

Full length article

Marine protected areas and maritime spatial planning integration dynamics across Europe

Helena Calado^{a,b,*}, Joyce Dias Gois Rodrigues de Queiroz^{a,c}, Débora Gutierrez^{a,b,c,d}, Anna Larissa Oliveira^a, Camila Pegorelli^e, Fien De Raedemaeker^f, Francisco Rafael Barboza^g, Inne Withouck^f, Javier García-Sanabria^{e,h}, Jacek Zauchaⁱ, Margarita Stancheva^j, Marina Markovic^k, Martina Bocci^l, Päivi Haapasaari^m, Riku Varjopuro^m, Alina Daiana Spinuⁿ, Ivana Stojanovic^o, Adriano Quintela^{b,p}

^a Faculty of Sciences and Technology (FCT), University of the Azores (UAc), Rua da Mãe de Deus, Ponta Delgada 9500-321, Portugal

^b Marine and Environmental Sciences Centre (MARE), Aquatic Research Network (ARNET), Faculdade de Ciências, Universidade de Lisboa, Lisboa 1749-016, Portugal

^c Faculty of Sciences and Technology (FCT), Gambelas Campus, Universidade do Algarve, Faro 8005-139, Portugal

^d Centre for Marine and Environmental Research (CIMA), Aquatic Research Network (ARNET), Universidade do Algarve, Gambelas Campus, Faro 8005-139, Portugal

^e Department of History, Geography, and Philosophy, Integrated Coastal Zone Management Research Group, University of Cadiz, Cadiz, Spain

^f Vlaams Instituut voor de Zee (VLIZ), Jacobsenstraat 1, Oostende 8400, Belgium

^g Estonian Marine Institute, University of Tartu, Mäealuse 14, Tallinn 12618, Estonia

^h University Research Institute for Sustainable Social Development (INDESS), University of Cadiz, Cadiz, Spain

ⁱ Uniwersytet Morski w Gdyni (GMU), Ulica Morska 81-87, Gdynia 81-225, Poland

^j Center for Coastal and Marine Studies (CCMS), Podvis 33, Varna 9000, Bulgaria

^k Priority Actions Programme Regional Activity Centre (PAP/RAC), Kraj SV Ivana 11, Split, Croatia

^l t-ELIKA, Giudecca 83D, Venice, Italy

^m Finnish Environment Institute (Syke), Latokartanonkaari 11, Helsinki 00790, Finland

ⁿ National Institute for Marine Research and Development "Grigore Antipa", 300 Mamaia Blvd, Constanta 900581, Romania

^o s.Pro - sustainable projects GmbH, Kärntener Str. 20, Berlin 10827, Germany

^p Oceano Azul Foundation, Lisbon, Portugal

ARTICLE INFO

Keywords:

Ocean Governance
Maritime Spatial Planning
Marine Protected Areas
Marine Policy
Conservation

ABSTRACT

Maritime Spatial Planning (MSP) has emerged as a central governance tool to balance ecological, social, and economic uses of marine space, while Marine Protected Areas (MPAs) remain essential for biodiversity conservation and ecosystem resilience. Effective integration of MPAs into MSP can enhance conservation outcomes and reduce conflicts with human activities, yet the degree of integration across the European Union (EU) remains highly uneven. This study examines how MPAs are embedded within national MSP frameworks in 20 EU Member States, aiming to classify, compare, and explain differences in integration levels. A typology of four integration levels is introduced, ranging from MPAs as primary drivers of MSP to their treatment as passive spatial layers. The methodology combines the development and application of a set of questions directed at MSP experts with the use of a decision tree and allocation criteria designed to assess responses and classify countries according to their level of MPA–MSP integration. Results reveal substantial disparities across EU Member States. Belgium, Germany, Latvia, Slovenia, Sweden and the Netherlands showed the strongest degree of integration, with conservation objectives embedded in MSP provisions and influencing cross-sectoral planning decisions. In contrast, most countries incorporated MPAs mainly through environmental assessment instruments or treated them as existing spatial layers, environmental constraints, or separate legal instruments. Key barriers include fragmented governance structures, limited translation of environmental assessments into binding spatial decisions, weak links between MSP and MPAs management, uneven monitoring and enforcement capacity, and limited mechanisms for stakeholder coordination. Advancing MPA–MSP integration requires stronger legal frameworks, adaptive management strategies, ecological connectivity, and inclusive governance processes. By providing a

* Corresponding author at: Faculty of Sciences and Technology (FCT), University of the Azores (UAc), Rua da Mãe de Deus, Ponta Delgada 9500-321, Portugal.
E-mail address: helena.mg.calado@uac.pt (H. Calado).

systematic comparison and highlighting best practices, this study provides recommendations to foster more cohesive, resilient, and biodiversity-informed marine governance.

1. Introduction

Maritime Spatial Planning (MSP) has emerged as a strategic tool to promote the sustainable use of marine resources while balancing ecological, social, and economic objectives [1,2]. Within this context, Marine Protected Areas (MPAs) are a cornerstone for biodiversity conservation, ecosystem resilience, and the long-term sustainability of marine ecosystems [3,4]. A more effective approach to marine protection involves maximizing the benefits of MPAs while minimizing the trade-offs with human activities at sea by integrating MPA planning into broader MSP and ocean zoning strategies [5,6]. However, the practical integration of MPAs into MSP remains inconsistent and often fragmented across countries and regions, reflecting a wide diversity of institutional pathways and governance models. To assess the integration level in each country, instead of using a set of vague approaches we build up a scale of integration levels.

In Europe, MSP was formally institutionalized through Directive 2014/89/EU, which established a framework for promoting the sustainable growth of maritime economies, the sustainable development of marine areas, and the sustainable use of marine resources. The Directive requires Member States to organize human activities at sea through coordinated planning processes while applying an ecosystem-based approach and considering land-sea interactions and cross-border cooperation [7]. MSP in the European Union therefore seeks to balance multiple maritime sectors, including fisheries, aquaculture, maritime transport, offshore energy, tourism, and environmental protection.

Although the Directive encourages the consideration of environmental protection, it does not explicitly mandate the integration of MPAs or conservation targets within MSP frameworks. Moreover, the designation of MPAs was already an established process prior to the adoption of the Directive [8,9]. As a result, MSP and MPA systems are developed in parallel, under distinct legal and institutional frameworks, leading to varying degrees of coordination and coherence [10,11].

Earlier empirical analyses of MSP implementation in Europe highlighted this tension between conservation and maritime development objectives. Jones et al., [12] showed that several MSP processes were driven primarily by strategic sectoral objectives, particularly energy development and broader blue growth priorities, rather than by conservation or Good Environmental Status as the central organising principle. In this sense, some MSP processes were described as closer to “strategic sectoral planning” than to fully ecosystem-based spatial planning, with conservation and MPAs often accommodated within planning rather than acting as the main driver of spatial governance.

Since then, however, the European policy context has evolved substantially. The European Green Deal, the EU Biodiversity Strategy for 2030, the 2021 Communication on a Sustainable Blue Economy, and the European Ocean Pact have progressively reframed the role of MSP from a tool mainly associated with coordinating maritime growth towards a strategic instrument for supporting ecosystem-based governance, marine protection, restoration, climate resilience and sustainable blue economy objectives [13–16]. This changing policy context makes it increasingly important to assess not only whether MPAs are recognised in MSP, but also how they influence planning objectives, spatial decisions, governance mechanisms and implementation processes.

The degree of integration between MSP and MPAs can vary considerably across jurisdictions. In some cases, conservation objectives strongly shape spatial planning processes and maritime governance, reflecting approaches in which biodiversity protection acts as a primary driver of planning. A well-known example is Australia, where the establishment of the Great Barrier Reef Marine Park triggered the development of a comprehensive MSP regime aimed at conserving

biodiversity while regulating competing maritime uses [17,18]. In other cases, MPAs exert more limited influence on broader maritime planning decisions. Conservation objectives are accommodated within planning processes but remain subordinate to other maritime priorities, as observed in some early MSP initiatives in the United States [2,19,20] and, to some extent, in Portugal [21]. Between these two ends of the spectrum, a wide range of institutional arrangements and governance approaches can be found, reflecting different ways of incorporating conservation objectives into MSP.

Despite the growing implementation of MSP across Europe, comparative assessments of how MPAs are integrated into national MSP frameworks remain limited [6,22]. This gap is increasingly relevant in the current European policy context, in which MSP is expected to contribute not only to the coordination of maritime uses, but also to biodiversity conservation, ecosystem-based management, climate resilience and the sustainable blue economy. Recent work has also framed the alignment between MSP, MPAs and other conservation approaches as a necessary step towards more integrated marine governance [22]. This is consistent with calls for ecosystem-based MSP to move beyond general principles and translate EBA into specific planning actions [23]. Understanding different degrees of integration between MPAs and MSP is therefore critical for assessing whether, and to what extent, conservation objectives are prioritized, embedded, procedurally integrated, or only marginally incorporated across marine governance frameworks.

For the purposes of this study, although the definition of MPA is the one from the International Union for Nature Conservation (IUCN), they also stress their role as a specific spatial type of conservation measures within a broader set of conservation objectives, tools, and other spatial management measures that may be incorporated into MSP. Thus, although the empirical focus of this paper is on MPAs, the analysis also considers how their broader conservation objectives and related management measures shape, support, or constrain MPAs integration within MSP frameworks.

In this context, the main objective of this study is to explore the degree of integration of MPAs within national MSP frameworks in the EU Member States, while acknowledging that MPAs form part of a broader set of conservation objectives and management measures. Specifically, the study aims to: (a) empirically assess whether, and to what extent, MPAs are prioritized, embedded, procedurally integrated, or only marginally incorporated in MSP processes across the EU; (b) identify structural gaps and systemic barriers hindering the integration of MPAs and related conservation objectives within MSP; and (c) summarize recommendations to foster a more cohesive and sustainable approach to integrate MPAs and conservation objectives into MSP.

2. Methodology

2.1. Understanding the relationship between conservation and MSP processes

This work was developed within the scope of the MSP4BIO project (www.msp4bio.eu), which brings together experts in MSP and conservation from across Europe, with contributions from the five European sea basins.

Since the specific topic of MPAs integration into MSP remains relatively underexplored in the scientific literature, an exploratory literature review on MSP assessment was conducted mainly by combining existing guidelines and policy documents addressing the integration of conservation efforts within MSP processes. The selection of documents was based on their relevance to MSP governance, biodiversity integration, ecosystem-based management, and MPA planning. Key references

included WWF [24], WWF European Policy Office [25–27], Ehler [28], UNESCO-IOC/European Commission [29], BirdLife International [30], and EC-CINEA et al. [31]. A complete list of consulted documents is provided in (see 7).

Based on the literature review, a critical discussion with the expertise of the MSP4BIO partners, a set of guiding questions was developed to examine the relationship between MPAs and MSP across EU countries (see 7). The questions addressed the following themes:

- policy and legal frameworks;
- MPA network design and ecological coherence;
- spatial analysis and mapping;
- stakeholder engagement and consultation;
- ecosystem-based management;
- adaptive management and monitoring;
- capacity building and knowledge sharing;
- evaluation and review processes; and
- SEA.

The guiding questions were applied through consultations with two local experts per country whenever possible, typically including members of MSP planning teams and/or representatives of competent MSP authorities. This interaction was of particular interest both to contextualize and analyse the plan according to the guiding question but also to validate how conservation objectives and MPAs are considered within national MSP processes. The analysis covered 20 of the 22 coastal EU countries (Belgium, Bulgaria, Cyprus, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovenia, Spain, and Sweden), representing the Baltic Sea, Black Sea, Mediterranean Sea, North Atlantic, and North Sea basins. Croatia and Greece were excluded due to the early stage of MSP development in these countries. For countries with maritime jurisdictions across multiple basins, results were considered for all basins.

2.2. Classification based on levels of integration

Given the wide disparity in approaches to the incorporation of conservation within MSP, this paper introduces and applies typologies of integration levels aimed at capturing the diversity of relationships between MPAs, conservation measures and MSP across EU Member States. These typologies resulted from a critical pre-screening of the interviews with agents and planners involved in each MSP.

Conceptually, these typologies reflect different degrees of integration between conservation and MSP, ranging from approaches associated with “strong sustainability” — in which conservation objectives act as the central organizing principle of maritime governance — to “softer sustainability” approaches, in which conservation is incorporated as one sectoral interest among multiple competing maritime uses [12]. Although the typology focuses on MPAs, the classification also considers broader conservation objectives and management measures incorporated into MSP frameworks. The proposed typologies result in four levels of integration:

1. **Conservation as the driver for MSP** – where conservation serves as the primary motivation for initiating and structuring MSP processes. This level is associated with stronger sustainability approaches [12], in which ecological protection constitutes a non-substitutable condition for maritime governance. Globally, the most emblematic example is Australia, where the establishment of the Great Barrier Reef Marine Park strongly shaped the development of MSP and marine zoning frameworks [17,18,32].
2. **MPAs fully integrated into MSP across sectors** – where conservation is embedded across broader MSP processes and influences multiple sectors and governance mechanisms. This level reflects ecosystem-based and integrative governance approaches aligned with Ecosystem-Based Approach (EBA) principles, in which conservation objectives are incorporated alongside economic and social priorities through cross-sectoral coordination, ecological considerations, and conflict-management mechanisms [1,29]. In these cases, MPAs are not treated as isolated conservation instruments, but as components of broader socio-ecological planning systems.
3. **MPAs integrated through SEA or other environmental assessment instruments** – where SEA, ecosystem-based assessments, or other environmental assessment instruments function as the primary mechanisms for incorporating conservation objectives into MSP. This includes approaches based on habitat mapping, ecological connectivity analyses, vulnerability assessments, conservation priority zones, or long-term environmental planning instruments. In these cases, conservation is integrated procedurally into MSP processes, although it may not necessarily act as the central organizing principle of maritime governance [29,33].
4. **MPAs as a layer or sector within MSP** – where MPAs are primarily considered as existing spatial constraints or designated areas to be accounted for within MSP, rather than as elements actively shaping broader planning priorities, sectoral coordination, or conservation-oriented governance objectives. This level reflects weaker or softer sustainability approaches [12], in which conservation objectives are accommodated within planning processes but have limited influence on broader spatial governance and decision-making [2,19,20].

2.3. Data analysis

Interview responses constituted the basis for the classification of countries into the four proposed MPA-MSP integration categories. Responses were compiled in Word documents to facilitate further analysis. Data extraction and organization were supported by artificial intelligence tools, specifically OpenAI’s GPT-5.5 model [34]. All AI-assisted outputs were reviewed, interpreted, and validated by the research team. All extracted information was subsequently reviewed and validated by three members of the research team who had been directly involved in the development of the guiding questions and the MSP screening framework, ensuring consistency and accuracy in data interpretation and classification.

The data analysis followed a structured process: i) each country was assessed individually using the expert-completed country guidelines (see 7), the decision tree (Fig. 1), and the allocation criteria presented in Table 1; ii) when a country exhibited characteristics associated with more than one integration level, classification was based on the dominant relationship between MPAs and MSP identified in the guidelines; iii) when the guidelines did not provide clear evidence that the allocation criteria for a higher level were met, the country was placed in the lower level; iv) a sea-basin analysis was conducted to identify regional patterns and common characteristics that could be associated with shared governance frameworks, regional sea conventions, and transboundary cooperation mechanisms; and v) countries were grouped according to their level of integration, and the responses were assessed together to identify recurring gaps, weaknesses, and implementation barriers influencing the integration of MPAs into MSP.

3. Overview of MPA-MSP nexus

The extent of integration between MPAs and MSP differs considerably across EU Member States, ranging from systems where MPAs are institutionally embedded within MSP to cases where MPAs are mainly considered as existing spatial layers or environmental constraints. No EU Member State assessed in this study was classified as Level 1, as none of the analysed MSP systems were primarily initiated or structured around conservation as the central driver. Consequently, Level 1 is not further analysed.

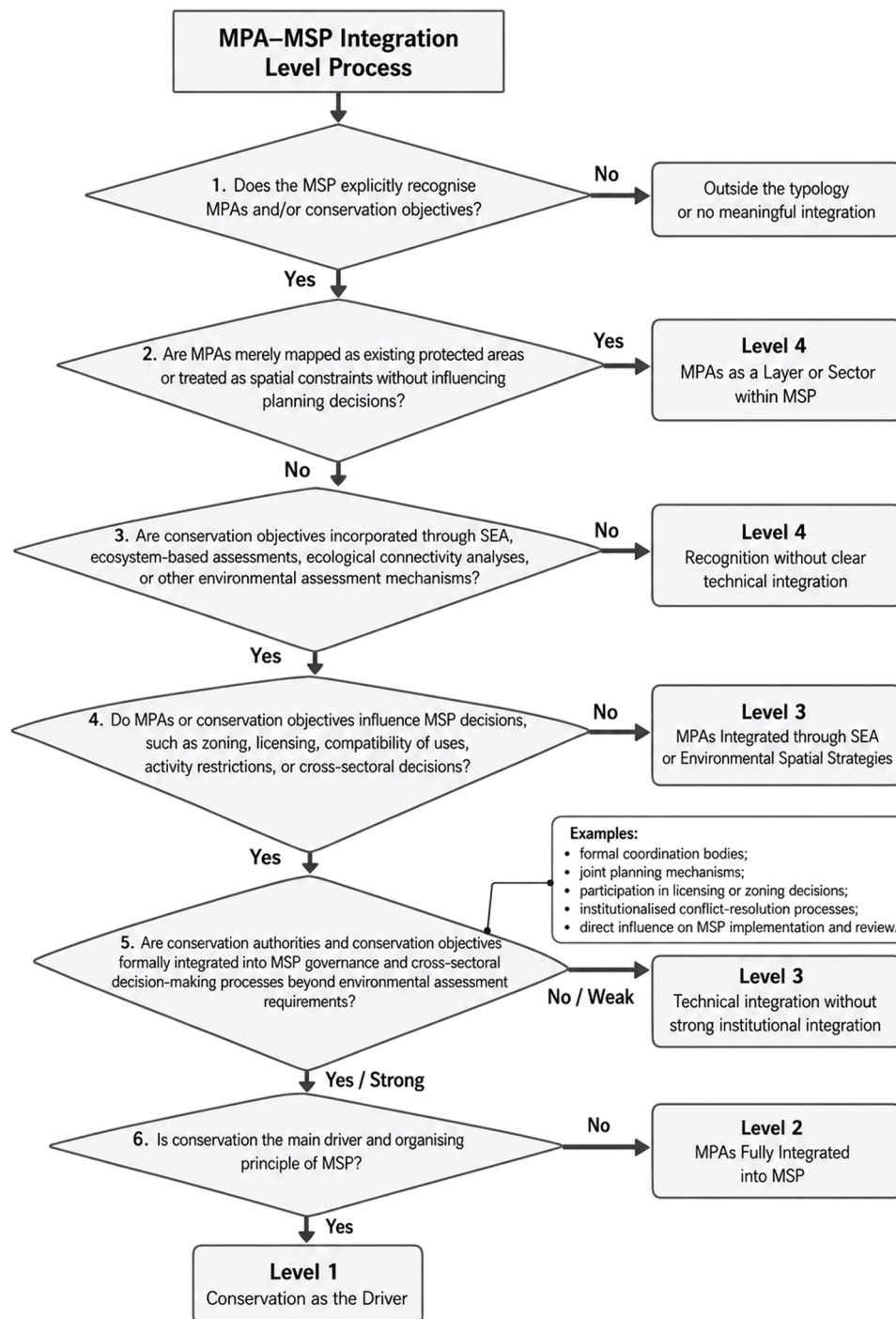


Fig. 1. Decision tree used to classify countries according to the degree of integration between marine protected areas and maritime spatial planning. Note: The existence of consultation, participation, or environmental review procedures alone is not sufficient to demonstrate Level 2 integration. Evidence should show that conservation authorities and conservation objectives actively shape MSP governance, spatial decisions, or cross-sectoral management outcomes.

3.1. Level 2 – MPAs fully integrated into MSP

Six countries — Belgium, Germany, Latvia, Slovenia, Sweden and the Netherlands — were classified as Level 2 (Table 2). In these cases, conservation objectives are not only recognized in MSP, but are embedded in planning provisions, legal frameworks or spatial priorities. While the designation and management of MPAs may still remain under environmental authorities, MPAs or conservation objectives are sufficiently incorporated into MSP governance to shape cross-sectoral planning outcomes, including zoning, restrictions, priority areas, ecological

corridors, future conservation areas, and/or monitoring arrangements.

In **Belgium**, MPAs and conservation objectives are formally integrated into MSP through legally binding Royal Decrees, which specify the location, ecological features and applicable regulatory restrictions of protected areas [35]. Natura 2000 sites (Habitats Directive e Birds Directive; [36,37]), bottom integrity zones and proposed marine reserves are incorporated directly into the MSP framework and influence zoning, licensing and sectoral activities. Integration is further supported by SEA, which provides mitigation and monitoring guidance, and by formal coordination mechanisms such as the MSP Advisory Commission,

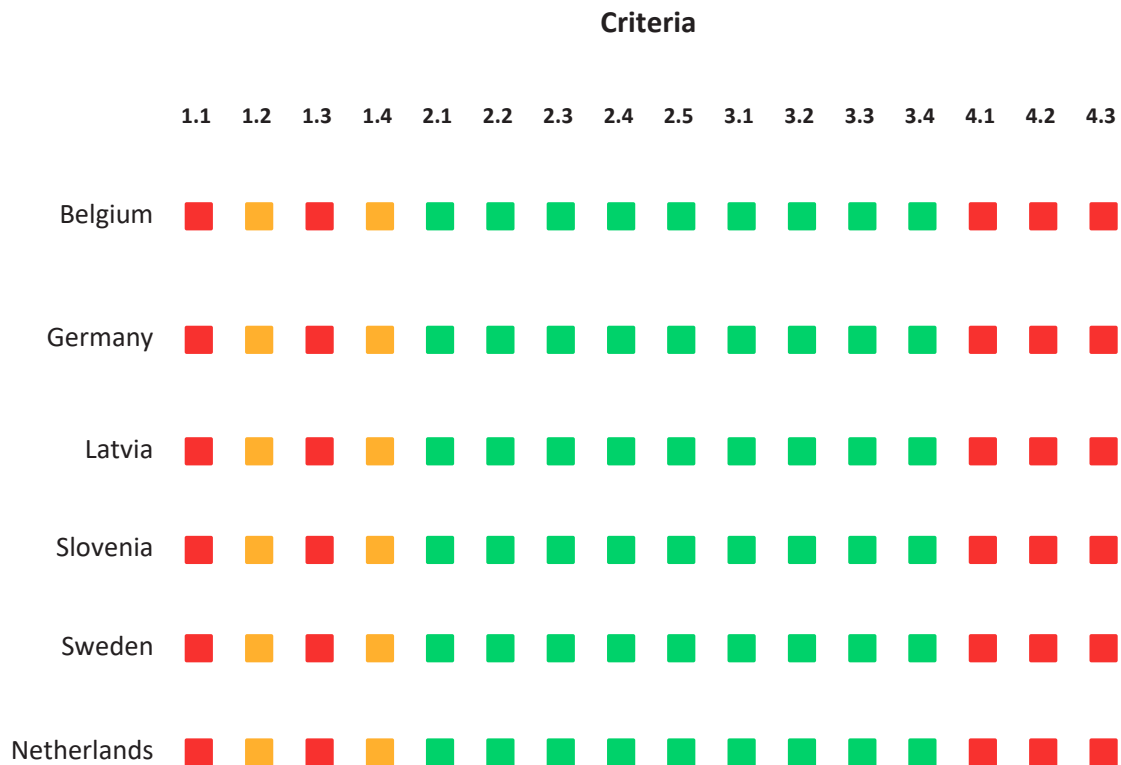
Table 1

Allocation criteria used to classify countries according to MPAs and conservation objectives integration into MSP.

Level 1 – Conservation as the Driver	Level 2 – MPAs Fully Integrated into MSP
Allocation criteria 1.1. Conservation is the primary objective of MSP. 1.2. MPAs or conservation objectives structure the planning process. 1.3. Sectoral uses are organized around conservation priorities. 1.4. Conservation has legal or strategic precedence in spatial decisions.	Allocation criteria 2.1. Conservation is embedded in MSP objectives, legal frameworks, or planning provisions. 2.2. MPAs or conservation objectives influence planning decisions across sectors. 2.3. Future conservation areas, ecological corridors, priority areas, or restrictions are incorporated into MSP. 2.4. Institutional coordination links MSP and conservation authorities. 2.5. Stakeholder engagement, EBM, monitoring, or adaptive review support cross-sectoral integration.
Level 3 – MPAs Integrated through SEA or other environmental assessment instruments	Level 4 – MPAs as a Layer or Sector within MSP
Allocation criteria 3.1. Conservation enters MSP mainly through technical or environmental mechanisms. 3.2. SEA, or similar tools support integration. 3.3. Ecological mapping, biodiversity priority areas, connectivity, or ecological coherence are considered. 3.4. Conservation influences decisions through environmental assessment requirements.	Allocation criteria 4.1. MPAs or conservation objectives are mainly included as existing protected areas, map layers, or environmental constraints. 4.2. Ecological coherence, connectivity, or MPA network design are absent or weak. 4.3. Conservation has no or limited influence on planning decisions.

Table 2

Level 2 countries assessment of allocation criteria according to the decision tree. The analysis of the decision tree, supported by the allocation criteria, resulted in the following assessment.  indicates that the criterion was met;  indicates partial or weak evidence; and  indicates that the criterion was not met.



value investigation areas in the EEZ to identify potential protected biotopes and species. These areas guide future MPA designation and restrict potentially harmful activities, such as offshore wind development, where conservation priorities may be affected. Through these mechanisms, conservation objectives influence spatial planning, licensing and future conservation allocation.

In **Slovenia**, existing marine and coastal protected areas, Natura 2000 sites, ecologically important areas and blue corridors are incorporated into MSP. The plan was subject to SEA and was developed with public consultation. The Nature Conservation Act [41] and related by-laws provide the legal basis for biodiversity protection, while the Institute of the Republic of Slovenia for Nature Conservation plays an important role by providing guidelines, permits, expert opinions and proposals for new protected areas. Slovenia's MSP sets mandatory management measures that regulate activities of other sectors within protected areas and identifies potential new MPAs. Although the formal designation of protected areas remains a separate process, the MSP provides a legally binding, cross-sectorally coordinated basis for future conservation planning.

Sweden also exemplifies robust institutional and legal integration. The Swedish Maritime Spatial Planning Ordinance and Environmental Code provide the legal basis for MSP, supporting the sustainable use of marine resources while preserving and restoring ecosystems in line with the EU Marine Strategy Framework Directive (MSFD) [42]. Existing MPAs are represented in MSP as areas designated for nature, including

national interest areas for nature conservation. Potential new MPAs are identified as areas requiring particular consideration due to high nature values. The Swedish system also benefits from institutional coordination among national and regional authorities, including the Swedish Agency for Marine and Water Management and county administrative boards. Conservation objectives, MPAs and ecologically significant areas are therefore embedded in the MSP framework and influence spatial priorities, rather than being treated only as background layers.

In the **Netherlands**, MSP is implemented through the North Sea Programme 2022–2027, which coordinates marine uses in relation to ecological objectives, environmental limits and the achievement of Good Environmental Status [42]. Around 30% of the Dutch North Sea is designated as MPAs under Natura 2000, the Birds and Habitats Directives and the MSFD. The programme includes actions to strengthen protection, including restrictions on destructive bottom trawling in part of the Dutch North Sea, and incorporates newly established MPAs into the planning framework. The programme applies ecosystem-based and precautionary approaches through environmental assessment, MSFD objectives and indicators, and nature-inclusive development across sectors. Structured governance arrangements, such as the North Sea Agreement and North Sea Consultation, support coordination among government, industry, fisheries, nature organisations and scientific experts.

Table 3

Level 3 countries assessment of allocation criteria according to the decision tree. The analysis of the decision tree, supported by the allocation criteria, resulted in the following assessment.  indicates that the criterion was met;  indicates partial or weak evidence; and  indicates that the criterion was not met.

	Criteria															
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	4.1	4.2	4.3
Bulgaria																
Estonia																
Finland																
France																
Ireland																
Malta																
Poland																
Spain																

3.2. Level 3 – MPAs integrated through SEA or other environmental assessment instruments

Eight countries — Bulgaria, Estonia, Finland, France, Ireland, Malta, Poland and Spain — were classified as Level 3 (Table 3). In these cases, conservation objectives enter MSP primarily through SEA, environmental assessment, ecological analysis, biodiversity priority areas, connectivity considerations, MSFD-related processes or other environmental planning tools. MPAs are recognised and may inform planning decisions, but they are not fully integrated into MSP governance across sectors. In several cases, MPA designation and management remain under separate legal or administrative frameworks.

In **Bulgaria**, conservation objectives are incorporated into MSP mainly through environmental legislation, the MSFD, the Water Framework Directive [43] and EIA/SEA procedures. Existing MPAs, including Natura 2000 sites and nationally designated protected areas, are included as spatial layers and environmental considerations. However, the MSP is non-legally binding and does not have the mandate to designate or expand MPAs; this remains the responsibility of the Ministry of Environment and Water through separate legal and institutional processes. As a result, the relationship between MSP and MPAs is primarily mediated through environmental assessment and regulatory requirements rather than through shared governance arrangements.

In **Estonia**, conservation objectives are incorporated into MSP primarily through SEA, Natura 2000 assessments, cumulative impact modelling, and the application of precautionary and avoidance principles. The plan recognises existing MPAs and incorporates environmental directives such as the Habitats and Birds Directives. Stakeholder participation involving public authorities, sectoral representatives, scientists, NGOs and coastal communities further supports the integration of environmental considerations into planning decisions. However, the designation of new protected areas remains a separate legal procedure under the Nature Conservation Act. Although MSP and MPA processes are structurally similar, they remain institutionally distinct. Consequently, the relationship between MSP and MPAs is mainly articulated through environmental assessment and ecological evidence, rather than through fully integrated MPA governance.

Finland's MSP is regionally based, expert-driven and coordinated by coastal Regional Councils under the guidance of the Ministry of the Environment. It promotes an ecosystem-based approach and uses ecological evidence from the Finnish Inventory Programme for Underwater Marine Diversity and the Ecologically Significant Underwater Marine Areas (EMMAS; [44]). These tools highlight biodiversity values and ecological corridors relevant to MSP. However, the MSP is non-binding and does not designate MPAs or conservation measures. Formal establishment and management of MPAs occur through separate legal processes under national environmental laws. Coordination between MSP and conservation occurs through data sharing, stakeholder participation and policy alignment, but not through institutionalised joint governance or direct cross-sectoral decision-making.

In **France**, conservation objectives are incorporated into MSP mainly through the integration of MSFD objectives within the Document Stratégique de Façade (DSF) and through mandatory SEA for each maritime basin. Environmental assessments, ecological analyses, biodiversity objectives, monitoring programmes and periodic revisions inform planning decisions and help identify priority areas for enhanced protection, including potential zones for stricter conservation measures. The DSF process involves public authorities, environmental institutions, sectoral stakeholders, experts and the public, and integrates environmental, social and economic objectives across sectors. However, the legal designation, management and governance of MPAs remain largely embedded in separate conservation frameworks and institutions. Thus, conservation strongly informs MSP through strategic environmental planning, but MPA governance is not fully integrated into MSP as a cross-sectoral mechanism.

Ireland's National Marine Planning Framework integrates sectoral

policies and incorporates environmental considerations through SEA. Biodiversity protection, ecosystem-based management, cumulative impact assessment and monitoring support conservation integration within MSP. However, Ireland lacked a clear national legal definition of MPAs at the time of the framework, which limits the coherence, representativeness and connectivity of its protected area network. Marine conservation is governed through multiple instruments, including the Habitats and Birds Directives and the OSPAR Convention, but the absence of a comprehensive national MPA framework results in a fragmented system. Conservation is therefore incorporated through SEA and environmental policy mechanisms, while MPA designation and governance remain outside the MSP framework.

In **Malta**, conservation is integrated into MSP mainly through the Strategic Plan for Environment and Development (SPED), SEA and MSFD implementation. The SPED includes policy objectives aimed at safeguarding Special Areas of Conservation, Special Protection Areas and MPAs. It also considers ecological coherence and ecological corridors, helping to ensure that future development does not undermine ecosystem connectivity. However, MPA designation remains under a separate regulatory framework. Conservation objectives influence planning and permitting through environmental assessment, spatial analysis, monitoring and policy integration, rather than through direct MPA governance.

In **Poland**, existing MPAs are incorporated into the marine spatial plan, and areas of high ecological value may be assigned a priority function for nature conservation, including areas not yet formally designated as MPAs. The plan also relies on ecological assessments, environmental data and SEA as the dominant integration mechanisms to support biodiversity protection and ecological connectivity. However, MPAs are primarily established through Natura 2000 and other conservation instruments under the responsibility of environmental authorities, while conservation plans and MSP remain administratively and procedurally separate.

Spain's MSP explicitly identifies Conservation Priority Zones, which include legally established MPAs, and High Potential Areas for Biodiversity Conservation, which include areas under scientific investigation as potential future MPAs. This allows MSP to recognise both existing conservation commitments and areas under consideration for protection. Conservation objectives therefore inform planning through SEA, biodiversity criteria, environmental monitoring and future conservation measures. However, the establishment and management of MPAs remain under separate legal and administrative procedures, and ecological coherence assessments are largely addressed through biodiversity authorities rather than MSP itself.

3.3. Level 4 – MPAs as a layer or sector within MSP

Six countries — Cyprus, Denmark, Italy, Lithuania, Portugal and Romania — were classified as Level 4 (Table 4). In these cases, MPAs or conservation objectives are mainly included in MSP as existing protected areas, spatial layers or environmental constraints. Ecological coherence, connectivity or MPA network design are absent, weak or addressed outside MSP. Conservation has limited influence on zoning, licensing, sectoral allocation or management measures, and MPA governance remains largely separate from MSP.

In **Cyprus**, the MSP includes existing and proposed Natura 2000 areas, 14 proposed MPAs, artificial reefs and Fisheries Restricted Areas. However, the designation and management of MPAs remain under environmental institutions outside the MSP process. Any future Natura 2000 marine areas designated by the competent authority may be treated as part of the MSP until the next revision, when they can be formally incorporated. Protected areas are recognised and mapped, but there is limited evidence that MPAs shape broader MSP governance, sectoral allocation or ecological network design.

In **Denmark**, there has been dialogue between the MSP team and the Ministry of Environment, and the Ministry participates in the MSP

Table 4

Level 4 countries assessment of allocation criteria according to the decision tree. The analysis of the decision tree, supported by the allocation criteria, resulted in the following assessment. ■ indicates that the criterion was met; ■ indicates partial or weak evidence; and ■ indicates that the criterion was not met.

	Criteria																
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	4.1	4.2	4.3	
Cyprus	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Denmark	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Italy	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Lithuania	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Portugal	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Romania	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

working group. However, the legal framework does not provide clear mechanisms for integrating MPAs into MSP. The Ministry of Environment remains responsible for the MPA process, while MSP mainly serves as a platform for discussion and negotiation. Input on MPAs selection criteria, boundaries and management objectives was not systematically sought through the MSP process, and ecological processes and MPA network design were not explicitly addressed within MSP. Although SEA and ecosystem-based elements are present, participation and cumulative impact assessment remain limited.

In **Italy**, MSP legal and policy frameworks do not explicitly support the establishment or management of MPAs. Existing MPAs and Natura 2000 areas are recognised and included in planning maps, and areas of ecological importance such as Ecologically or Biologically Significant Marine Areas (EBSAs), Important Marine Areas and seamounts are considered when zoning marine areas. However, MSP has no mandate to identify new MPAs, and the competent MSP ministry does not have responsibility for MPA designation or management. Ecological coherence and socio-economic dimensions of MPAs are weakly addressed. Thus, MPAs are acknowledged as spatial layers and environmental constraints, but their governance remains weakly integrated into MSP.

Lithuania's MSP is embedded in the legally binding National Master Plan, and MPAs are incorporated as spatial layers reflecting their ecological and legal significance. SEA was conducted during MSP development, supporting compliance with EU environmental directives, including the MSFD and the Habitats and Birds Directives. However, despite the formal recognition of MPAs, their role within MSP remains primarily sectoral. There is limited evidence of cross-sectoral coordination, ecological coherence or strategic influence of MPAs over broader planning decisions. Conservation is therefore recognised within MSP but remains only partially integrated, with MPAs treated mainly as mapped sectors rather than planning drivers.

In **Portugal**, MSP and MPA-related authorities are located within the same broader administrative structure, which allows some

consideration of conservation during planning. However, MSP and MPA systems remain governed by distinct legal and institutional frameworks, with separate objectives, instruments and implementation responsibilities. MPAs are incorporated into MSP mainly as spatial constraints and are treated as one sector or layer within the plan. Although some specific conflicts have been addressed through sectoral meetings and case-by-case agreements, there is no systematic mechanism for joint decision-making, ecological coherence assessment or integrated MPA–MSP governance. As such, conservation has limited influence on broader MSP decisions and remains weakly integrated into spatial governance.

Romania's MSP recognises the MPA network as an important element of marine ecosystem protection and includes it in maps and descriptive sections. The plan also acknowledges the need for ecological corridors to improve connectivity and recognises conflict zones between conservation objectives and maritime uses. However, MSP does not allocate exclusive space for MPAs, does not introduce new regulations or restrictions for maritime uses, and does not identify the space required for new or expanded protected areas. MPA designation and expansion remain under separate legal instruments, while monitoring and evaluation of MPA–MSP integration remain weak.

4. Integration by Sea Basin

Although all EU Member States assessed in this study operate under a common European policy framework, including the MSP Directive, MSFD, Habitats and Birds Directives, and SEA Directive, the level of integration between MPAs and MSP varies considerably across countries. This suggests that EU directives provide a shared baseline for conservation integration, but do not fully explain differences in national implementation. One possible factor contributing to these differences is the role of regional sea frameworks and cooperation mechanisms, such as HELCOM–VASAB in the Baltic Sea, OSPAR in the North-East Atlantic

Table 5
Regional Sea Basins and Relevant Cooperation Frameworks.

Sea basin	Relevant regional instruments / cooperation frameworks	Integration levels and Countries assessed
Baltic Sea	HELCOM–VASAB MSP cooperation [45]; Baltic Sea Action Plan [46]; regional work on ecosystem-based MSP, ecological coherence and transboundary coordination [47].	Level 2: Latvia, Sweden, Germany Level 3: Estonia, Finland, Poland
Black Sea	Bucharest Convention [48]; Black Sea regional cooperation mechanisms; emerging regional MSP cooperation [49].	Level 3: Bulgaria Level 4: Romania
Mediterranean Sea	Barcelona Convention; Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean; UNEP/MAP; EcAp process; regional biodiversity strategies [50,51].	Level 2: Slovenia Level 3: Spain, Malta Level 4: Cyprus, Italy
North-East Atlantic	OSPAR Convention [52]; transboundary cooperation; basin-level work on ecological coherence and marine protection [53].	Level 3: France, Ireland, Spain Level 4: Portugal
North Sea	OSPAR Convention [52]; North Sea cooperation processes [54,55]; coordination around offshore renewable energy and nature protection [56].	Level 2: Belgium, Germany, Netherlands Level 4: Denmark

and North Sea, the Barcelona Convention in the Mediterranean, and the Bucharest Convention in the Black Sea (Table 5). These frameworks may differ in their degree of maturity, institutional strength, technical guidance, transboundary coordination and influence on ecological coherence, which may help explain broader regional tendencies in MPA–MSP integration.

The **Baltic Sea** exhibits some of the most advanced examples of MSP–MPA integration in Europe, largely due to the long-standing cooperation fostered by the HELCOM–VASAB framework. Shared ecosystem-based planning principles, extensive ecological data, transboundary coordination mechanisms, and a strong emphasis on ecological coherence have created a favourable regional context for embedding conservation objectives into MSP, with Latvia, Sweden, and Germany achieving Level 2 integration. However, national implementation still matters, as Estonia, Finland, and Poland remain at Level 3 due to reliance on SEA/environmental assessment and more separate MPA governance. Cross-border cooperation is relatively advanced, but stronger policy harmonization is needed to address inefficiencies.

The **Black Sea** remains one of the least integrated sea basins in terms of MSP–MPA coordination. Although regional cooperation initiatives have advanced dialogue and knowledge exchange, they have not yet translated into strong institutional integration between marine conservation and MSP. Bulgaria has reached Level 3 integration by incorporating conservation objectives through environmental assessment processes, ecosystem-based considerations, and ecological recommendations within MSP, while Romania remains at Level 4. Across the basin, persistent challenges include limited ecological connectivity between protected areas, weak adaptive management mechanisms, and underdeveloped monitoring and evaluation frameworks, highlighting the need for stronger governance coordination and policy harmonisation.

The **Mediterranean Sea** displays a heterogeneous picture of MPA–MSP integration. This region features a prominent ecosystem-based approach, with adaptive management and cross-sectoral integration playing key roles. Regional policy frameworks and conservation commitments provide a common foundation for integrating biodiversity considerations into maritime planning. However, the extent to which these elements influence spatial planning decisions varies considerably among countries. Furthermore, the uneven incorporation of spatial ecological assessments and ecological connectivity considerations into

MSP processes, particularly for identifying suitable locations for MPAs, hinders the development of ecologically coherent MPA networks at both national and regional scales. Therefore, despite important advances in ecosystem-based planning, stronger institutional integration and greater attention to ecological coherence are still needed to achieve more effective MPA–MSP integration across the Mediterranean.

The **North-East Atlantic basin** has made considerable progress in integrating MPAs into MSP, supported by OSPAR and EU environmental frameworks that promote ecological coherence, biodiversity objectives, environmental assessment, and monitoring. France, Ireland and Spain demonstrate relative advanced integration, while Portugal benefits from well-established legal frameworks. Nevertheless, the region continues to face difficulties in achieving ecological coherence, particularly due to incomplete assessments and sectoral tensions—especially between traditional maritime industries, such as fisheries, and emerging sectors like offshore renewable energy.

The **North Sea** demonstrates relatively advanced MPA–MSP integration, with Belgium, Germany, and Netherlands at Level 2. This is supported by well-established planning frameworks, strong environmental assessment practices, and increasing efforts to balance offshore renewable energy development with marine conservation objectives. However, significant differences remain across the basin, as reflected by Denmark's lower level of integration, highlighting that favourable regional conditions do not automatically translate into strong national implementation, which may hinder the effective conservation of shared marine ecosystems.

5. Major gaps and weaknesses across integration levels

The heterogeneity of MPA–MSP integration in the EU, shown in the previous sections, is also reflected in the type of gaps and weaknesses identified in the country guidelines (Table 6). This section summarises the main gaps by integration level, following the analytical themes used in the screening: policy and legal frameworks; MPA network design and ecological coherence; spatial analysis and mapping; stakeholder engagement and consultation; ecosystem-based management; adaptive management and monitoring; capacity building and knowledge sharing; evaluation and review processes; and SEA.

5.1. Level 2 – MPAs fully integrated into MSP across sectors

Despite achieving a high degree of integration between MPAs and MSP, countries at Level 2 still present implementation challenges that may affect the operational effectiveness of this alignment. In these countries, the main gaps were not related to the absence of conservation objectives in MSP, but to the implementation and operationalisation of already existing integration mechanisms. Weaknesses related to regulatory authority, monitoring, enforcement, adaptive review and coordination between MSP and MPA authorities were identified.

A recurring gap concerns the fact that MPA designation and management may remain under environmental authorities, even where MSP incorporates conservation objectives into planning provisions. This requires continued coordination between maritime planning and conservation institutions. In some cases, the regulatory strength of MPAs also varies according to designation type, meaning that not all protected areas have the same capacity to influence conflicting maritime uses. The guidelines also indicate that ecological coherence, cumulative impact assessment and adaptive monitoring are not always fully operationalised in plan implementation or review.

5.2. Level 3 – MPAs integrated through SEA or other environmental assessment instruments

Regarding the countries at Level 3, although they have taken important steps toward integrating MPAs into MSP through SEA or related mechanisms, several persistent challenges continue to hinder full

Table 6

Main gaps and weaknesses in MPA–MSP integration identified from the country guidelines.

Integration level	Guideline theme	Main gap or weakness identified
Level 2	Policy and legal frameworks	Conservation objectives are embedded in MSP, but MPA designation and management may remain under separate environmental authorities.
	MPA network design and ecological coherence	Priority areas, corridors or future conservation areas may be included, but ecological coherence still requires stronger operationalisation and follow-up.
	Adaptive management, monitoring, evaluation and review	Monitoring and adaptive review exist or are planned, but links between MSP implementation and MPA effectiveness remain incomplete.
Level 3	Policy and legal frameworks	MSP and MPA responsibilities often remain institutionally separate, even where conservation objectives are recognised.
	SEA	SEA and environmental assessment are central integration mechanisms, but do not automatically ensure governance integration.
	Spatial analysis and mapping	Ecological mapping and biodiversity priority areas inform MSP, but do not always translate into binding spatial provisions.
	MPA network design and ecological coherence	Ecological coherence, connectivity or future MPAs may be considered, but often through environmental strategies rather than direct MSP authority.
Level 4	Policy and legal frameworks	MSP and MPA frameworks are weakly connected, and MSP often lacks authority to designate, expand or manage MPAs.
	Spatial analysis and mapping	MPAs are mainly included as existing protected areas, map layers or spatial constraints.
	MPA network design and ecological coherence	Connectivity, ecological coherence and MPA network design are absent, weak or addressed outside MSP.
	Stakeholder engagement and consultation	Stakeholder engagement specifically focused on MPA–MSP integration is limited or case-specific.
	Adaptive management, monitoring, evaluation and review	Monitoring, evaluation and adaptive review of MPA–MSP integration are weak, fragmented or project-based.
Cross-cutting	Connectivity, resilience, climate adaptation and cumulative pressures	These issues appeared across levels rather than as distinctive features of one level. Their treatment varied according to how strongly MSP provisions, environmental assessments, monitoring and MPA governance were connected.

alignment. The main gaps identified in the guidelines were linked to the limited translation of these technical or environmental mechanisms into binding spatial decisions, institutional coordination and MPA governance.

Conservation objectives informed planning decisions, but MPA governance often remained under separate legal or administrative frameworks. This was observed in cases where conservation plans, protected area designation, ecological coherence assessments or management measures were developed outside the MSP process. As a result, SEA and ecological assessments strengthened the evidence base for MSP, but did not necessarily ensure that conservation objectives directly shaped zoning, licensing, compatibility rules or MPA management.

The guidelines also pointed to gaps in monitoring, evaluation and review. In several cases, monitoring was linked to environmental impacts, SEA requirements or sectoral developments, rather than directly to the effectiveness of MPA–MSP integration. Connectivity, resilience and climate adaptation were identified as broader implementation issues. In some Level 3 countries, these aspects were explicitly recognised in strategic or environmental frameworks, but their practical influence on MSP decisions and MPA management remained uneven.

5.3. Level 4 – MPAs as a layer or sector within MSP

In Level 4 countries, the main gaps were more structural. The guidelines showed limited evidence that MPAs shaped broader spatial priorities, sectoral allocation, licensing, zoning or management measures. The most frequent gaps concerned weak legal and institutional links between MSP and MPA frameworks, resulting in misaligned objectives and uncoordinated conservation efforts. Many MSP documents remain non-binding or lack the legal authority to influence the designation or adjustment of MPAs, severely limiting their functional impact. Ecological coherence, connectivity and MPA network design were often absent, weak or addressed outside MSP. Spatial analysis and mapping were commonly used to represent existing MPAs, but less often to guide future MPA network development or conservation-oriented spatial decisions.

Stakeholder engagement and consultation also tended to be limited or case-specific with, with limited mechanisms to foster collaboration between maritime spatial planners and environmental authorities. Although SEA or environmental assessment existed in some Level 4 countries, the guidelines suggest that these instruments were not strongly connected to MPA network design, adaptive management, stakeholder coordination or binding MSP decisions. Connectivity, resilience and climate adaptation are therefore not treated here as distinctive Level 4 characteristics. Rather, Level 4 cases generally showed weaker mechanisms for addressing these broader challenges through MSP because conservation remained mostly recognised or mapped, with limited influence on spatial governance.

6. Discussion

The integration of MPAs into MSP varies considerably across EU Member States. While some countries have MSP frameworks that embed conservation objectives into spatial planning and cross-sectoral decision-making, others operate through parallel systems in which conservation and MSP remains but weakly coordinated. This variability reflects the complexity of marine governance in Europe, where common EU directives coexist with diverse national legal frameworks, institutional arrangements and planning cultures.

The typology applied in this study helps clarify these differences by distinguishing between three observed forms of integration: MPAs fully integrated into MSP across sectors, MPAs integrated mainly through SEA or other environmental assessment instruments, and MPAs treated primarily as layers or sectors within MSP. No EU country assessed in this study was classified as Level 1, where conservation acts as the primary driver and organising principle of MSP. This absence may reflect the original orientation of the EU MSP Directive (2014/89/EU), which was designed primarily to organise maritime activities and support blue growth, while environmental protection was incorporated as one objective among several rather than as the central basis for spatial governance [12,57].

Countries classified at Level 2 — Belgium, Germany, Latvia, Slovenia, Sweden and the Netherlands — represent the strongest cases of MPA–MSP integration identified in this study. In these countries, conservation objectives are not only recognised in MSP, but are embedded in legal frameworks, planning provisions, priority areas, restrictions, ecological corridors, future conservation areas or institutional coordination mechanisms. These cases suggest that stronger integration

depends on the ability of MSP to move beyond mapping existing MPAs and to translate conservation objectives into spatial decisions, sectoral compatibility rules and cross-sectoral governance arrangements. The Level 2 cases also show that full legal unification between MSP and MPA systems is not necessarily required for advanced integration. In several countries, MPA designation and management remain under environmental authorities, but conservation objectives still influence MSP decisions through formal coordination, legally binding spatial provisions, priority areas or restrictions on incompatible uses.

Regional sea-basin cooperation appears to support, but not determine, these stronger integration patterns. Long-standing collaboration in the Baltic Sea through the HELCOM-VASAB MSP Working Group has likely contributed to more coherent planning principles, transboundary dialogue and exchange of experience among countries [58,59]. The North Sea also provides examples of relatively advanced integration, particularly in Belgium, Germany and the Netherlands, where conservation objectives are reflected in binding planning provisions, priority areas, restrictions and cross-sectoral governance mechanisms. However, Denmark shows that regional cooperation alone is not sufficient to ensure higher integration. National legal mandates, institutional arrangements and the capacity to translate conservation objectives into MSP decisions remain decisive.

At the same time, Level 2 does not mean that integration is complete or without vulnerabilities. These countries still face implementation challenges related to monitoring, enforcement, adaptive review, ecological coherence and the operational connection between MSP implementation and MPA management. Also, in some cases, the regulatory strength of protected areas varies by designation type. Therefore, the main challenge for Level 2 countries is not the formal inclusion of conservation in MSP, but the consolidation of mechanisms that ensure conservation objectives remain effective during implementation, revision and enforcement.

Countries classified at Level 3 — Bulgaria, Estonia, Finland, France, Ireland, Malta, Poland and Spain — represent an intermediate form of MPA–MSP integration. In these cases, conservation objectives inform MSP decisions and may help avoid or mitigate conflicts with protected areas. However, integration remains primarily technical and procedural, with coordination between MSP and conservation occurring mainly through data sharing, stakeholder participation and policy alignment rather than through institutionalised joint governance or direct cross-sectoral decision-making. Although environmental assessment instruments can strengthen the ecological evidence base for MSP, they do not automatically ensure that MPAs directly shape zoning, licensing, sectoral allocation or management measures. This finding aligns with recent work on ecosystem-based MSP, which shows that MSP processes continue to exhibit a gap between the conceptual adoption of EBA principles and their operational implementation. In particular, challenges related to governance structures, stakeholder engagement, data availability, ecosystem process knowledge, future scenarios, climate change and monitoring continue to constrain implementation [23].

Countries classified at Level 4 — Cyprus, Denmark, Italy, Lithuania, Portugal and Romania — represent the weakest form of MPA–MSP integration identified in this study. In these countries, MPAs tend to be acknowledged rather than actively integrated into planning and governance arrangements. For example, Portugal addresses marine conservation, ecological connectivity and protected areas only to a limited extent, while Denmark's legal framework does not clearly define how MPAs should be incorporated into MSP. Similarly, Italy, Lithuania and Romania recognise existing MPAs and Natura 2000 sites within planning processes, but MSP plays only a limited role in shaping conservation measures, protected area management or network development. These findings suggest that the main barrier to stronger MPA–MSP integration is not the absence of environmental legislation, protected area frameworks or environmental assessment procedures, which are present in most countries, but rather the extent to which these instruments are translated into MSP provisions, institutional coordination, spatial

decisions and implementation mechanisms. The Level 4 cases therefore represent a form of passive recognition of conservation objectives, contrasting with the more advanced technical and procedural, and ultimately cross-sectoral governance, forms of integration observed at higher levels of the typology.

This gradient suggests that recent European policy developments have not yet been evenly translated into national MSP practice. Importantly, the absence of Level 1 cases does not indicate the absence of conservation concerns in European MSP. Rather, it points to a gap between the emerging policy ambition to place ecosystem-based conservation more centrally within MSP and the still uneven translation of this ambition into national planning authority, spatial decisions and implementation mechanisms. Although EU policy increasingly links MSP with ocean health, biodiversity protection, restoration, climate resilience and sustainable blue economy objectives [14,16], the assessed national MSP frameworks still tend to position conservation as an embedded, procedural or spatially recognised objective, rather than as the primary driver of maritime spatial governance [31].

This distinction also resonates with broader assessments of MSP implementation in Europe. WWF's assessment of Mediterranean MSP, for example, evaluates MSP through the inclusion of nature, socio-economic considerations, good ocean governance and the comprehensiveness of the planning process. Its findings show that the presence of SEA or marine protection measures does not necessarily guarantee that nature protection, restoration, cumulative impact assessment or adaptive monitoring are fully operationalised within MSP [60]. This supports the interpretation that MPA–MSP integration should be assessed not only by whether MPAs are included in plans, but by whether conservation objectives influence the spatial allocation of uses, governance structures and implementation mechanisms.

Across all levels, several challenges remain recurrent. These include institutional fragmentation, uneven stakeholder coordination, limited monitoring and enforcement capacity, insufficient links between ecological assessment and binding spatial provisions, and difficulties in operationalising ecological coherence. Although connectivity, climate adaptation and resilience may be explicitly recognised in some Level 3 strategic frameworks, partially operationalised in some Level 2 systems, or weakly addressed in Level 4 cases, they should be understood as cross-cutting challenges rather than characteristics of a single level. What varies across the typology is not whether these challenges exist, but the degree to which MSP provides mechanisms to respond to them through spatial governance, monitoring, adaptive review and MPA management.

From a policy perspective, the findings suggest that strengthening MPA–MSP integration requires different priorities depending on the integration level. For Level 4 countries, the priority is to move beyond recognition and mapping by creating clearer legal and institutional mechanisms linking MSP with MPA designation, ecological coherence and conservation-oriented spatial decisions. For Level 3 countries, the key challenge is to connect SEA and environmental assessment outputs more directly to binding MSP provisions, licensing, zoning and MPA governance. For Level 2 countries, the focus should be on improving implementation, adaptive monitoring, enforcement and the operational links between MSP revision and MPA effectiveness.

The upcoming revision cycles of national MSPs may therefore provide an important opportunity to strengthen MPA–MSP integration. Rather than treating MPAs only as pre-existing constraints, future MSP processes could use conservation objectives more proactively to guide spatial priorities, identify ecological corridors, anticipate future protected areas and improve compatibility between maritime uses and biodiversity protection. Such progress would require not only stronger legal and institutional arrangements, but also better ecological data, inclusive stakeholder processes and adaptive mechanisms capable of responding to cumulative pressures and climate-related change [6,22,23,29]. These are essential if MSP is to support more coherent, ecosystem-based and biodiversity-informed marine governance in Europe.

7. Conclusion

The analysis of MPA integration into MSP across EU Member States reveals substantial disparities in legal, institutional and operational approaches. While a small group of countries reached advanced integration, most still operate through systems where conservation is incorporated mainly through environmental assessment mechanisms or treated as an existing spatial layer or constraint. This heterogeneity highlights the need for tailored strategies that reflect national legal capacities, institutional arrangements and ecological priorities.

For countries at Level 4, where MPAs are mainly treated as spatial layers or environmental constraints, foundational changes are needed to establish clearer legal and institutional links between MSP and MPA designation, ecological coherence and conservation-oriented spatial decisions. For countries at Level 3, advancing integration requires bridging institutional gaps and linking SEA, ecological assessments and biodiversity strategies more directly to binding MSP provisions, zoning, licensing and MPA governance. Even in Level 2 countries, where conservation objectives are more clearly embedded in MSP, further progress depends on strengthening implementation, adaptive monitoring, enforcement and the operational links between MSP revision and MPA effectiveness.

Across all levels, integration efforts should be reinforced by ecological coherence, climate resilience, robust monitoring frameworks and inclusive governance processes. The findings show that MPA–MSP integration is not only a technical or regulatory challenge, but also a governance challenge. Conservation objectives need to be translated into planning authority, cross-sectoral decision-making and implementation mechanisms.

Ultimately, successful integration of MPAs into MSP requires moving beyond the recognition of protected areas in plans towards a more functional role for conservation in maritime spatial governance. By learning from advanced cases while addressing persistent structural gaps, EU Member States can move towards more coherent, ecosystem-based and biodiversity-informed MSP.

It is important to note that the findings reflect the views and experiences of the interviewees, which may not fully capture the complexity of each national context. Future research should deepen this analysis by including additional perspectives and exploring the long-term outcomes of MPA–MSP integration in practice.

Funding

This study received funding from the European Union's Horizon Europe research and innovation programme under the MSP4BIO project (Improved science-based maritime spatial planning to safeguard and restore biodiversity in a coherent European MPA network), Grant Agreement No. 101060707.

CRedit authorship contribution statement

Margarita Stancheva: Writing – review & editing, Resources, Investigation. **Jacek Zaucha:** Writing – review & editing, Resources, Investigation. **Martina Bocci:** Writing – review & editing, Resources, Investigation. **Joyce Dias Gois Rodrigues de Queiroz:** Writing – review & editing, Writing – original draft, Formal analysis. **Marina Markovic:** Writing – review & editing, Resources, Investigation. **Helena Calado:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Riku Varjopuro:** Writing – review & editing, Resources, Investigation. **Anna Larissa Oliveira:** Writing – review & editing, Writing – original draft, Formal analysis. **Päivi Haapasaari:** Writing – review & editing, Resources, Investigation. **Débora Gutierrez:** Writing – review & editing, Writing – original draft, Visualization, Supervision, Resources, Project administration, Methodology, Investigation, Funding acquisition,

Formal analysis, Conceptualization. **Ivana Stojanovic:** Supervision, Project administration, Funding acquisition. **Fien De Raedemaeker:** Writing – review & editing, Resources, Investigation. **Alina Daiana Spinu:** Writing – review & editing, Resources, Investigation. **Camila Pegorelli:** Writing – review & editing, Resources, Investigation. **Inne Withouck:** Writing – review & editing, Resources, Investigation. **Adriano Quintela:** Writing – review & editing. **Francisco Rafael Barboza:** Writing – review & editing, Resources, Investigation. **Javier García-Sanabria:** Writing – review & editing, Resources, Investigation.

Institutional Review Board Statement

The study was conducted in accordance with the Declaration of Helsinki, and approved by the Ethics Committee of the University of the Azores (PARECER 16/2023, approved on 3 March 2023).

Declaration of generative AI and AI-assisted technologies in the writing process

The authors acknowledge the assistance of ChatGPT-4, developed by OpenAI, which was used to improve spelling, grammar, and overall readability. The authors thoroughly reviewed, edited, and validated the content, maintaining full responsibility for the final version of the publication. The AI tool was utilised solely to organise and present ideas more effectively, without replacing the critical analysis and professional judgement essential to academic research and writing.

Declaration of Competing Interest

All authors declare no financial or non-financial competing interests.

Acknowledgements

We sincerely thank the individuals whose dedication and invaluable support played a key role in the successful completion of Deliverable 4.4: “Strategic Guidance for the Integration of MPA and MSP Processes on Multiple Governance and Ecosystem Levels” within the MSP4BIO Project. Our profound gratitude to all local experts for their unwavering commitment and collaboration.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.marpol.2026.107272](https://doi.org/10.1016/j.marpol.2026.107272).

Data availability

The data that support the findings of this study are available from the MSP4BIO project (<https://msp4bio.eu/>) under restrictions. Requests can be made to the authors.

References

- [1] C. Ehler, F. Douvère, *Marine spatial planning, a step-by-step approach towards ecosystem-based management*, UNESCO, Paris, 2009.
- [2] S. Jay, W. Flannery, J. Vince, W.-H. Liu, J.G. Xue, M. Matczak, et al., International progress in marine spatial planning, *Ocean. Yearb.* Online 27 (2013) 171–212, <https://doi.org/10.1163/22116001-90000159>.
- [3] Rodríguez-Rodríguez D, Martínez-Vega J. Ecological effectiveness of marine protected areas across the globe in the scientific literature, *Adv. Mar. Biol.* 92 (2022) 129–153, <https://doi.org/10.1016/bs.amb.2022.07.002>.
- [4] S. Giakoumi, C. Scianna, J. Plass-Johnson, F. Micheli, K. Grorud-Colvert, P. Thiriet, et al., Ecological effects of full and partial protection in the crowded Mediterranean Sea: A regional meta-analysis, *Sci. Rep.* 7 (2017) 8940, <https://doi.org/10.1038/s41598-017-08850-w>.
- [5] T. Agardy, G.N. di Sciara, P. Christie, Mind the gap: Addressing the shortcomings of marine protected areas through large scale marine spatial planning, *Mar. Policy* 35 (2011) 226–232, <https://doi.org/10.1016/j.marpol.2010.10.006>.
- [6] C. Frazão Santos, L.M. Wedding, T. Agardy, J.M. Reimer, E. Gissi, H. Calado, Marine spatial planning and marine protected area planning are not the same and

- both are key for sustainability in a changing ocean, NPJ Ocean. Sustain. 4 (2025) 23, <https://doi.org/10.1038/s44183-025-00119-4>.
- [7] Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning. Official Journal of the European Union; 2014.
 - [8] G.W. Allison, J. Lubchenko, M.H. Carr, Marine reserves are necessary but not sufficient for marine conservation, Ecol. Appl. 8 (1998) 79–92.
 - [9] G. Kelleher, Guidelines for Marine Protected Areas. World Commission on Protected Areas of IUCN – The World Conservation Union, in: Best Practice Protected Area Guidelines Series, 8, World Commission on Protected Areas of IUCN – The World Conservation Union, 1999.
 - [10] W. Qiu, P.J.S. Jones, The emerging policy landscape for marine spatial planning in Europe, Mar. Policy 39 (2013) 182–190, <https://doi.org/10.1016/j.marpol.2012.10.010>.
 - [11] W. Flannery, J. Clarke, B. McAteer, Politics and power in marine spatial planning, in: J. Zauha, K. Gee (Eds.), Maritime Spatial Planning: past, present, future, Springer International Publishing, Cham, Switzerland, 2019, pp. 201–217.
 - [12] P.J.S. Jones, L.M. Lieberknecht, W. Qiu, Marine spatial planning in reality: Introduction to case studies and discussion of findings, Mar. Policy 71 (2016) 256–264, <https://doi.org/10.1016/j.marpol.2016.04.026>.
 - [13] European Commission. The European Green Deal (COM(2019) 640 final). Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions. Brussels: 2019.
 - [14] European Commission. The European Ocean Pact (COM(2025) 281 final). Brussels: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions; 2025.
 - [15] European Commission, EU Biodiversity Strategy for 2030: Bringing nature back into our lives (COM(2020) 380 final). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Brussels, 2020.
 - [16] European Commission. (2021). On a new approach for a sustainable blue economy in the EU: Transforming the EU's Blue Economy for a Sustainable Future (COM (2021) 240 final). 2021.
 - [17] J.C. Day, Zoning-lessons from the Great Barrier Reef Marine Park, Ocean. Coast. Manag. 45 (2002) 139–156.
 - [18] J. Day, The need and practice of monitoring, evaluating and adapting marine planning and management-lessons from the Great Barrier Reef, Mar. Policy 32 (2008) 823–831, <https://doi.org/10.1016/j.marpol.2008.03.023>.
 - [19] C.N. Ehler, Two decades of progress in Marine Spatial Planning, Mar. Policy 132 (2021) 104134, <https://doi.org/10.1016/j.marpol.2020.104134>.
 - [20] S.E. Lester, C. Costello, B.S. Halpern, S.D. Gaines, C. White, J.A. Barth, Evaluating tradeoffs among ecosystem services to inform marine spatial planning, Mar. Policy 38 (2013) 80–89, <https://doi.org/10.1016/j.marpol.2012.05.022>.
 - [21] C. Frazão Santos, M. Orbach, H. Calado, F. Andrade, Challenges in implementing sustainable marine spatial planning: The new Portuguese legal framework case, Mar. Policy 61 (2015) 196–206, <https://doi.org/10.1016/j.marpol.2015.08.010>.
 - [22] C. Pegorelli, J.G. Sanabria, M. de Andres, J. Garcia Onetti, L. Lees, H. Calado, et al., Aligning socio-economic and governance criteria to support better integration marine spatial planning, marine protected areas and other conservation approaches, Ocean. Coast. Manag. 272 (2026) 107985, <https://doi.org/10.1016/j.ocecoaman.2025.107985>.
 - [23] I. Galparsoro, N. Montero, G. Mandiola, I. Menchaca, Á. Borja, W. Flannery, et al., Assessment tool addresses implementation challenges of ecosystem-based management principles in marine spatial planning processes, Commun. Earth Environ. 6 (2025), <https://doi.org/10.1038/s43247-024-01975-7>.
 - [24] WWF. Assessing the balance between nature and people in European Seas: Maritime Spatial Planning in the Baltic. Assessment Report. 2022.
 - [25] WWF European Policy Office. Maritime Spatial Planning in the North-East Atlantic – Technical Annex. Brussels: 2022.
 - [26] WWF European Policy Office. Maritime Spatial Planning in the North Sea – Technical Annex. Brussels: WWF European Policy Office; 2022.
 - [27] WWF-European Policy Office. Guidance Paper - Ecosystem-based Maritime Spatial Planning in Europe and how to assess it. Brussels: 2021.
 - [28] C. Ehler, A Guide to Evaluating Marine Spatial Plans, IOC Man. Guides 70 (2014).
 - [29] UNESCO-IOC/European Commission. MSPglobal International Guide on Marine/ Maritime Spatial Planning. Paris: UNESCO; 2021.
 - [30] Bird Life International. Are EU Member State's Maritime Spatial Plans Fit for Nature and Climate? Technical Report – Approach and Main Findings. 2022.
 - [31] Van Den Burg S.W.K. EC-CINEA, H. Chouchane, M. Kraan, T. Selnes, P. Roebeling, et al., Assessment of the relevance and effect of the Maritime Spatial Planning Directive in the context of the European Green Deal, Final. Report. (2022) 1–58, <https://doi.org/10.2926/911941>.
 - [32] X. Jiang, H. Cao, Implementing the debt-for-nature swaps for marine protected areas: case studies from Seychelles and Belize, Humanit. Soc. Sci. Commun. 11 (1) (2024), <https://doi.org/10.1057/s41599-024-02855-3>.
 - [33] A. Pinkau, K.S. Schiele, Strategic Environmental Assessment in marine spatial planning of the North Sea and the Baltic Sea – An implementation tool for an ecosystem-based approach? Mar. Policy 130 (2021) <https://doi.org/10.1016/j.marpol.2021.104547>.
 - [34] OpenAI. ChatGPT [Large language model]. 2026.
 - [35] Belgian State. Royal Decree establishing the marine spatial planning for the period 2020–2026 in the Belgian sea areas. Belgian Official Gazette 2019. <https://www.heid.be/royal-decree-2020-english-courtesy-translation> (accessed June 8, 2026).
 - [36] Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds. Official Journal of the European Union, L 20 2010:7–25.
 - [37] Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Official Journal of the European Communities, L 206 1992:7–50.
 - [38] HELCOM-VASAB. Guideline for the implementation of ecosystem-based approach in Maritime Spatial Planning (MSP) in the Baltic Sea area. 2016.
 - [39] Federal Maritime and Hydrographic Agency. Maritime Spatial Plan for the German Exclusive Economic Zone in the North Sea and in the Baltic Sea. BSH 2021.
 - [40] Federal Maritime and Hydrographic Agency. Spatial planning in the German Exclusive Economic Zone of the North Sea and Baltic Sea: Supporting document to the Maritime Spatial Plan 2021. BSH 2022.
 - [41] Zakon o ohranjanju narave (ZON). [Nature Conservation Act]. Uradni list Republike Slovenije, 56/99 1999.
 - [42] Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive). Official Journal of the European Union, L 164 2008:19–40.
 - [43] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. Official Journal of the European Communities, L 327 2000:1–73.
 - [44] Kuusmanen L.M.J., Virtanen E.A., Lappalainen J., Kurvinen L., Blankett P., Viitasalo M. Identifying ecologically valuable marine areas to support conservation and spatial planning at scales relevant for decision making 2023. <https://doi.org/10.1016/j.marpol.2022>.
 - [45] HELCOM-VASAB. Revised HELCOM-VASAB Maritime Spatial Planning Working Group Mandate until 2030. 2021.
 - [46] HELCOM. Baltic Sea Action Plan: 2021 update 2021.
 - [47] HELCOM-VASAB. Regional Maritime Spatial Planning Roadmap 2021–2030 2021.
 - [48] European Commission. Ministerial declaration on a common maritime agenda for the Black Sea (Bucharest, 21 May 2019) 2019.
 - [49] European Commission. Governance in the Black Sea Basin 2024.
 - [50] United Nations Environment Programme Mediterranean Action Plan. Post-2020 strategic action programme for the conservation of biodiversity and sustainable management of natural resources in the Mediterranean region (Post-2020 SAPBIO) 2021.
 - [51] United Nations Environment Programme. Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention) 1995.
 - [52] OSPAR Commission, Convention for the Protection of the Marine Environment of the North-East Atlantic, OSPAR Convention, 1992.
 - [53] OSPAR Commission. North-East Atlantic Environment Strategy 2030 2021.
 - [54] Greater North Sea Basin Initiative. Greater North Sea Basin Initiative: Ministerial conclusions 2023.
 - [55] T. Werner, M. Hauswirth, J. Hennicke, Status of the OSPAR Network of Marine Protected Areas in 2021. OSPAR, 2023: The 2023 Quality Status Report for the North-East Atlantic, OSPAR Commission, London, 2022.
 - [56] NorthSEE Consortium. A North Sea Perspective on Shipping, Energy and Environmental Aspects in Maritime Spatial Planning (NorthSEE) 2021. <https://northseeregion.eu/northsee/index.html> (accessed May 25, 2026).
 - [57] C. Frazão Santos, T. Domingos, M.A. Ferreira, M. Orbach, F. Andrade, How sustainable is sustainable marine spatial planning? Part I-Linking the concepts, Mar. Policy 49 (2014) 59–65, <https://doi.org/10.1016/j.marpol.2014.04.004>.
 - [58] HELCOM-VASAB, Balt. Sea broad-Scale Marit. Spat. Plan. (MSP) Princ. (2013).
 - [59] HELCOM-VASAB. Country Fiche Finland and Åland. 2025.
 - [60] WWF. Assessing the balance between nature and people in European seas: Maritime Spatial Planning in the Mediterranean sea. 2023.