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Centro Euro-Mediterraneo
sui Cambiamenti Climatici

CMCC's Views on the European Ocean Act

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Executive Summary

The Euro-Mediterranean Center on Climate Change (CMCC) welcomes the European Ocean Act and the parallel revision of the Maritime Spatial Planning Directive (MSPD) as an opportunity to modernise EU ocean governance, close the gap between planning ambition and ecological outcomes, and strengthen the coherence and effective implementation of maritime governance across all EU sea basins. Drawing on its integrated expertise in high-resolution ocean and climate modelling, operational oceanography, and environmental economics, as well as its active role in Copernicus Marine, the EU Digital Twin of the Ocean, EMODnet and Destination Earth, CMCC brings a distinctive focus on the land–sea interface, Europe's most climate-exposed frontier.

CMCC's contribution sets out seven priority objectives for the revision: (1) embedding climate-smart, three-dimensional and temporally dynamic planning aligned with EU climate targets and Good Environmental Status; (2) establishing centralised, interoperable ocean data-sharing through a formal Commission-Member State forum, long-term financing, statutory EMODnet stewardship and an "interoperability-by-design" requirement; (3) advancing ocean research and innovation via institutionalised regulatory sandboxes and pilot demonstrators; (4) ensuring inclusive, participatory governance for coastal, island and outermost communities; (5) mandating ecosystem-based planning through cumulative-impact assessment; (6) integrating security considerations, including protection of critical subsea infrastructure; and (7) governing marine carbon dioxide removal on a precautionary-by-default basis alongside blue-carbon protection.

1. Introduction

The CMCC Foundation - Euro-Mediterranean Center on Climate Change - welcomes the opportunity to contribute to the public consultation on the European Ocean Act and the revision of the Maritime Spatial Planning Directive (MSPD).

As a leading European multidisciplinary research center dedicated to the study of climate change and its interactions with society, economy, and the environment, CMCC's work spans ocean modelling and forecasting, operational oceanography, coastal and marine climate services, environmental impact assessment, and climate-economic analysis. CMCC contributes actively to the Copernicus Marine Environment Monitoring Service (CMEMS), the EU Digital Twin of the Ocean (DTO), EMODnet, and the Destination Earth initiative. A central pillar of our scientific mission is the application of high-resolution oceanographic and climate data to the land-sea interface: coasts, Europe's most climate-exposed frontier and the domain where governance failures carry the highest human cost.

CMCC recognizes the MSPD Directive's value as it has established a common planning culture across EU Member States and improved coordination of maritime uses. Overall, the CMCC observes that MSPD enabled growth of maritime economies, sustainable use of marine resources, planning of existing and future uses, and increasing knowledge in maritime areas. On environmental protection, however, MSPD fell short due to structural gaps between planning ambitions and ecological outcomes. Maritime spatial plans are currently designed and assessed primarily in terms of economic use and spatial coordination; their contribution to marine environmental status remains weak.

CMCC highlights the importance of the use and exploitation of coastal and marine satellite and in situ observations (e.g. physical, ecological, biodiversity, socio-economic) and the modelling, AI and Digital Twin of the Ocean assets to inform a science-based MSP process.

CMCC values cross-border cooperation between neighboring countries for managing shared sea areas. Beyond just a governance mechanism, the sea-basin approach is a scientific necessity, given that marine ecosystems, pollution pathways, climate stressors, and migratory species do not respect national boundaries.

2. Priority Objectives

From CMCC's perspective, the revision should concentrate on 7 interrelated objectives.

2.1 Climate-Smart Maritime Governance

As climate change is reshaping coastal and marine space, climate-smart planning must be embedded into marine spatial planning instruments and processes.

Sea-level rise, intensifying storm surges, ocean warming, coastal erosion, acidification, and shifts in species distribution are already altering the viability and spatial logic of maritime uses across all EU sea basins.

Therefore, the MSP Directive revision should support climate-smart, ecosystem-based, and data-driven planning by integrating climate risk, cumulative impacts, land-sea interactions, and ocean observation systems.

In this context, CMCC recommends mandating climate-risk screening for National Ocean Plans using Copernicus-derived products and hazard maps, incorporating cumulative climate-impact assessments into licensing decisions based on long-term projections, and adopting a three-dimensional and temporally dynamic planning framework. Plans should align with EU climate targets and Good Environmental Status (GES) objectives, strengthen land-sea governance through integrated coastal zone management, and embed source-to-sink dynamics across all planning dimensions.

CMCC also supports embedding multi-use of maritime space as a core design principle in the revised MSPD, where it enhances spatial efficiency and enables co-existence of uses within ecological limits.

2.2 Ocean Data-Sharing and Centralized Monitoring

Reliable ocean observation and data, its monitoring, as well as the capacity, integrate, and share this information across borders and sectors are the foundation of credible maritime spatial planning. Yet, the European ocean observation system remains fragmented, chronically under-resourced, and too dependent on project-based funding.

Against this background, CMCC supports improved governance at national level, EU level, regional (sea basin) level, and EU level to contribute internationally. This should be accompanied by operational mechanisms, interoperable data systems, monitoring and reporting tools, and climate-smart, ecosystem-based planning approaches to ensure that targets are translated into effective implementation.

To this end, CMCC recommends:

- **The establishment of formal Commission–Member State forum** with a degree of decision-making authority, advisory role to the Commission and Member States,

as well as overseeing role the development and implementation of maintaining a European Ocean Observation Investment Plan

- **Long-term financing** for the European Ocean Observation System (EOOS).
- **Formalised long-term stewardship for EMODnet** as Europe's marine data backbone, with a statutory mandate to host MSFD reporting data, nature-restoration obligations data, and a single reporting-submission pathway for Member States.
- **A binding 'interoperability-by-design' requirement** for all publicly funded ocean data collection systems.
- **Structured integration of citizen science** into the data value chain, with quality-assurance frameworks, calibration protocols, and defined contribution pathways into operational datasets.

Moreover, CMCC's coordination of CoastPredict, the UN Ocean Decade-endorsed programme for coastal ocean observing and forecasting, and its GlobalCoast Experiment, which is building a network of over 210 pilot sites across the world's coastal regions, demonstrates the value of this pilot-based approach at international scale. GlobalCoast pairs local, fit-for-purpose observing and modelling systems with structured stakeholder engagement, allowing findings on hazard early-warning, ecosystem monitoring, and community resilience to be tested locally and then compared and replicated across very different coastal settings. The revised MSPD should draw on this model, ensuring that EU sea-basin pilot demonstrators are similarly designed for cross-comparison and knowledge transfer, and that European coastal science programmes remain interoperable with, and contribute to, global coastal observing efforts such as CoastPredict.

2.3 Advancing Ocean Research and Innovation

CMCC supports the inclusion of ocean research, knowledge, and innovation as a priority objective for the revised MSPD. Europe has made substantial investments in world-class ocean data infrastructure, such as EMODnet, Copernicus Marine, the Digital Twin of the Ocean. Yet, the governance frameworks within which planning authorities operate have not kept pace with the capabilities these tools offer.

CMCC proposes the institutionalization of **regulatory sandboxes and pilot demonstrators** as a bridge between digital applications and their uptake by planning authorities and end-user communities:

Sandboxes would allow ports, coastal municipalities, sea-basin and fisheries authorities to test DTO-based applications in real planning scenarios outside standard licensing constraints. In parallel, pilot sites co-designed with regional and local authorities should be established across all EU sea basins to validate specific

applications. Their findings would be codified as best-practice guidance through the Maritime Spatial Planning Platform to support replication across Member States.

2.4 Inclusive and Participatory Governance

CMCC supports the stronger inclusion of coastal communities, island communities, and outermost regions in MSP processes. These communities bear the highest direct costs of marine environmental degradation and climate change, and hold invaluable local knowledge of marine and coastal ecosystems built up through direct interaction with their environment, yet their voices and their knowledge are systematically under-represented in planning processes dominated by national administrations and large industrial sectors. The revised MSPD should therefore establish binding stakeholder engagement standards, including specific participation mechanisms for coastal and island municipalities in the development of National Ocean Plans, enhanced provisions for outermost regions whose ecological and socioeconomic vulnerabilities require tailored planning approaches, and the integration of ocean literacy programmes into MSP processes to connect scientific observation and planning with sea-dependent communities.

2.5 Ecosystem-Based Planning

Maritime activities must operate within ecological boundaries, yet under current MSFD framework lacks mandatory cumulative impact assessments, ecosystem-capacity thresholds, or a binding link to Good Environmental Status (GES).

CMCC proposes that **cumulative impact assessment** become a mandatory procedural requirement, with spatial plans and licensing decisions evaluated against MSFD-derived thresholds. Where those thresholds are uncertain, the precautionary principle should apply, placing the burden of proof on demonstrating GES compatibility. The MSP cycle should be formally synchronized with the revised MSFD assessment cycle, and conservation targets expanded beyond flagship species to encompass ecosystem connectivity, trophic structures, and habitat integrity.

2.6. Security and Maritime Spatial Planning

The evolving strategic context in European seas, including the protection of critical subsea infrastructure, maritime route, and the dual-use implications of offshore energy and data-cable networks, creates planning challenges that cannot be addressed through environmental and economic governance frameworks alone. Security considerations should be integrated into the revised MSPD by establishing mechanisms to raise and manage them within the MSP process, such as dedicated

monitoring and coordination structures, risk assessment procedures/reports, and information-sharing protocols with relevant authorities.

2.7 Marine CDR and Blue Carbon

Marine carbon dioxide removal (CDR) approaches, including ocean alkalinity enhancement, macroalgae cultivation, and seabed carbon storage, are advancing rapidly. In the absence of an EU governance framework, there is risk of either premature deployment without adequate evidence, or of regulatory paralysis that forecloses legitimate scientific exploration. CMCC recommends the adoption of a precautionary-by-default **governance framework for marine CDR** requiring robust scientific assessment before any deployment authorization, aligned with the Carbon Removal Certification Framework (CRCF) Regulation.

High-standard MRV protocols drawing on observation systems and building on MSFD monitoring obligations should be put into place, supported by DTO-based scenario modelling to assess the climate effectiveness, ecological risks, and spatial interactions of different marine CDR approaches across EU sea basins.

Furthermore, **protection and restoration of blue-carbon ecosystems**, such as seagrass, saltmarshes, kelp forests, **should be identified as a priority pathway**, given their co-benefits for biodiversity, coastal protection, and fisheries.

About CMCC Foundation

CMCC is a leading European multidisciplinary research center dedicated to the study of climate change and its interactions with society, economy, and the environment. Its mission is to produce advanced climate knowledge and multidisciplinary analyses and datasets by integrating state-of-the-art climate modeling with impact assessments and environmental economics.

As a strategic research infrastructure, CMCC hosts the most powerful computational facility in Italy and one of the most advanced in Europe, fully dedicated to climate change research. CMCC is one of the institutions selected by the World Meteorological Organization (WMO) to produce seasonal climate forecasts, and collaborates with a network of over 700 partner organizations across 71 countries. Since 2006, CMCC has served as Italy's National Focal Point for the Intergovernmental Panel on Climate Change (IPCC).

At a time of extraordinary change, CMCC is doubling down on its commitment to advanced applied research at the nexus of climate science and socio-economic transformation, powered by a wide adoption of advanced machine learning and data science tools. Over the next two decades, the key challenge is sustaining broad-based economic growth in the face of rapidly changing material conditions while transitioning to a low-carbon economy. CMCC addresses this through four priorities: integrating climate and socio-economic modeling for decision-making; focusing on vulnerable coastal zones using AI-driven digital twins for natural and engineered infrastructures; advancing a comprehensive understanding of the integrated carbon cycle to guide mitigation; and embedding AI across all research to enhance modeling, data assimilation, and risk assessment.

This strategic framework reinforces CMCC's commitment to producing high-impact science that drives informed decision-making and tackles climate change challenges. By doing so, CMCC continues to shape the critical knowledge needed for a more sustainable, equitable, and resilient future.

For further information about CMCC and our work, please visit www.cmcc.it.

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