_issues_brief-v2.pdf

IUCN. 2021. Manual for the creation of Blue Carbon projects in Europe and the Mediterranean. Otero M. (Ed). IUCN Center for Mediterranean Cooperation: Malaga, Spain.

IUCN. 2020. Global Standard for Nature-based Solutions. A user-friendly framework for the verification, design and scaling up of NbS. First edition. Gland, Switzerland: IUCN.

IUCN. 2024. IUCN position paper for UNFCCC COP29. Retrieved from: https://iucn.org/sites/default/files/2024-09/iucn-position-paper-for-unfccc-cop29-final.pdf

Lecerf M, Herr D, Elverum C, Delrieu E and Picourt L. 2023. Coastal and marine ecosystems as Nature based Solutions in new or updated Nationally Determined Contributions. Ocean & Climate Platform, Conservation International, IUCN, Rare, The Nature Conservancy, Wetlands International and WWF.

Lovelock CE & Duarte CM. 2019. Dimensions of blue carbon and emerging perspectives. *Biology letters*, *15*(3). DOI: 10.1098/rsbl.2018.0781.

Macreadie PI, Costa MD, Atwood TB, Friess DA, Kelleway JJ, Kennedy H, ... & Duarte CM. 2021. Blue carbon as a natural climate solution. *Nature Reviews Earth & Environment*, *2*(12), 826-839.

Malerba ME, de Paula Costa MD, Friess DA, Schuster L, Young MA, Lagomasino D, Serrano O, Hickey SM, York PH, Rasheed M, Lefcheck JS, Radford B, Atwood TB, Ierodiaconou D, Macreadie P. 2023. Remote sensing for cost-effective blue carbon accounting. Earth-Science Reviews, Volume 238, 104337, ISSN 0012-8252. https://doi.org/10.1016/j.earscirev.2023.104337.

Pendleton L, Donato DC, Murray BC, Crooks S, Jenkins WA, Sifleet S, ... & Baldera A. 2012. Estimating global "blue carbon" emissions from conversion and degradation of vegetated coastal ecosystems. DOI: 10.1371/journal.pone.0043542

Quevedo JMD and Kohsaka R. 2024. A systematic review of cultural ecosystem services of blue carbon ecosystems: Trends, gaps, and challenges in Asia and beyond. Marine Policy, Volume 159, 105898, ISSN 0308-597X, https://doi.org/10.1016/j.marpol.2023.105898

Stiftung Wissenschaft und Politik (SWP). 2024. Third Generation of Nationally Determined Contributions: The Heart of the Paris Agreement Is at Stake. Adolphsen O, Könneke J, Thielges S. SWP Comment 2024/C 33. DOI: 10.18449/2024C33

Sutton-Grier AE, Wowk K, & Bamford H. 2015. Future of our coasts: The potential for natural and hybrid infrastructure to enhance the resilience of our coastal communities, economies and ecosystems. *Environmental Science & Policy*, *51*, 137-148. DOI: 10.1016/j.envsci.2015.04.006

UN Ocean Conference. 2017. Factsheet: People and Oceans. Retrieved from: https://sustainabledevelopment.un.org/content/documents/Ocean_Factsheet_People.pdf

UNFCCC. 2023a. Technical dialogue of the first global stocktake: Synthesis report by the co-facilitators on the technical dialogue (FCCC/SB/2023/9).

UNFCCC. 2023b. Nationally determined contributions under the Paris Agreement Synthesis report by the secretariat (FCCC/PA/CMA/2023/12).

UNFCCC. 2024. Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fifth session, held in the United Arab Emirates from 30 November to 13 December 2023 - Addendum. Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement at its fifth session (FCCC/PA/CMA/2023/16/Add.1).

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