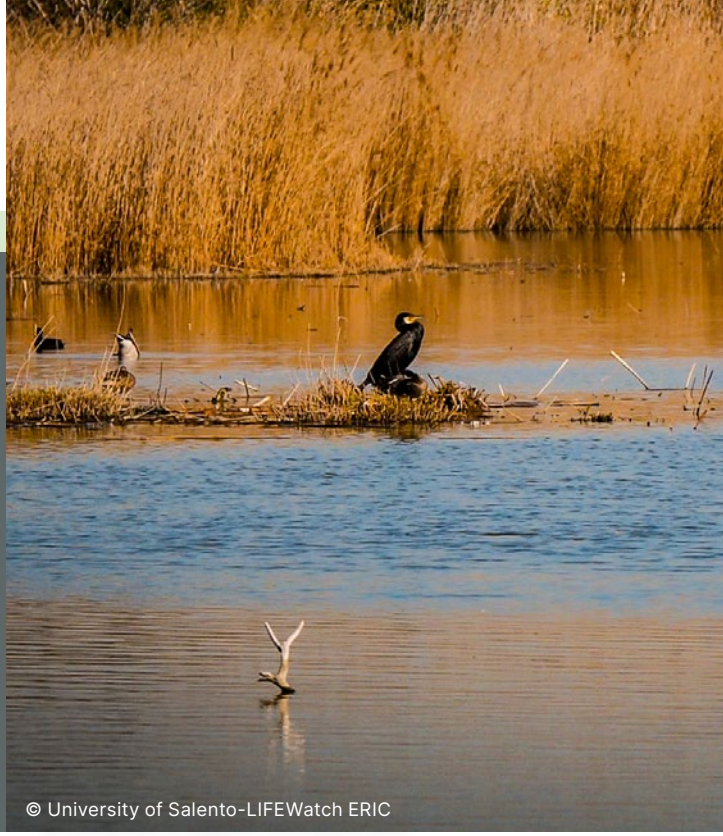
POLICY BRIEF

Advancing a coherent framework for assessing European coastal wetland condition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Introduction

Coastal wetlands are among the most productive ecosystems, providing essential benefits for both biodiversity and people, such as food, flood protection, and carbon sequestration. Yet these ecosystems are often overlooked within policy frameworks, which is reflected, among other things, in the lack of a clear definition of coastal wetlands—what they are and what they represent. **This approach contributes to persistent data, monitoring, and policy gaps that limit effective management**.

Definition of coastal wetlands

The Mapping and Assessment of Ecosystems and their Services (MAES) framework provided the first EU-wide classification of ecosystems[5], but it largely focuses on inland wetland systems. As a result, coastal ecosystems are dispersed across categories such as dunes, beaches, and transitional waters. This fragmentation has limited the ability to capture the ecological diversity and spatial extent of coastal wetlands and has overlooked key habitats—including intertidal flats, riparian zones, rice fields, and brackish and freshwater marshes. Despite their ecological importance and exceptional carbon storing capacity, coastal wetlands are still frequently categorised under broad "marine" or "transitional water" classes.

KEY MESSAGES

- **The European Coastal Ecosystem Assessment – implemented by Restore4Cs - has made significant steps by providing an ecological definition and harmonized mapping**, drawing from the European Environment Agency (EEA) extended wetland layer (2018), Joint Research Centre (JRC) seagrass data (2022), and the EUNIS habitat classification.
- **A newly developed map of coastal wetland ecosystems in Europe provides the first consistent hydro-ecological baseline for these vital areas**. Spanning 238,780 km², this map covers both marine (33%) and terrestrial/transitional (67%) regions within coastal watersheds—where land meets the ocean or other large bodies of water—offering a comprehensive foundation for future conservation and management efforts.
- **Coastal wetlands extend across Europe's marine basins, with the largest areas found in deltas and estuaries**. Notably, the Atlantic (47.5%), Boreal (14.3%), and Mediterranean (11.6%) biogeographic regions support extensive wetland coverage.
- **Continued Loss of Wetlands: from 2000 to 2018, coastal wetlands in Europe declined by 1.1%** due to land conversion. Urbanization (6%) and agricultural expansion (20%) remain major drivers of this ongoing loss, despite efforts to conserve these vital ecosystems.
- **Despite progress in mapping coastal wetlands, critical data gaps remain**. Outdated datasets, such as Corine Land Cover and EMODnet Seagrasses, hinder effective planning, while limited in-situ monitoring restricts our understanding of wetland health. Real-time monitoring and more comprehensive data are essential for future conservation and restoration efforts.

The present work - done in the context of the Restore4Cs Horizon Europe project - advances a harmonised definition of coastal wetlands, aligned with the Ramsar Convention on Wetlands (1971), that captures the full land–sea continuum where salt, brackish, and fresh waters interact.

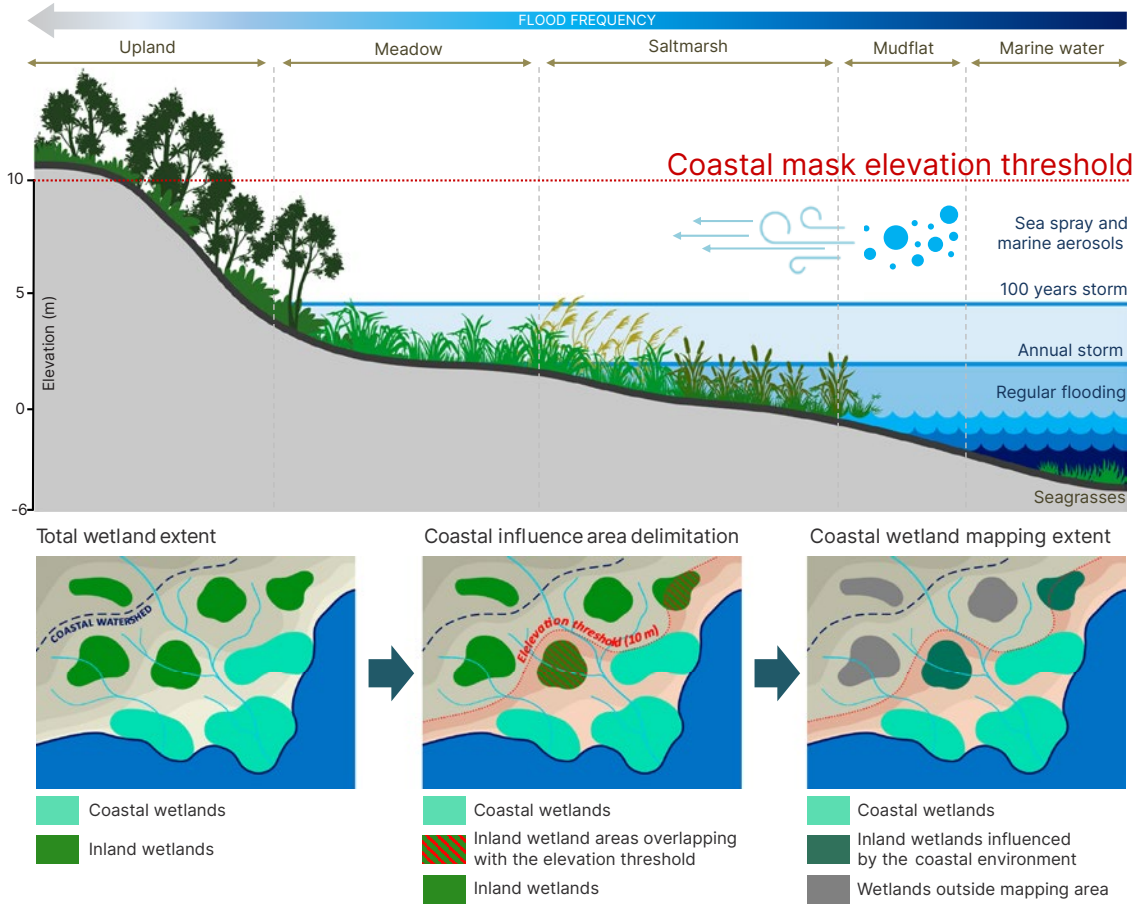
The definition recognises the wide diversity of habitats found in Europe's coastal watersheds—from seagrass meadows and tidal marshes to freshwater marshes, flats, creeks, and saltpans—across lagoons, estuaries, fjords, deltas, and other transitional systems[6,7]. For more on the definition refer to Policy Brief Unlocking potential of coastal wetlands in Europe: Integration into National Restoration Plans[4].

Mapping the extent of European coastal wetlands

Building on the refined definition, a harmonised spatial **mapping** approach was developed to delineate coastal wetlands across Europe (Figure 1). This method integrates watershed delineation, altitude thresholds, hydrological sub-basin delineation, coastal influence zones, and flood and tidal dynamics.

The resulting coastal wetland extent map captures the ecological processes that structure coastal wetlands and establish a consistent EU-wide baseline for monitoring their extent and condition. This spatial foundation supports coherent assessments across Member States and strengthens integration of coastal wetlands into EU Nature, Water, and Climate policy frameworks.

Figure 1. Workflow for mapping coastal wetland extent identifying the underlying habitat types hosted in the influence zones



Coastal Wetland Extent and Dominant Habitat Types

European coastal wetlands cover ~238,780 km², representing over one-third (36.3%) of Europe's total wetland area (EEA extended wetland layer, 2018). They are therefore among the continent's most extensive and ecologically significant wetland domains.

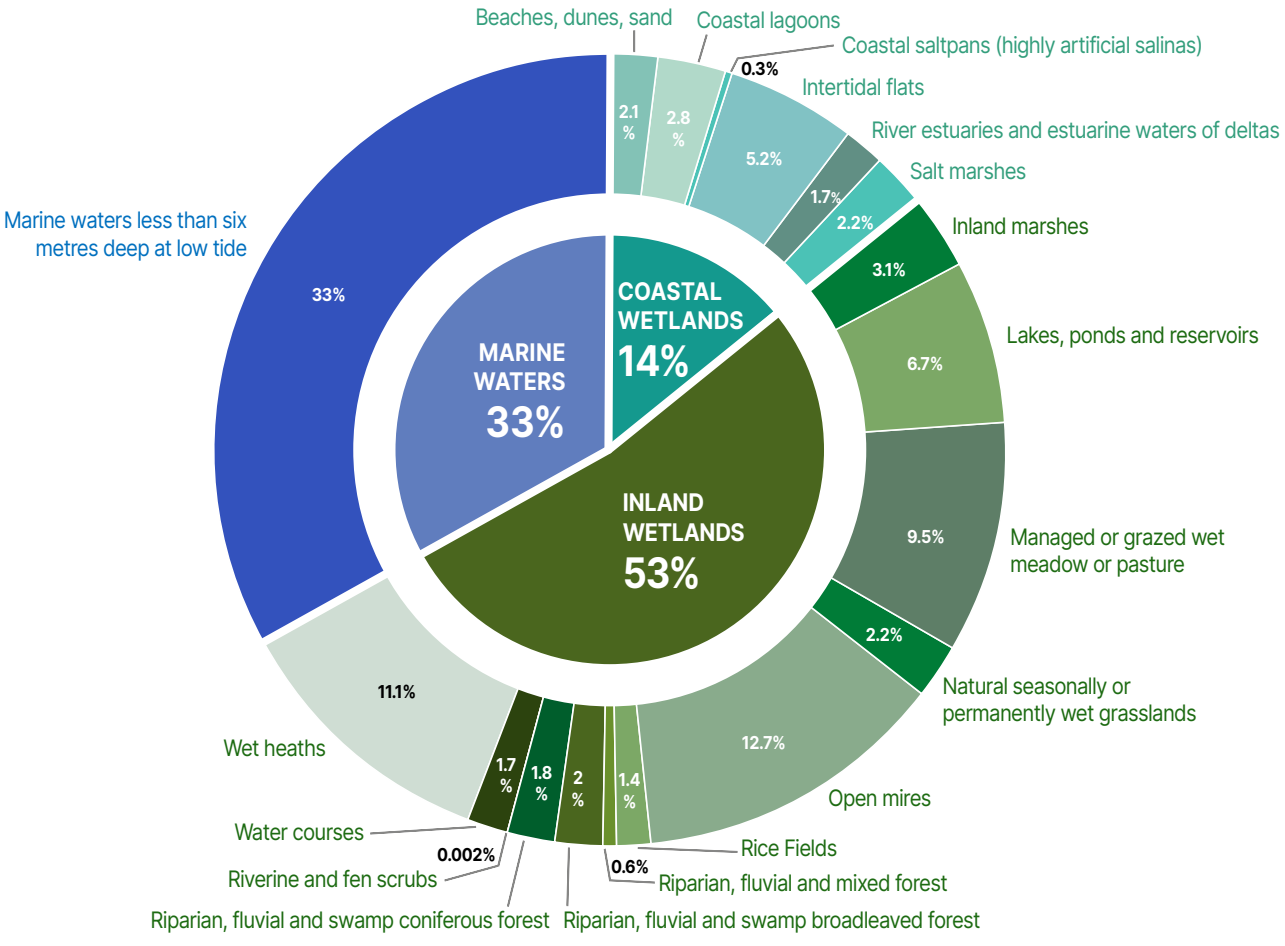
The overall typology includes:

- 33% marine waters,
- 14% strictly coastal habitats, and
- 53% other wetland habitat types within coastal watersheds.

The dominant strictly coastal wetland habitats include tidal marshes, intertidal flats, and seagrass meadows, though their abundance varies by region (Figure 2):

- Tidal marshes dominate the Atlantic and North Sea coasts.
- Intertidal flats are extensive in the Wadden Sea and similar shallow estuarine systems.
- Seagrasses, present in shallow marine waters and intertidal flats are concentrated in Mediterranean and southern European waters.
- Coastal lagoons, deltas, and estuaries further enrich the habitat mosaic, reflecting Europe's highly diverse geomorphological settings.

Figure 2. Percentage of wetland habitat cover in Europe



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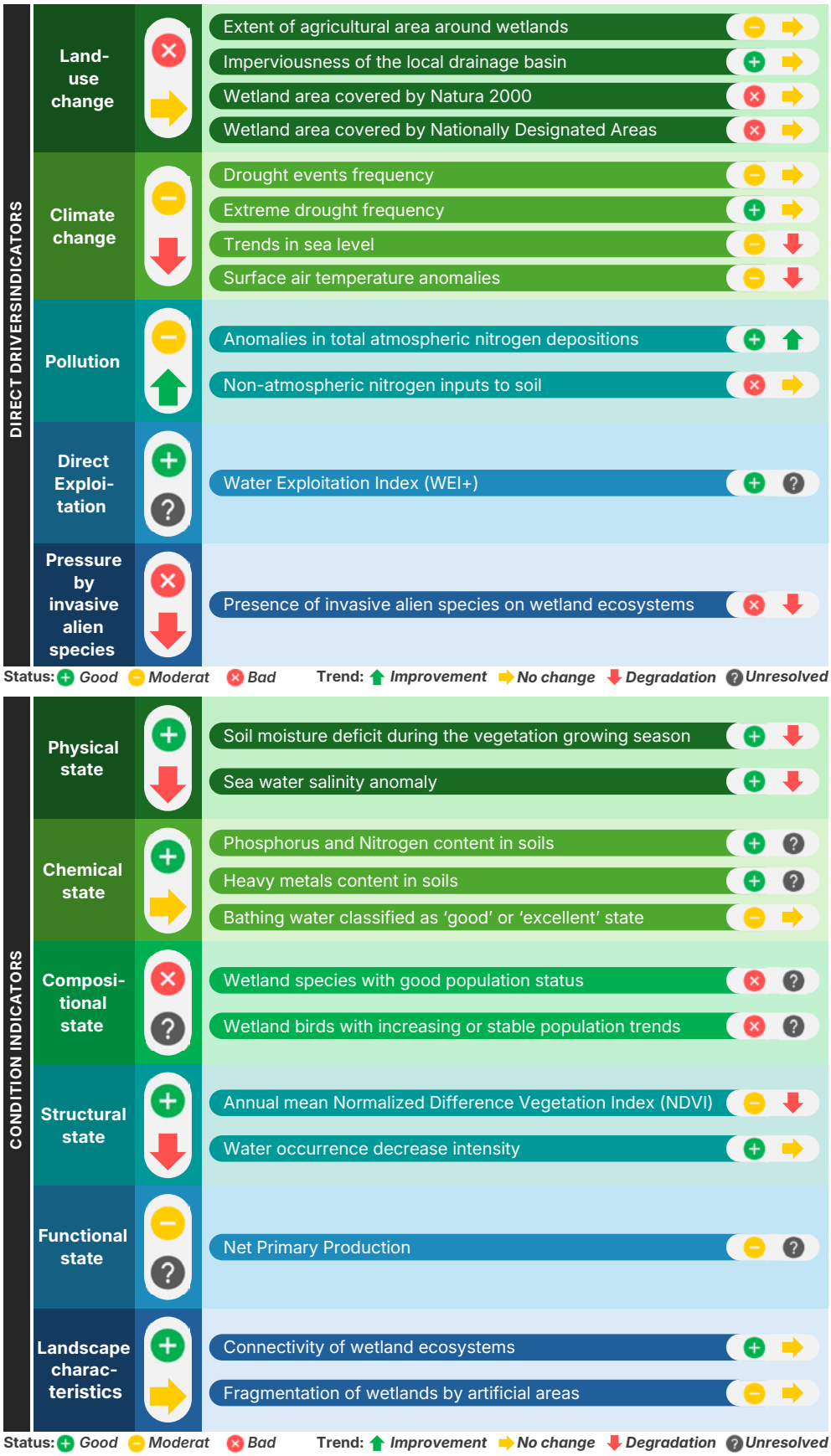
Assessing the direct drivers on and condition of coastal wetlands

Drawing on advances in MAES, IPBES, and recent European assessments[5, 8, 10], a harmonised, policy-relevant indicator set has been developed to **assess the direct drivers on and condition of coastal wetlands**. It incorporates authoritative datasets from EEA, JRC, Copernicus, EMODNet and other European sources covering indicators to assess the extent, the pressures, and the condition of these critical habitats (the extended list of indicators, input data and reference values is accessible through this link).

Using the MAES2IPBES framework for assessing European Ecosystems and their condition, the condition indicators assessed in Restore4Cs were grouped into physical, chemical, compositional, structural/functional, and landscape categories (Figure 3). Overall, the results indicate a progressive erosion of ecological resilience, highlighting the need for stronger monitoring and adaptive management to halt degradation. Key findings include:

- Widespread long-term declining trends since 2000, even when current coastal wetland condition is moderate or good,
- Land-use change, climate pressures, and invasive species are the most severe and universal drivers,
- Nutrient pressures show some improvement proving that some policy measures (i.e. the EU Nitrate Directive) are reaching their targets, but
- Biodiversity indicators reveal persistent declines, with a number of species remaining in poor conservation status.
- The Physical and Structural states are currently assessed as good, though the predominant negative trends are expected to threaten future conditions.
- Chemical status is generally good, but substantial data gaps prevent trend analysis and therefore these results shall be interpreted with caution.

Figure 3. Trends in coastal wetland condition, 2000–2018



Relevance of coastal wetlands definition and monitoring for legislation and strategic frameworks

Integrating coastal wetlands definition and monitoring into the decision-making process, would be crucial for improving coastal wetland conservation and restoration and thus, meeting the ambitions of the relevant EU policies, as well as global and Regional Sea Conventions, notably:

- **Ramsar Convention on Wetlands** – promotes conservation and sustainable wetland use of wetlands, including coastal wetlands systems to a depth of 6m at low tide.
- **EU Nature Restoration Regulation (NRR)** – requires Member States to restore degraded ecosystems,
- **EU Biodiversity Strategy for 2030** – calls for effectively protecting and restoring habitats,
- **EU Land Use, Land Use Change and Forestry (LULUCF) Regulation** – ensures land use, land-use change and forestry activities contribute to climate mitigation by increasing carbon removals.
- **EU Water Framework Directive** – aims to protect and restore clean water across Europe and achieve good ecological and chemical status for all water bodies.
- **EU Marine Strategy Framework Directive** – promotes sustainable management of marine environments to achieve good environmental status of EU seas.

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Strengthening Europe´s coastal wetlands - policy recommendations

The following policy recommendations focus on improving knowledge, better integrating of scientific evidence into policymaking, and enhancing coherence across sectors.

Strengthen Europe's Knowledge Base through Integrated Monitoring

Good knowledge base is one of the critical requirements for an adequate decision-making. In this context, it is important to:

- Consolidate observation efforts under Copernicus and the EEA to reduce fragmentation and improve comparability.
- Ensure annual Copernicus updates of coastal wetland maps to track rapid changes.
- Establish reference conditions and thresholds for hydrology, vegetation, water quality, and carbon fluxes.
- Support Member States in incorporating indicators into the Nature Restoration Law, LULUCF Regulation, Water Framework Directive, and Marine Strategy Framework Directive.

Embed Harmonised Scientific Indicators into EU Policy Implementation

The MAES2IPBES framework - adapted by RESTORE4Cs - to assess Coastal wetland ecosystem condition - should be adopted as the standard for coastal wetland monitoring across Europe. This will enable:

- Consistent identification of wetland loss,
- Detection of degradation hotspots,
- Prioritisation of restoration areas, and
- More efficient allocation of investment.

Improve Policy Coherence Across Water, Nature, and Climate Agendas

Effective restoration requires:

- Stronger alignment between EU nature, water, agriculture, and climate policies,
- Harmonised spatial and temporal data collection across Member States, and
- Clear, measurable targets to guide action and track progress.

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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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