

Advancing Policy Integration Across Mediterranean Countries:

Aligning with the Barcelona Convention and International Commitments Through a Common Evidence-Based Strategy



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KEY MESSAGES

- **Protecting Mediterranean coastal wetlands** is vital to preserve their ecological, economic, and social benefits — from biodiversity and flood protection to carbon storage and clean water. Yet these vital ecosystems are vanishing, mainly due to urbanisation and conversion to agricultural lands or artificial wetlands.
- **A harmonized set of indicators and metrics**, building on the Barcelona Convention's Integrated Monitoring and Assessment Programme (IMAP), Ramsar and relevant EU policies, is essential to track policy performance progress, guide decisions, and coordinate action on Mediterranean wetland conservation.
- Indicators should prioritize the collection of knowledge on wetland extent and condition, and must also assess progress in restoration trends and ecosystem health. At the same time, they should support climate goals under the Paris Agreement by tracking the role of wetlands in **greenhouse gas abatement** and **climate vulnerability reduction**.
- **Investing in innovation and collaboration**—including satellite monitoring, AI tools, and stakeholder partnerships—will improve data quality, support adaptive management, and ensure the region meets its biodiversity, climate, and sustainability commitments.

Introduction

Coastal wetlands in the Mediterranean region are unique ecosystems that provide numerous ecological, economic, and social benefits. These vital habitats include marshes, coastal mudflats, lagoons, estuaries, and deltas. They act as natural buffers against storms and sea-level rise, support rich biodiversity, and help regulate droughts and floods. Furthermore, they play a crucial role in carbon sequestration and greenhouse gas regulation. Wetlands filter pollutants from agriculture, aquaculture, and sewage, removing nitrogen and pesticides from water. They also retain and accumulate sediment from terrestrial flood systems, enriching nearby agricultural lands with nutrients and supplying fresh water for irrigation.

Despite their importance, Mediterranean wetlands have experienced significant habitat loss, resulting in a sharp decline in both their natural extent and ecological health. Over the past 50 years, approximately 50% of all Mediterranean wetlands, including freshwater wetlands and peatlands, have disappeared ⁽¹⁾. This loss is due to erosion, extreme weather events, salt-water intrusion, and human-induced pressures, such as the expansion of irrigated agriculture, urbanization, industrial development, and infrastructure construction. Rapid socio-economic and demographic changes in the region are further exacerbating these challenges. From 1990 to 2013, wetland-dependent species declined by 46%, highlighting the

urgent need for enhanced conservation and management efforts⁽¹⁾. Furthermore, in the case of EU countries, the reporting on the conservation status of the 8 types of coastal wetland habitats protected under the **EU Habitats Directive** (2013-2018) reveals that most of these habitats are in an unfavourable (poor or bad) status⁽²⁾, climate change poses substantial threats to these wetlands. Rising sea levels, erosion, and changes in precipitation patterns and air temperatures, along with more frequent droughts, are projected to alter water discharge and sediment flow in Mediterranean rivers and catchments⁽³⁾. These issues underscore the urgent need for effective policies to protect and restore these vital ecosystems.

Efforts to address these challenges are reflected in various regional and international policies and commitments,, such as those under the **Barcelona Convention, the Global Biodiversity Framework by the Convention of Biological Biodiversity, and the EU Biodiversity Strategy and Nature Restoration Law, the UN Decade of restoration**, among others. The **RAMSAR Convention** further supports these efforts by highlighting the global importance of wetland conservation and blue carbon ecosystems, reinforcing the need for integrated and strategic approaches to protect these critical ecosystems for both nature and climate targets.

Under the Barcelona Convention, the Post-2020 Strategic Action Programme for the Conservation of Biodiversity and Sustainable Management of Natural Resources in the Mediterranean Region (**Post-2020 SAPBIO**) sets up 27 targets by 2030. Coastal wetlands are among the most critical ecosystems addressed by the SAPBIO Programme, particularly in terms of restoration needs, nature-based solutions and ecosystem services like blue carbon. Coastal wetland habitats are considered for inclusion in the Specially Protected Areas (SPAs) Directory and are part of the strategic goals of the **Mediterranean Strategy for Marine and Coastal Protected Areas and OECMs**. These efforts also align with several regional plans aimed at reducing pollution and enhancing spatial planning, as described in the **Integrated Coastal Zone Management (IZCM)** and the **Land-based Sources of Pollution Protocol**.

As the Post-2020 SAPBIO progresses, along with other EU, regional, and international policy initiatives, it is crucial to establish a performance monitoring and evaluation framework to track progress on coastal wetlands as part of the Ecosystem Approach. This framework will allow for consistent assessments of the health and status of these key ecosystems, guide adaptive management practices, and ensure that conservation and restoration efforts align with regional and international objectives. Ultimately, it will help safeguard biodiversity, enhance climate change mitigation and adaptation efforts, and promote sustainable development in the Mediterranean region.



Fig. 1. Key Actions and Policies planned within the Barcelona Convention to support the conservation and restoration of Mediterranean Coastal Wetlands.

REGIONAL ACTION PLANS AND TARGETS CONTRIBUTING TO COASTAL WETLANDS CONSERVATION AND RESTORATION



Indicators for measuring policy progress on coastal wetland targets aligned with international goals

To achieve conservation and restoration goals for coastal wetlands in the Mediterranean region, it is crucial to establish a comprehensive set of performance indicators and metrics. These key indicators and metrics will serve as a strategic planning framework used to help plan, implement and evaluate the impacts of the actions taken by the countries, establish reference points to measure national efforts, identifying areas for improvement, and help to make data-driven decisions. It will enable countries to use consistent language and metrics when sharing information on the status of implementation, ensuring that collective actions are coordinated to maximize impact. While it will also ensure the availability of high-quality evidence to inform actions and projects on the ground and **stimulate investment in nature-based solutions**, enhancing the resilience and sustainability of these vital ecosystems.

The indicators should complement those already developed as part of the **Integrated Monitoring and Assessment Programme (IMAP) under the Barcelona Convention** and as those established by different EU policies and Directives. They should also extract the necessary information on these ecosystems to support those targets related to understand progress regarding mitigating habitat loss, managing land use changes, improving wetland health and water quality, reducing greenhouse gas emissions, and adapting to the impacts of climate change, such as rising sea levels and altered hydrological cycles. In addition, to effectively inform policies on coastal wetland performance, they will need to consider and agree on baseline conditions, set a meaningful period for periodic assessment and track progress over time to measure performance against set targets.

Below, we outline a proposal for selected performance policy indicators designed to assess the status, trends, and policy targets for Mediterranean coastal wetlands. These indicators should prioritize evaluating the extent and condition of coastal wetland habitats, tracking trends in restoration efforts, and assessing the condition and representativity of these ecosystems within protected sites. Additionally, we propose adding indicators to support efforts in achieving the targets of the **Paris Agreement by 2030**, focusing on the GHG abatement capacity of wetland restoration measures and reducing vulnerability to climate change.

The table 1 provides a framework for monitoring and evaluating the effectiveness of policy implementation across Mediterranean countries, ensuring alignment with the Integrated Monitoring and Assessment Programme (IMAP) and facilitating comprehensive regional assessments with Regional Strategies, Programmes and Plans. It illustrates the connection between the policy indicators, proposed metrics, and their relationship to the IMAP Common Indicators. In some instances, highlighted within the table, the proposed metrics offer additional relevant evidence to address gaps and further support certain policy indicators. This is particularly true for metrics related to assessing and monitoring hydrological connectivity, prioritization of restoration, greenhouse gas emissions, and funding prioritization in coastal wetlands. Alongside these policy indicators, an additional set of associated metrics is proposed to provide quantitative measures to translate the broad goals and objectives of the policies into specific, actionable data points (Table 1).

These metrics, centered on habitat extent, wetland condition, restoration, connectivity, and ecosystem services, offer a holistic framework to assess progress in enhancing the health, restoration, and functionality of Mediterranean coastal wetlands. Additionally, the framework is aligned with international and regional objectives, such as EU targets and Ramsar goals, reinforcing the value of conservation efforts and stressor mitigation.

Schematic representation of the initial proposed set of outcome policy indicators for 2030 regional targets designed to assess the status and monitor progress related to Mediterranean coastal wetlands aligned with the Barcelona Convention and EU Green Deal.

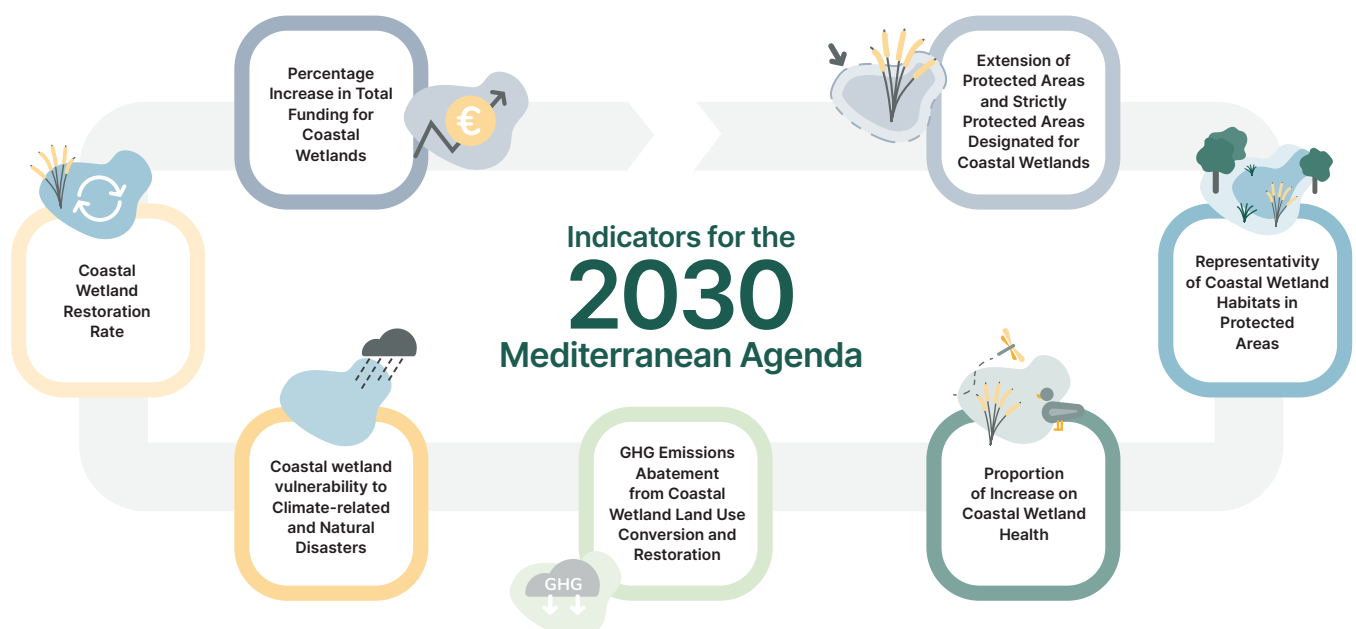


Table 1. Proposed set policy outcome indicators and metrics to build evidence and foster greater integration for Mediterranean countries to streamline reporting processes with the Barcelona Convention and EU Green Deal. Indicators should be disaggregated per country and at Mediterranean level.

POLICY OUTPUT	METRIC TITLE	UNITS	DESCRIPTION	BARCELONA CONVENTION	
				RELATION TO IMAP COMMON INDICATORS (CI)	CONTRIBUTES TO:
Extension of Coastal Wetlands Protected and Strictly Protected 	Total coastal wetland extent in protected areas and in strict protected areas	Percentage of area coverage (km ²)	Percentage change on spatial cover of total coastal wetlands protected and strictly protected from the total area of protected areas	Partly relates to <i>CI 1: Habitat distributional range to also consider habitat extent as a relevant attribute</i>	- Post 2020 SAPBIO - Strategy of MCPAs and OECMS
	Total coastal wetland extent designated as Ramsar sites and/in SPAMI	Area coverage (km ²)	Total area of coastal wetlands designated as Ramsar sites and within the SPAMI network	Partly relates to <i>CI 1: Habitat distributional range to also consider habitat extent as a relevant attribute</i>	- Post 2020 SAPBIO - Strategy of MCPAs and OECMS
	Total coastal wetland protected as a proportion of coastal wetlands	Percentage of area coverage (km ²)	Percentage change on spatial cover of coastal wetlands protected as a percentage of the total coastal wetland extent.	Partly relates to <i>CI 1: Habitat distributional range to also consider habitat extent as a relevant attribute</i>	- Post 2020 SAPBIO - Strategy of MCPAs and OECMS
Representativity of Coastal Wetland Habitats in Protected Areas 	Spatial cover of different coastal wetland habitats in protected areas	Percentage of area coverage (km ²)	Percentage on coastal wetland extent data by habitat type (e.g., salt marshes, mudflats)	Partly relates to <i>CI 1: Habitat distributional range to also consider habitat extent as a relevant attribute</i> Partially relates to <i>CI 25: Land-cover change (habitat types of Inland marshes, peat bogs, salt marshes, salt flats, intertidal mudflats)</i>	- Post 2020 SAPBIO - Strategy of MCPAs and OECMS
Coastal Wetland Habitat Health 	Coastal wetland habitat condition	Percentage change in condition of different coastal wetland habitats	Measures changes in the quality of various coastal wetland habitats over time, including factors such as vegetation health, soil quality, and water clarity.	Partly relates to <i>CI 2: Condition of the habitat's typical species and communities</i>	Post 2020 SAPBIO
	Coastal wetland biodiversity (species) condition	Percentage change in condition of different coastal wetland species	Tracks changes in the condition of species diversity and abundance within different coastal wetland habitats.	Partly relates to <i>CI 2: Condition of the habitat's typical species and communities</i> Partly relates to <i>CI 4: Population abundance of selected species</i>	Post 2020 SAPBIO
	Deterioration status	Area coverage (km ²) of deteriorated coastal wetlands; Level of deterioration of different types; Area coverage (km ²) of drained coastal wetlands and organic soils	Assesses the extension of total deterioration of coastal wetlands based on parameters such as pollution levels, invasive species presence, drainage, and physical alterations.	Partly relates to: <i>CI 13: Concentration of key nutrients in water column</i> <i>CIs 17-21: Concentration of key harmful contaminants on coastal and marine ecosystems and human health</i> <i>CI 6: Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species</i> <i>CI 15: Location and extent of the habitats impacted directly by hydrographic alterations</i>	- Regional Plan on Urban Wastewater Treatment - Regional Plan on Sewage Sludge Management - Regional Marine litter Plan
	Risk posed by invasive species	Percentage of area coverage to total coastal wetland area (km ²); Population size; Number of Invasive species	Assesses the size of populations and extension risk posed by invasive species to natural coastal wetland ecosystems.	<i>CI 6: Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species</i>	Post 2020 SAPBIO
Coastal Wetland Restoration Rate 	Hydrological connectivity	Km of free-flowing rivers connected to coastal wetlands being restored	Evaluates changes in water flow patterns and connectivity between wetland areas		Post 2020 SAPBIO
	Surface and groundwater restoration	Ecological and chemical threshold values	It integrates multiple dimensions of surface and groundwater status, particularly quality and quantitative to examine trends on water restoration efforts.	Partly relates to: <i>CI 13: Concentration of key nutrients in water column;</i> <i>CIs 17-21: Concentration of key harmful contaminants on coastal and marine ecosystems and human health</i>	- Post 2020 SAPBIO - Regional Plan on Urban Wastewater Treatment - Regional Plan on Sewage Sludge Management - Regional Marine litter Plan

				BARCELONA CONVENTION	
POLICY OUTPUT	METRIC TITLE	UNITS	DESCRIPTION	RELATION TO IMAP COMMON INDICATORS (CI)	CONTRIBUTES TO:
Coastal Wetland Restoration Rate 	Pollutant reduction effectiveness	Percentage decrease in concentrations of key pollutants per wetland	Evaluates the trend reductions in pollutant levels to meet the targets.	Relates to: <i>CI 17-21: Concentration of key harmful contaminants on coastal and marine ecosystems and human health</i> <i>CI 22: Trends in the amount of litter washed ashore and/or deposited on coastlines</i> <i>CI 23: Trends in the amount of litter in the water column including microplastics and on the seafloor.</i>	- Regional Plan on Urban Wastewater Treatment - Regional Plan on Sewage Sludge Management - Regional Marine litter Plan
	Barrier impact index	Percentage change in natural water flow patterns due to the elimination of barriers	Assesses the impact of physical barriers (e.g., roads, dams, levees, dikes, ports) on the ecological connectivity and the hydrological flow (marine and coastal).	Relates to: <i>CI 15: Location and extent of the habitats impacted directly by hydrographic alterations.</i>	
	Restoration potential	National plans that prioritize coastal wetland areas for restoration; Area coverage (km ²) of habitats of coastal wetlands	Assesses efforts to help identify and prioritize areas for coastal wetland restoration from the proportion deteriorated		Post 2020 SAPBIO
	Restoration progress	Area coverage (km ²) of coastal wetlands restored and under restoration; Number of countries; Area coverage (km ²) of coastal wetlands with restored drainage systems.	Percentage change in condition or extent specifically attributable to coastal wetland areas under active restoration or restored from the percentage of area deteriorated.		- Post 2020 SAPBIO - Regional Plan on Urban Wastewater Treatment - Regional Plan on Sewage Sludge Management
Vulnerability to Climate-Related and Natural Disasters 	Coastal wetland vulnerability	Vulnerability Index Score	Assess the vulnerability of coastal wetlands to various environmental stressors, particularly climate change impacts such as sea-level rise, storm surge, and increased frequency of extreme weather events	Partially relates to <i>CI 25: Land-cover change</i>	- Post 2020 SAPBIO - Regional Climate Change Adaptation Framework for Marine and Coastal Areas
GHG Emissions Abatement from Coastal Wetland Land Use Conversion and Restoration 	Land use conversion area	Percentage change of converted coastal wetland area	Proportion at which coastal wetlands are converted to other land uses over time (from reference reporting period) to assess the effectiveness of land use policies to conserve natural carbon sinks such as wetlands.	Partly relates to <i>CI 1: Habitat distributional range to also consider habitat extent as a relevant attribute</i> <i>CI 16: Length of coastline subject to physical disturbance due to the influence of man-made structures</i> <i>CI 25: Land Cover change.</i>	
	Extended coastal wetland habitat loss/gain ratio	Area coverage (km ²) of total coastal wetlands	Compares the area of wetland habitats lost to development or other uses against the area gained through conservation and restoration activities.	Partly relates to <i>CI 1: Habitat distributional range to also consider habitat extent as a relevant attribute</i> <i>CI 16: Length of coastline subject to physical disturbance due to the influence of man-made structures</i> <i>CI 25: Land Cover change.</i>	Post 2020 SAPBIO
	GHG emissions and removals from land converted wetlands	Annual GHG emissions and removals per hectare following wetland conversion	Tracks losses and emissions of CO ₂ , methane, and nitrous oxide, in CO ₂ equivalents, resulting from the conversion of coastal wetlands to other land uses.		
	GHG from coastal wetland restoration	Annual GHG emissions per hectare following wetland restoration	Tracks the net balance of CO ₂ , methane, and nitrous oxide, in CO ₂ equivalents, resulting from coastal wetlands restoration.		
Overall funding sources for Coastal Wetlands 	Coastal wetland funding	Euros invested per reporting period	Evaluate the overall funding landscape for coastal wetlands, assess the availability, from various sources, including government agencies, non-governmental organizations, international bodies, and private sector contribution		Post 2020 SAPBIO



Delta plain of the Medjerda River, Tunisia. January 2021. © European Union, Copernicus Sentinel-2 imagery.

Integrating advanced technologies and collaborative approaches for monitoring coastal wetlands

As technology advances, countries will be able to complement and enhance the information used to support the indicators and metrics for monitoring coastal wetlands. Emerging technologies, such as high-resolution satellite imagery, autonomous drones, and artificial intelligence (AI) algorithms, offer today unprecedented capabilities for data collection and analysis. These tools can provide detailed and accurate information on various aspects of wetland ecosystems, including changes in vegetation cover, hydrological patterns, and biodiversity of wetland habitats.

By integrating these technological advancements with existing monitoring frameworks, countries can achieve a more comprehensive understanding of the ecological health of coastal wetlands. This enhanced capability will enable more precise tracking of policy progress in alignment with various international goals and improve assessment of conserva-

tion measure effectiveness. Furthermore, as the existing technological toolkit expands, it will enable more proactive management approaches, such as creating early warning systems for pollution or habitat degradation, ultimately supporting the long-term sustainability and resilience of these critical ecosystems.

In addition to technological advancements, collaborative approaches with local institutions and stakeholders play a crucial role in the effective monitoring and management of coastal wetlands. Regional cooperation among Mediterranean countries, as well as partnerships with research institutions and organisations together with local communities, will further enhance the capacity to implement integrated management strategies and support the restoration and conservation of the Mediterranean coastal wetlands for nature, climate and people.

References and guideline documents

1. Trombetti *et al*, 2022. Mapping and assessment of the state of wetland ecosystems: a Mediterranean perspective.
2. Maes, J. *et al*. 2020. Mapping and Assessment of Ecosystems and their Services: An EU ecosystem assessment.
3. MedECC, 2023. (Draft) Special Report Climate and Environmental Coastal Risks in the Mediterranean.

RESTORE4Cs is a Horizon Europe project that aims to evaluate the effects of restoration actions on wetlands' ability to mitigate climate change and deliver a range of ecosystem services, using an integrative socio-ecological systems approach. More information is available at: <https://www.restore4cs.eu/>



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