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## Conservation ready marine spatial planning

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1 **Title**

2 Conservation ready marine spatial planning

3

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19 **ABSTRACT**

20 Marine spatial planning (MSP) often favors blue growth objectives over biodiversity  
21 conservation, diminishing its role in promoting sustainability. We used in-depth qualitative  
22 document analysis to assess how conservation principles and priorities are included in five case  
23 studies to identify a path for better integrating conservation with MSP. Five themes emerged,  
24 reflecting conservation in MSP from weak to strong inclusion: (1) prioritizing economy; (2)  
25 ecosystems as limits; (3) social-ecological systems; (4) ecosystems as functional; and (5)  
26 ecosystems as fundamental. Our analysis suggests MSP priorities for managing or mitigating  
27 impacts and conservation was less apparent, though some plans appear more prepared to  
28 integrate conservation. We propose the concept of conservation ready MSP, where plans are  
29 designed to integrate conservation in MSP as a way to support sustained ocean use. MSP may

30 be more conservation ready when specific commitments are made and conservation underpins  
31 ocean use, reflecting the fundamental role of biodiversity conservation in sustainability.

## 32 INTRODUCTION

33 Ensuring a healthy ocean is a global priority for sustainable development (Claudet et al., 2020;  
34 United Nations, 2015), but our footprint on the ocean is growing like never before (Jouffray et  
35 al., 2020). A new narrative is needed to recognize that humans, the ocean, biodiversity, and  
36 climate are inextricably linked, and that by protecting the ocean we protect ourselves (Laffoley  
37 et al., 2020).

38  
39 Ecosystem-based management (EBM) is widely accepted as the preferred approach to managing  
40 marine resources and human activities (Long et al., 2015). This approach, rooted in ecology, aims to  
41 preserve ecosystem structure, function, and essential processes (Leslie & McLeod, 2007), while  
42 considering the role of human activities in altering ecosystems (Agardy et al., 2017; CBD, 2007).  
43 While much of the science required for EBM exists (Trenkel, 2018), it remains stifled in its  
44 implementation by a persistent fragmentation of management agencies (Charles, 2018). Single-  
45 sector approaches historically dominated ocean management, though multi-sector approaches  
46 are necessary to achieve conservation and sustainability goals (Reimer et al., 2021; Schupp et  
47 al., 2019). Marine spatial planning (MSP) has emerged prominently over the past two decades  
48 as an approach that operationalizes EBM and accounts for multiple uses and objectives,  
49 supported by policymakers, practitioners, and academics (Ansong et al., 2017; Domínguez-Tejo  
50 et al., 2016; Flannery et al., 2020). For example, the EU's Integrated Maritime Policy identifies MSP  
51 as an essential planning tool and provides the Maritime Strategic Framework Directive, which  
52 requires Member States to implement EBM (Frazão Santos et al., 2014). Today, more than 75  
53 countries are undertaking MSP across all ocean basins (Ehler, 2020; Frazão Santos et al., 2020).

54  
55 In practice, MSP is often used for strategic sectoral planning or blue growth, diluting the  
56 supporting role of ecosystems and the need for their protection (Frazão Santos et al., 2014;  
57 Jones et al., 2016; Trouillet, 2020). Balancing socioeconomic activities and conservation remains  
58 a key challenge in MSP (Frazão Santos et al., 2021). For many years, MSP and conservation  
59 planning, especially marine protected area (MPA) planning, have evolved in parallel with little  
60 integration (Vaughan & Agardy, 2020). While MSP is not designed to advance conservation  
61 goals on its own (Ehler & Douvère, 2009), it is clearly being leveraged for reducing threats to

62 biodiversity, as evidenced by Target 1 under the *Kunming-Montreal Global Biodiversity*  
63 *Framework* that aims to “ensure that all areas are under participatory integrated biodiversity  
64 inclusive spatial planning...” (CBD, 2022). Without efforts to integrate conservation with MSP, it  
65 may fail to achieve its potential as a holistic, multi-objective process that can support  
66 conservation and sustainable use goals.

67  
68 Here, we explore (i) which conservation principles and priorities have permeated MSP and (ii)  
69 how this might inform integration of conservation in MSP. Using a broad definition of  
70 conservation – *the protection, management, and maintenance of ecosystems, species, and*  
71 *populations to safeguard the conditions that ensure their long-term survival* (IUCN, 2021) – we  
72 analyzed its inclusion in formal MSP initiatives using an in-depth document analysis of five case  
73 studies. We propose that conservation ready MSP – where plans are designed to support and  
74 enact conservation by embedding these principles and priorities – recognizes and secures the  
75 foundational role of conservation in sustainable resource use.

## 77 **METHODS**

### 78 **Selection of case studies**

79 We selected case studies following a screening process of the Intergovernmental  
80 Oceanographic Commission (IOC)’s online database (<http://msp.ioc-unesco.org>, see Methods  
81 S1 in supplementary information). Answering our research questions required case studies that  
82 were sufficiently detailed and readily available in English. We screened case studies from  
83 Europe and the USA due to the availability of documents from these regions and for their long  
84 history and experience with formal MSP as it is considered in this study (Ehler et al., 2019).

85  
86 While our analysis focuses on a wide range of conservation principles and priorities (see below)  
87 rather than only the relationship to MPAs, which has been examined elsewhere (Trouillet & Jay,  
88 2021; Vaughan & Agardy, 2020), we used MPA listing as an indicator for conservation to ensure  
89 case studies captured diverse approaches. We selected case studies based on how they  
90 included MPAs as listed by the IOC database (Figure S1). This database categorized the MSP

91 relationship to MPAs in three ways: (1) MPAs are separate from MSP (i.e., MPAs are not  
92 considered in MSP); (2) only existing MPAs are considered in MSP; and (3) both existing and  
93 future MPAs are considered in MSP. Where the IOC had not categorized a plan based on this  
94 relationship, we undertook a preliminary scan of the relevant MSP document to determine the  
95 appropriate category. We selected newer and older plans reflecting each of these relationships  
96 to MPAs and different types (advisory or regulatory), spatial and temporal scales, ocean  
97 sectors, and phases of MSP from pre-implementation to adaptation (Table S1). Selected case  
98 studies pertained to Belgium, Norway, Scotland, Wales, and Washington State (United States),  
99 and the corresponding primary MSP documents were analyzed.

100

### 101 **Document and themes analysis**

102 We conducted an in-depth document analysis using a hybrid approach of inductive and  
103 deductive qualitative coding, the process of labelling and organizing passages of text, in QSR  
104 International's NVivo-12 software (Fereday & Muir-Cochrane, 2006; Skjott Linneberg &  
105 Korsgaard, 2019) to identify conservation principles and priorities used in MSP (see Methods  
106 S1, Table S2). Document analysis is a systematic process of reviewing documents, in this  
107 research the primary MSP document resulting from each case study, that can produce rich  
108 descriptions and develop understanding relevant to the research question (Bowen, 2009).  
109 Conservation principles reflect key concepts in biodiversity conservation, such as ecological  
110 resilience (Folke et al., 1996) and biological connectivity (Margules & Pressey, 2000).  
111 Conservation priorities reflect action areas, such as protecting habitat or endangered species.  
112 We also recorded analytical memos, ongoing reflections on the data, to track emerging themes  
113 and extract meaning (Birks et al., 2008). NVivo-12 allows the user to create memos linked to  
114 documents or passages of text within a document as a way to capture insights, interpretations,  
115 and growing understanding as they emerge through analysis. Analytical memos are a critical  
116 tool in qualitative research that can enhance the extraction of meaning from qualitative data  
117 (Birks et al., 2008).

118

119 We conducted a themes analysis based on coding data and memos (Skjott Linneberg &  
120 Korsgaard, 2019) to describe how conservation has been included in MSP and identify a path  
121 toward integration. We condensed analytical memos and arranged them into basic themes:  
122 coherent topics on how conservation, or more generally ecosystems, were conceptualized,  
123 emerging from at least two case studies (Attride-Stirling, 2001). We quantitized codes and  
124 memos into frequency counts (Sandelowski et al., 2009) to estimate prominence and compare  
125 across case studies, which informed basic themes. We then defined and clustered basic themes  
126 into organizing themes that shared similar topics or approaches to conservation from four or  
127 more case studies (Attride-Stirling, 2001).

128

## 129 **RESULTS**

### 130 **Case study overview**

131 The analyzed case studies each addressed more than 10 individual sectors, spanned between  
132 3,454 km<sup>2</sup> and 1,120,000 km<sup>2</sup>, and captured diverse relationships to conservation planning and  
133 MPA establishment (Table 1 and Table S1, see Supplementary Information for additional case  
134 study overview). The *Royal Decree establishing the marine spatial planning for the period 2020*  
135 *to 2026 in the Belgian sea-areas* is a regulatory plan with a core principle of “naturalness”,  
136 which is considered a “basic precondition for the development of the Belgian North Sea” (FPS  
137 Health, Food Chain Safety and Environment, 2020). The plan establishes boundaries for  
138 commercial activities and nature conservation via MPAs. The *Update of the Integrated*  
139 *Management Plan for the Norwegian Sea* revises the initial plan released in 2008-2009 and sets  
140 goals for protection and sustainable use, reporting on the status for establishing MPAs, though  
141 MPAs are planned and legislated under a separate process (Norwegian Ministry of Climate and  
142 Environment, 2017). The plan emphasizes “valuable and vulnerable” areas, though lacks detail  
143 on who, when, or how actions to achieve goals will be undertaken. In the Scottish case, both  
144 MSP and MPAs are enabled through the *Marine (Scotland) Act 2010* though their establishment  
145 follows distinct processes. *Scotland’s National Marine Plan* aims to achieve the UK’s vision for a  
146 “clean, healthy, safe, productive, and biologically diverse” marine environment by “living within  
147 environmental limits” (The Scottish Government, 2015). The *Welsh National Marine Plan* shares

148 this vision and sets four broad objectives that highlight sustainability, resilience, blue growth,  
 149 and carbon emission targets (Welsh Government, 2019). Here, MSP and MPAs are again  
 150 enabled by shared legislation, the *Marine and Coastal Access Act 2009*, though their  
 151 establishment follows distinct processes with distinct outcomes (i.e., a marine plan and marine  
 152 conservation zones). As there is no overarching formal MSP process or legal framework in the  
 153 USA, the *Marine spatial plan for Washington’s Pacific coast* lacks authority to approve or  
 154 prohibit development or activities (Bates et al., 2017). Conservation planning and MPA  
 155 establishment are separate from MSP and occur at both state and federal levels.

156

157 **Conservation principles and priorities in MSP**

158 The case studies varied in their guiding principles, policies, sectors addressed, and use of  
 159 conservation tools (Table 1). These differences alone do not necessarily imply stronger or  
 160 weaker integration of conservation but reflect diverse approaches to conservation and,  
 161 potentially, enabling conditions for integration.

**Table 1.** Differences across case studies in their inclusion of conservation in MSP, from mention of conservation-centric guiding principles to references to specific conservation management tools. Documents analyzed were (1) *Royal Decree establishing the marine spatial planning for the period 2020 to 2026 in the Belgian sea-areas* and a public-facing brochure; (2) *Update of the Integrated Management Plan for the Norwegian Sea*; (3) *Scotland’s National Marine Plan*; (4) *Welsh National Marine Plan*; and (5) *Marine Spatial Plan for Washington’s Pacific Coast*.

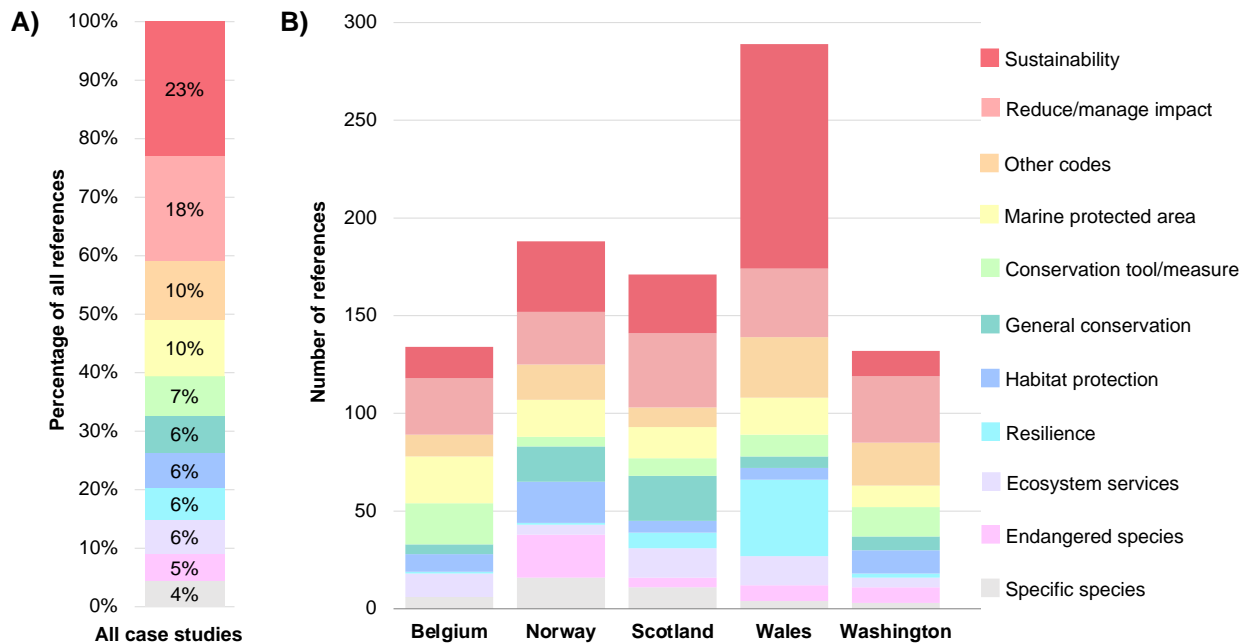
MSP case study	Conservation included in MSP as . . .					
	Guiding principles	Overarching policy	Specific goals	Dedicated section	Specific commitments	Specific tools
Belgium	✓		✓	✓	✓	✓
Norway			✓	✓	✓	✓
Scotland	✓	✓	✓*			✓
Wales	✓	✓	✓*			✓
Washington	✓					✓

\*Scotland relies on strategic objectives from the European Marine Strategy Framework Directive and both Scotland and Wales refer to the UK’s High-Level Marine Objectives, though neither provide independent conservation specific goals.

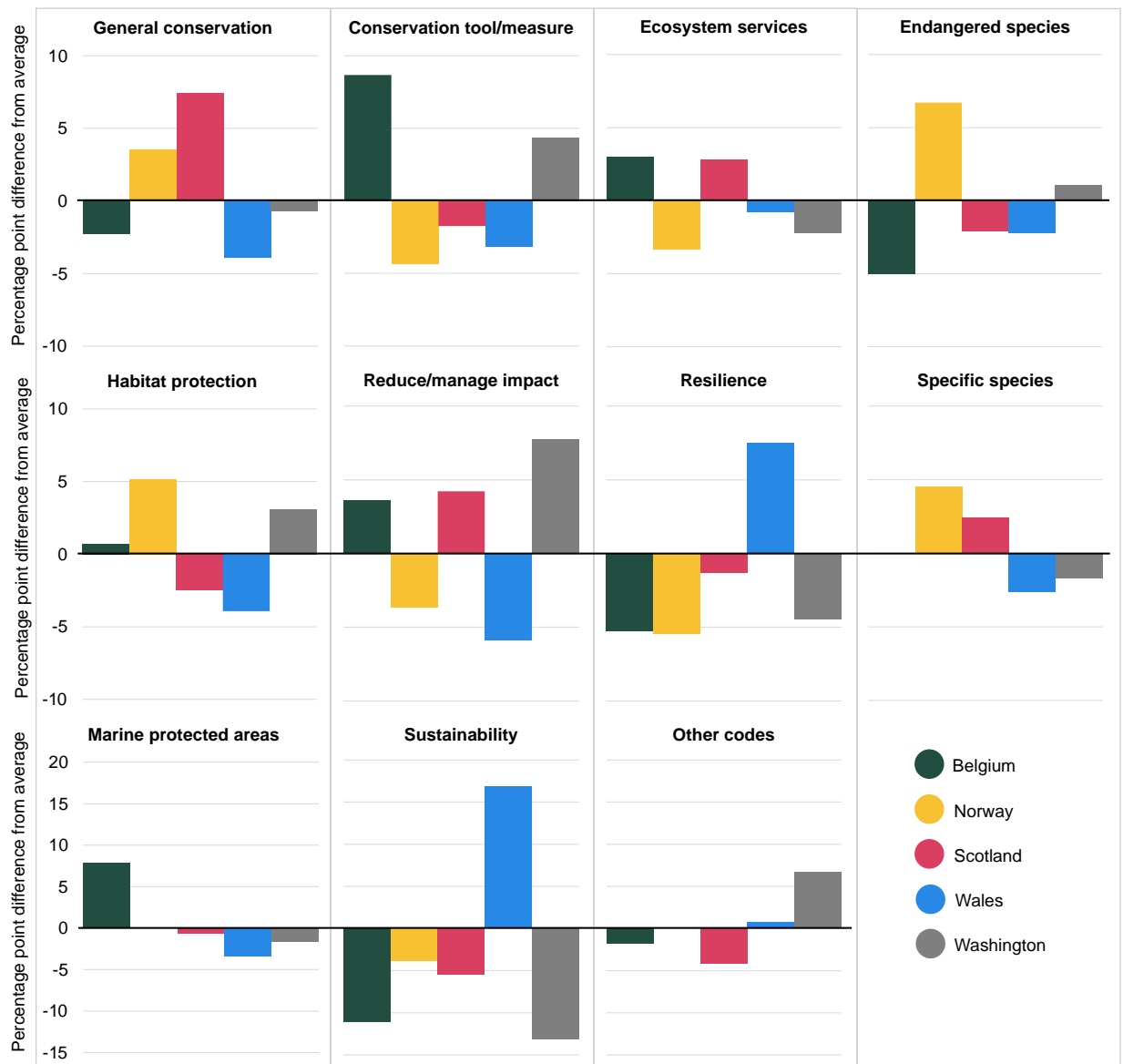
162 The analyzed plans rarely referred to principles and priorities as conservation *per se*,  
 163 particularly for references to “resilience” and “reduce/manage impacts”. Across case studies,



164 sustainability-related codes were used most often (23% of all references), while codes for  
 165 “general conservation”, “conservation measure/tool”, “ecosystem services”, “habitat  
 166 protection”, “specific species”, and “resilience” collectively accounted for less than half of all  
 167 references (40%, Figure 1). The Welsh case relied more on sustainability and resilience concepts  
 168 than other plans, with references to these codes being 17- and 7-percentage points higher than  
 169 average, respectively (Figure 2).



**Figure 1.** Occurrences of conservation principles and priorities referenced in MSP case studies. References to codes related to conservation principles and priorities (A) as percentages across all case studies and (B) as frequencies within individual case study documents. Other codes include those with fewer than 15 references across all case studies: “connectivity & coherence”, “ecosystem function”, “invasive species”, “long-term”, and “restoration”. Sustainability-related codes include “sustainability”, “blue economy”, “sustainable development”, “Sustainable Development Goal 14”, and “sustainable resource use”. MPA related codes include “marine protected area”, “MPA network”, and “specific MPA”.



**Figure 2.** Comparisons of conservation principles and priorities across MSP case studies, showing percentage point deviation within each case study from the average percentage of references per code across all case studies.

170 **Themes on conservation in MSP**

171 Our analysis revealed five organizing themes, developed from coding and analytical memos,  
 172 reflecting how MSP includes conservation (Table 2, Figures 3 and S2), on a spectrum of strong  
 173 to weak inclusion: (1) *ecosystems as fundamental*, (2) *ecosystems as functional*, (3) *social-*  
 174 *ecological systems* (4) *ecosystems as limits*, and (5) *prioritizing economy* (Table S3, see  
 175 Supplementary Information for detailed themes descriptions).

**Table 2.** Definitions of organizing and basic themes and the number of analytical memos sorted into each basic theme per case study.

Organizing theme (number of memos per theme)	Basic theme	BELGIUM	NORWAY	SCOTLAND	WALES	WASHINGTON
<b>Ecosystems as fundamental:</b> Healthy ecosystems underpin the ocean economy and have intrinsic value beyond the services they provide. (15)	Ecosystems, species, and habitats are interconnected and impacts to ecosystems should be avoided to maintain ecosystem function.		✓✓	✓		✓✓
	Prioritizing biodiversity conservation via effective conservation measures, including marine protected areas.	✓✓✓ ✓✓✓ ✓	✓✓	✓		
<b>Ecosystems as functional:</b> Ecosystems serve functions that benefit society through the delivery of ecosystem services. (13)	Ecosystems and the services they provide hold economic value.		✓✓✓	✓		
	Reducing threats and impacts to ecosystem services supports long-term sustainability.		✓✓	✓	✓	✓
	Co-locating conservation measures with other activities delivers ecosystem service benefits from protected areas.			✓	✓✓	✓
<b>Social-ecological systems:</b> Interdependencies between the socio-economic and ecological systems are recognized. (7)	Contributions of ecosystems to well-being are recognized as important for sustainability.	✓			✓✓	✓✓
	Space is created for local needs and priorities to be reflected in planning and management.			✓		✓
<b>Ecosystems as limits:</b> Ecosystems can be sustainably developed, and resources extracted, at a maximum within environmental limits. (10)	Sustainable development and maximum sustainable use occur within ecological limits of the marine environment.		✓	✓✓ ✓	✓✓	
	Environmental limits and risks are identified but guidance for managing within limits is not provided.			✓✓	✓	✓
<b>Prioritizing economy:</b> Continuation and/or development of ocean industries are clear priorities of marine spatial plans. (15)	Current and, to a lesser extent, new activities are maintained and impacts of activities on each other are minimized.	✓✓			✓✓ ✓	✓✓ ✓
	Activities with economic value are permitted within protected areas to limit the impact of conservation on industry.	✓	✓	✓✓ ✓✓		✓

176 *Ecosystems as fundamental* emerged from all but the Welsh case, demonstrating the value of  
177 ecosystems beyond the services provided, and representing the strongest inclusion of  
178 conservation (Table 2). The Norwegian, Scottish, and Washington cases recognize connectivity  
179 between species, habitats, and ecosystem function, and point to a need for reducing threats to  
180 these. The Belgian, Norwegian, and Scottish cases present commitments to biodiversity  
181 management and reducing risk of impacts to MPAs to ensure high quality MPAs to meet  
182 conservation objectives. The Belgian plan emphasizes “working with nature” and defines MPA  
183 boundaries, reflecting the higher-than-average references to this code (Figure 2). This theme  
184 also reflects that these cases showed more frequent references to conservation principles and  
185 priorities, cumulatively, compared to sustainability and reducing impacts (Figure 1).

186  
187 *Ecosystems as functional* focuses on ecosystem services that benefit society and a more  
188 utilitarian view of conservation, emerging clearly from most cases (Table 2) and only somewhat  
189 from the Belgian case via coding (Figure 2). This theme acknowledges that reducing threats and  
190 impacts to ecosystems is necessary to ensure the long-term delivery of services, particularly  
191 economically valuable services in the Norwegian and Scottish cases. While “ecosystem services”  
192 was not coded particularly often (Figure 1), it guided most the analyzed plans, exemplified by  
193 the Norwegian case stating, “there is a clear relationship between biodiversity conservation and  
194 ecosystem functioning and the provision of ecosystem services”.

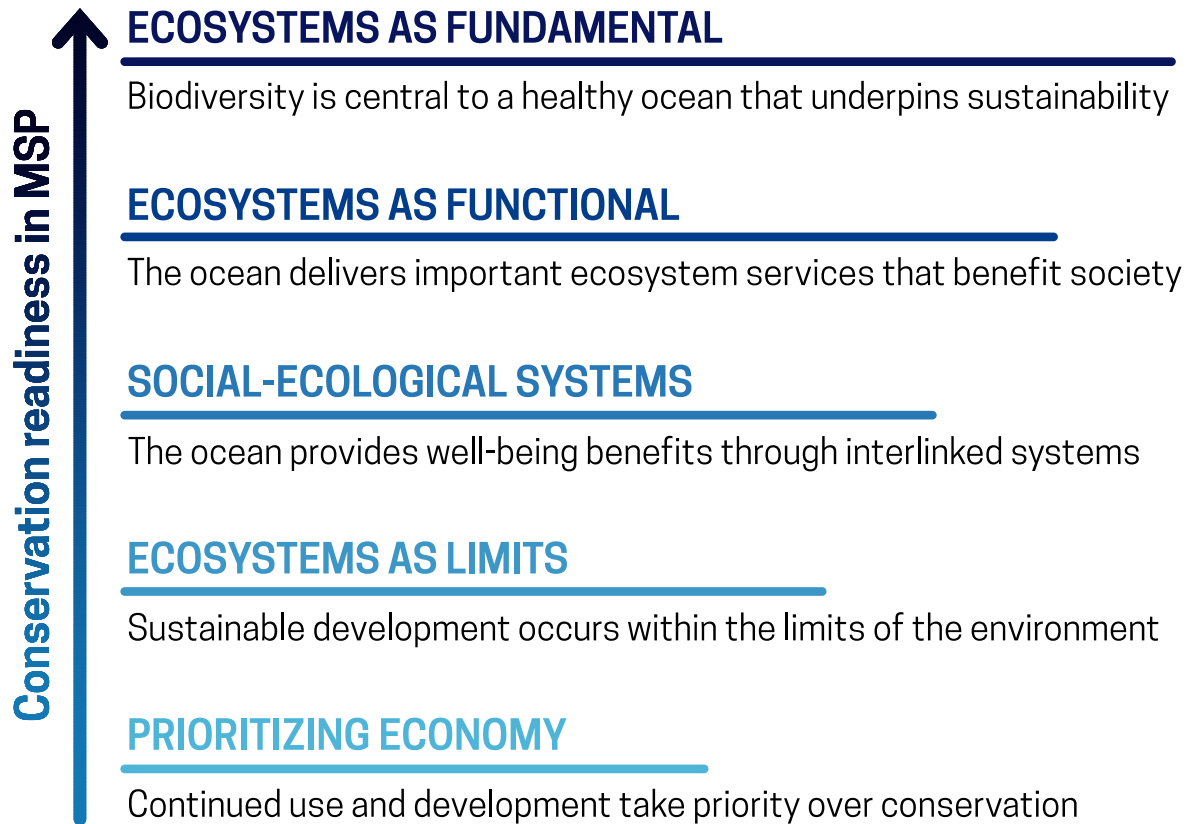
195  
196 *Social-ecological systems* was the least evident among themes, recognizing the contributions of  
197 ecosystems to well-being and a need for local engagement with MSP (Table 2). In the Scottish  
198 case, the national plan is intended to guide regional planners doing more localized MSP. This  
199 theme also reflects the recognized role of Tribal governments in the Washington case. The  
200 Welsh case was the only plan with cultural objectives, including preserving language,  
201 contributing to well-being, ensuring access to the marine environment, and an overarching  
202 policy for a “strong, healthy, and just society”. In the Belgian case, the connection between the  
203 social and ecological systems was clear from the onset, stating that “striving for the desired  
204 level of naturalness will result in healthy ecosystem services, at the service of social well-being.”

205 *Ecosystems as limits* emerged from all but the Belgian case, indicating that ecosystems can be  
206 exploited to a sustainable maximum capacity (Table 2). This theme suggests that sustainable  
207 development and use occur within ecological limits, though plans often acknowledged limits  
208 without defining them or providing guidance to manage within them. The Scottish, Welsh, and  
209 Washington cases in particular omit responsibility for managing within limits or defer this to  
210 other policies, plans, or agencies. Both the Scottish and Welsh cases follow the UK guidance of  
211 “living within environmental limits” as an overarching policy for users of the plan (Table 1). This  
212 theme also reflects the higher-than-average references to “resilience” in the Welsh case (Figure  
213 2), as resilient ecosystems may better withstand maximal sustainable use.

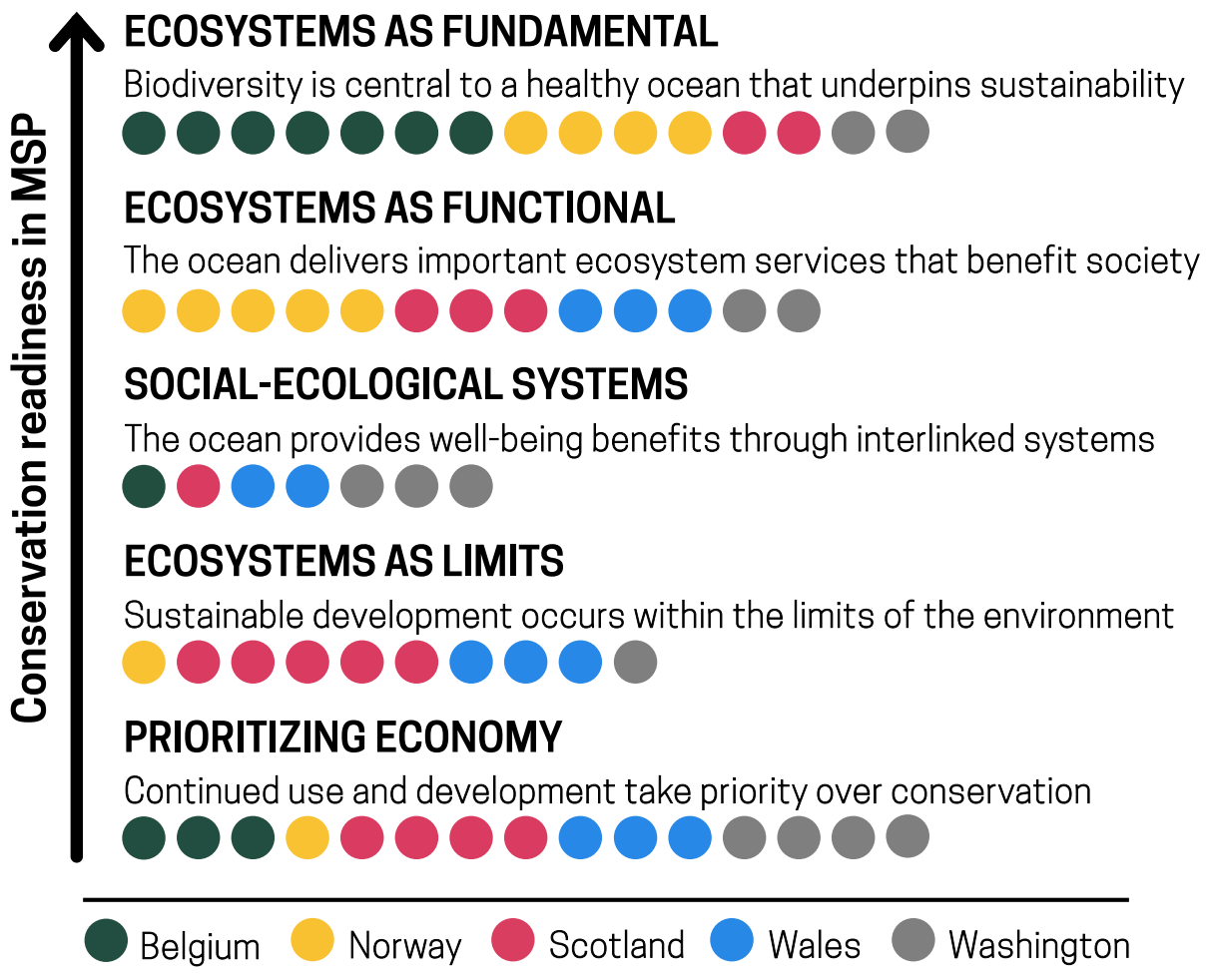
214  
215 *Prioritizing economy* emerged prominently across cases as plans aimed to coordinate continued  
216 use and development of existing and future activities (Table 2). This theme reflects frequent  
217 references to sustainability and “reduce/manage impact” (Figure 1), a priority for maintaining  
218 activities and minimizing their impacts on each other, and allowing activities within MPAs  
219 (Table 2). The Belgian and Scottish cases in particular allow economically important activities  
220 within MPAs where there is, in the Scottish case, “social or economic benefits of national  
221 importance”. This theme is less apparent in the Norwegian case but is masked by a pattern of  
222 requiring longer-term assessments to warrant conservation action, thereby ensuring  
223 continuance of economic activities and limiting conservation’s impact on other uses.

224  
225 **Conservation ready MSP**  
226 Our analysis reveals that some plans appear more prepared to integrate conservation than  
227 others. We argue that some plans are more conservation ready – better prepared to support  
228 and enact conservation given their use of conservation principles and priorities and inclusion of  
229 conservation through policies, goals, commitments, specific tools, or as a use of marine space.  
230 We suggest that the themes presented here reflect a spectrum of conservation readiness  
231 (Figure 3). Plans favouring *ecosystems as fundamental* and *ecosystems as functional*, like the  
232 Belgian and Norwegian cases, may be more conservation ready than plans favouring

233 *ecosystems as limits* and *prioritizing economy*, like the Scottish, Welsh, and Washington cases  
234 (Figure 4).



**Figure 3.** Conservation readiness in MSP based on organizing themes derived from case studies, where readiness is highest in plans that incorporate conservation using an *ecosystems as fundamental* theme and lowest in plans that incorporate conservation using a *prioritizing economy* theme.



**Figure 4.** Conservation readiness across MSP case studies. The relative importance of organizing themes per case study is depicted with coloured circles for analytical memos sorted into each theme (see Table 2). Case studies can reflect multiple themes to varying extents, affecting their level of conservation readiness.

235 Plans that frame *ecosystems as fundamental* may be the most conservation ready, recognizing  
 236 that biodiversity conservation serves as a foundation for sustainable resource use (Frazão  
 237 Santos et al., 2021). The Belgian and Norwegian plans most strongly reflect this theme (Figure  
 238 4), making specific conservation commitments (Table 1) and and presenting higher-than-  
 239 average coding frequencies for conservation priorities (Figure 2). For these plans, conservation  
 240 principles and priorities are more apparent, ecosystems are seen as interconnected, and  
 241 biodiversity is prioritized in conservation measures (Figure 1, Table 2).

242

243 Plans that frame *ecosystems as functional* may still be conservation ready, reflecting the role of  
244 healthy ecosystems in sustaining economically important services (Table 2); however,  
245 prioritizing only target species would limit the role of wider “biodiversity services” (Cavanagh et  
246 al., 2016; Seddon et al., 2016), potentially dampening conservation readiness. This theme is  
247 apparent in the Norwegian case, where conservation appears to serve as an enabling factor for  
248 sustainable use. This and the Belgian case also favour *ecosystems as fundamental*, improving  
249 conservation readiness relative to the Scottish case that leans more toward *ecosystems as*  
250 *limits* (Figure 4).

251  
252 Plans that reflect *social-ecological systems* recognize the importance of ecosystems to well-  
253 being, and thus their importance to sustainability, and may be somewhat conservation ready  
254 (Table 2, Figure 3). Favouring *social-ecological systems* may improve the inclusion of local needs  
255 and well-being objectives (Zuercher et al., 2022) as exemplified by the Washington and Welsh  
256 cases. Positive well-being outcomes can enhance MPA effectiveness by being more socially  
257 acceptable (Ban et al., 2019). Thus, favouring *social-ecological systems* may similarly support  
258 well-being outcomes in MSP, thereby improving social acceptability and potentially  
259 conservation readiness.

260  
261 While *ecosystems as limits* acknowledges the ecosystem, *prioritizing economy* favours  
262 development and minimizing the impact of conservation on continued use. Plans favouring  
263 these themes, including the Scottish, Washington, and Welsh cases, may be less conservation  
264 ready (Figure 4), as their focus lies in sustainability, reducing or managing impacts, and  
265 resilience (Figure 2). The Welsh case notably relied on resilience concepts, which were tied to  
266 future ocean benefits rather than explicitly ecological resilience. The Scottish and Welsh plans  
267 also refer to “maximizing sustainable development” without defining the “maximum”. This  
268 language may stem from fisheries maximum sustainable yield, which similarly relies on  
269 environmental limits and has been criticized for its simplistic view of ecosystems (DeFries &  
270 Nagendra, 2017). These plans may be less ready to integrate conservation, focusing instead on  
271 sustaining extractive activities.



272 The analysed plans clearly reflect multiple, at times seemingly contradictory, themes (Table 2,  
273 Figure 4). All plans reflect both *ecosystems as fundamental* and *prioritizing economy*, spanning  
274 the spectrum of conservation readiness (Figure 3); though plans favour different themes  
275 throughout the spectrum (Figure 4). This multiplicity highlights the diversity of objectives in  
276 MSP (UNESCO-IOC/European Commission, 2021), as it intends to balance economic  
277 development with biodiversity conservation for environmental sustainability (Frazão Santos et  
278 al., 2021). As a process that can foster a sustainable blue economy, delivering sustainable ocean  
279 use for economic growth and improved livelihoods while preserving ecosystem health  
280 (UNESCO-IOC/European Commission, 2021), MSP may help to overcome the false dichotomy  
281 between protection and profit through conservation readiness.

282

## 283 **DISCUSSION**

284 Our analysis demonstrates that a layering of themes is likely required to achieve diverse MSP  
285 objectives (Figure 4), but that conservation readiness may be bolstered through certain themes,  
286 particularly by framing ecosystems as fundamental to sustainable use and development.  
287 Conservation may be embedded in MSP via *ecosystems as functional* and *social-ecological*  
288 *systems*; enacted through conservation measures via *ecosystems as fundamental*; and address  
289 impacts from multiple uses via *ecosystems as limits*. Sectors depending on healthy ecosystems,  
290 like fisheries, may benefit more from conservation ready MSP in the short-term than less  
291 dependent sectors, like mining, where *prioritizing economy* may take precedent. In the long  
292 term, conservation ready MSP may safeguard healthy ecosystems by avoiding trade-offs  
293 between immediate profit and the long-term delivery of multiple benefits.

294

295 We suggest that planners consider how each of these themes are reflected in their marine  
296 spatial plans, and how the use of conservation principles and priorities can ensure that healthy  
297 ecosystems support full spectrum sustainability (Foley et al., 2020). Conservation readiness  
298 might be improved via a dedicated conservation component in MSP, as in the Belgian and  
299 Norwegian cases; however, we also recommend that conservation be viewed as underpinning  
300 other ocean uses, reflecting the need for protection and restoration to deliver sustainability

301 (Claudet, 2021). Compared to other cases, these two have stronger regulatory connections to  
302 MPAs, as MPAs are established through MSP in the Belgian case and the status of MPA  
303 establishment is reported in the Norwegian case, which may bolster conservation readiness.  
304 Further, these cases were both in the adaptation phase of MSP (Table S1), which means that  
305 resulting plans may be more conservation ready than earlier iterations. Conservation readiness  
306 may require time and adaptation as plans are evaluated and new information becomes  
307 available. MSP that considers human well-being outcomes, reflecting the social-ecological  
308 systems theme, and that goes further to prioritize participation, equity, and inclusion, may  
309 social acceptance (Frazão Santos et al., 2021) and therefore conservation readiness . Finally,  
310 since marine spatial plans often prioritize economic development (Trouillet, 2020), the  
311 historical context of conservation and political motivations in the planning region will likely  
312 influence conservation readiness.

313  
314 Conservation ready MSP does not negate the need for conservation planning. The Scottish,  
315 Welsh, and Washington cases tended to defer responsibility for managing within environmental  
316 limits to other policies, plans, or agencies. This may reflect the importance of mechanisms for  
317 advancing conservation beyond MSP. While MSP often includes conservation among several  
318 goals, and can supplement conservation measures by considering broader pressures on  
319 ecosystems (Trouillet, 2020), it should still be complemented by effective conservation policy  
320 and planning. We found that the analyzed plans rarely focused on finer principles and priorities,  
321 such as connectivity, ecosystem function, restoration, and long-term conservation, which may  
322 be difficult to include in MSP. For instance, connectivity is essential for ecosystem functioning  
323 and can support ecosystem-based MSP (Foley et al., 2010), but achieving connectivity remains a  
324 challenge in conservation planning (Balbar & Metaxas, 2019), potentially hindering its uptake in  
325 MSP. Our results highlight how some conservation concepts can be co-opted by MSP to  
326 promote use in perpetuity. In our analysis, resilience seems disconnected from the ability of  
327 ecosystems to recover from disturbances without slowly degrading, and therefore did not  
328 consider the need for conservation measures to promote resilience (Darling & Côté, 2018;  
329 Hughes et al., 2005). Comprehensive MSP that uses conservation planning as a tool may

330 improve conservation readiness (Trouillet & Jay, 2021).MSP research and practice are diverse  
331 (Trouillet, 2020). The plans assessed in this study do not reflect the full spectrum of MSP and  
332 our results may be less relevant to non-European or European influenced nations. While our  
333 qualitative analysis was comprehensive, it was limited to five marine spatial plans available in  
334 English. We propose the concept of conservation ready MSP as potentially beneficial, but the  
335 concept may not be generalizable for all MSP initiatives. The plans analyzed here take different  
336 approaches to conservation, but there are many more approaches that could further inform  
337 conservation ready MSP. This analysis was conducted on the most recent iteration of MSP and  
338 does not reflect accompanying documents that could add to our interpretations. Similarly, since  
339 this analysis focused on MSP, it did not extend to other conservation policies and plans in the  
340 case study areas. MSP seldom exists in a governance vacuum. The process must interact with,  
341 and ideally coordinate, various governance structures, processes, and policies. Future studies  
342 might explore the complex relationships between MSP and these other frameworks to more  
343 holistically understand the conservation system within a planning area. Our analysis does not  
344 assess conservation outcomes, but future studies may continue this work by analyzing  
345 outcomes to further develop this concept.

346

## 347 **CONCLUSION**

348 Our results suggest that MSP is driven by sustainable use and development, aiming to  
349 coordinate ocean management and mitigate impacts from multiple uses, more so than foster  
350 biodiversity conservation. . With cumulative impacts from climate change and human activities  
351 increasing in intensity across the ocean (Halpern et al., 2019), mainstreaming biodiversity in  
352 strategy, policy, and planning is critical for sustainable development (OECD, 2018). As others  
353 have identified a need for climate ready MSP (Frazão Santos et al., 2020), we suggest a need for  
354 conservation ready MSP to support progress toward global ocean goals (Secretariat of the  
355 Convention on Biological Diversity et al., 2016; Secretariat of the Convention on Biological  
356 Diversity & Technical Advisory Panel-GEF, 2012). MSP may be more conservation ready when  
357 ecosystems are viewed as fundamental to sustainable use, rather than limits to resource use or  
358 prioritizing economy. Conservation readiness is not intended to bias MSP, but rather to

359 integrate the objectives of marine protection, sustainable use, and sustainable development  
360 into planning. We propose conservation ready MSP as a concept and a call to action to  
361 centralize biodiversity in planning if we are to achieve a truly sustainable blue economy.

362

### 363 **ETHICS STATEMENT**

364 Ethical approval was not required for this research.

365

### 366 **CONFLICT OF INTEREST**

367 The authors declare no conflict of interest.

368

### 369 **DATA AVAILABILITY**

370 Data supporting this research are available in Supplementary Information.

371

### 372 **REFERENCES**

373 Ansong, J., Gissi, E., & Calado, H. (2017). An approach to ecosystem-based management in  
374 maritime spatial planning process. *Ocean & Coastal Management*, *141*, 65–81.

375 <https://doi.org/10.1016/j.ocecoaman.2017.03.005>

376 Attride-Stirling, J. (2001). Thematic networks: An analytic tool for qualitative research.

377 *Qualitative Research*, *1*(3), 385–405. <https://doi.org/10.1177/146879410100100307>

378 Balbar, A. C., & Metaxas, A. (2019). The current application of ecological connectivity in the  
379 design of marine protected areas. *Global Ecology and Conservation*, *17*, e00569.

380 <https://doi.org/10.1016/j.gecco.2019.e00569>

381 Ban, N. C., Gurney, G. G., Marshall, N. A., Whitney, C. K., Mills, M., Gelcich, S., Bennett, N. J.,  
382 Meehan, M. C., Butler, C., Ban, S., Tran, T. C., Cox, M. E., & Breslow, S. J. (2019). Well-  
383 being outcomes of marine protected areas. *Nature Sustainability*, *2*(6), 524–532.

384 <https://doi.org/10.1038/s41893-019-0306-2>

385 Bates, E., Gianou, K., Hennessey, J., Lassiter, K., Whiting, L., McCord, A., Niles, C., Doeringhaus,  
386 J., & Culver, M. (2017). *Marine Spatial Plan for Washington's Pacific Coast*. State of  
387 Washington Department of Ecology.

388 Birks, M., Chapman, Y., & Francis, K. (2008). Memoing in qualitative research: Probing data and  
389 processes. *Journal of Research in Nursing*, *13*(1), 68–75.  
390 <https://doi.org/10.1177/1744987107081254>

391 Cavanagh, R. D., Broszeit, S., Pilling, G. M., Grant, S. M., Murphy, E. J., & Austen, M. C. (2016).  
392 Valuing biodiversity and ecosystem services: A useful way to manage and conserve  
393 marine resources? *Proceedings of the Royal Society B: Biological Sciences*, *283*(1844),  
394 20161635. <https://doi.org/10.1098/rspb.2016.1635>

395 CBD. (2022). *Kunming-Montreal Global Biodiversity Framework*. Convention on Biological  
396 Diversity. <https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf>

397 Claudet, J. (2021). The seven domains of action for a sustainable ocean. *Cell*, *184*(6), 1426–  
398 1429. <https://doi.org/10.1016/j.cell.2021.01.055>

399 Claudet, J., Bopp, L., Cheung, W. W. L., Devillers, R., Escobar-Briones, E., Haugan, P., Heymans, J.  
400 J., Masson-Delmotte, V., Matz-Lück, N., Miloslavich, P., Mullineaux, L., Visbeck, M.,  
401 Watson, R., Zivian, A. M., Ansorge, I., Araujo, M., Aricò, S., Bailly, D., Barbrière, J., ... Gaill,  
402 F. (2020). A Roadmap for Using the UN Decade of Ocean Science for Sustainable  
403 Development in Support of Science, Policy, and Action. *One Earth*, *2*(1), 34–42.  
404 <https://doi.org/10.1016/j.oneear.2019.10.012>

405 Darling, E. S., & Côté, I. M. (2018). Seeking resilience in marine ecosystems. *Science*, *359*(6379),  
406 986–987. <https://doi.org/10.1126/science.aas9852>

407 DeFries, R., & Nagendra, H. (2017). Ecosystem management as a wicked problem. *Science*,  
408 356(6335), 265–270. <https://doi.org/10.1126/science.aal1950>

409 Domínguez-Tejo, E., Metternicht, G., Johnston, E., & Hedge, L. (2016). Marine Spatial Planning  
410 advancing the Ecosystem-Based Approach to coastal zone management: A review.  
411 *Marine Policy*, 72, 115–130. <https://doi.org/10.1016/j.marpol.2016.06.023>

412 Ehler, C., & Douvère, F. (2009). Marine Spatial Planning: A step-by-step approach toward  
413 ecosystem-based management. *Intergovernmental Oceanographic Commission and*  
414 *Man and the Biosphere Programme, IOC Manual(6)*, 1–98.

415 Ehler, C. N. (2020). Two decades of progress in Marine Spatial Planning. *Marine Policy*.  
416 <https://doi.org/10.1016/j.marpol.2020.104134>

417 Ehler, C., Zaucha, J., & Gee, K. (2019). Maritime/Marine Spatial Planning at the Interface of  
418 Research and Practice. In J. Zaucha & K. Gee (Eds.), *Maritime Spatial Planning: Past,*  
419 *present, future* (pp. 1–21). Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-](https://doi.org/10.1007/978-3-319-98696-8)  
420 [319-98696-8](https://doi.org/10.1007/978-3-319-98696-8)

421 Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating Rigor Using Thematic Analysis: A Hybrid  
422 Approach of Inductive and Deductive Coding and Theme Development. *International*  
423 *Journal of Qualitative Methods*, 5(1), 80–92.  
424 <https://doi.org/10.1177/160940690600500107>

425 Flannery, W., Toonen, H., Jay, S., & Vince, J. (2020). A critical turn in marine spatial planning.  
426 *Maritime Studies*, 19(3), 223–228. <https://doi.org/10.1007/s40152-020-00198-8>

427 Foley, M. M., Halpern, B. S., Micheli, F., Armsby, M. H., Caldwell, M. R., Crain, C. M., Prahler, E.,  
428 Rohr, N., Sivas, D., Beck, M. W., Carr, M. H., Crowder, L. B., Emmett Duffy, J., Hacker, S.

429 D., McLeod, K. L., Palumbi, S. R., Peterson, C. H., Regan, H. M., Ruckelshaus, M. H., ...  
430 Steneck, R. S. (2010). Guiding ecological principles for marine spatial planning. *Marine*  
431 *Policy*, 34(5), 955–966. <https://doi.org/10.1016/j.marpol.2010.02.001>

432 Foley, P., Pinkerton, E., Wiber, M., & Stephenson, R. (2020). Full-spectrum sustainability: An  
433 alternative to fisheries management panaceas. *Ecology and Society*, 25(2).  
434 <https://doi.org/10.5751/ES-11509-250201>

435 Folke, C., Holling, C. S., & Perrings, C. (1996). Biological Diversity, Ecosystems, and the Human  
436 Scale. *Ecological Applications*, 6(4), 1018–1024. <https://doi.org/10.2307/2269584>

437 FPS Health, Food Chain Safety and Environment. (2020). *Royal Decree establishing the marine*  
438 *spatial planning for the period 2020 to 2026 in the Belgian sea-areas*. Belgian Federal  
439 Public Service.  
440 [https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth\\_theme\\_file](https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file)  
441 [/msp-2020-englishtranslation.pdf](https://www.health.belgium.be/sites/default/files/uploads/fields/fpshealth_theme_file/msp-2020-englishtranslation.pdf)

442 Frazão Santos, C., Agardy, T., Andrade, F., Calado, H., Crowder, L. B., Ehler, C. N., García-  
443 Morales, S., Gissi, E., Halpern, B. S., Orbach, M. K., Pörtner, H.-O., & Rosa, R. (2020).  
444 Integrating climate change in ocean planning. *Nature Sustainability*, 3, 505–516.  
445 <https://doi.org/10.1038/s41893-020-0513-x>

446 Frazão Santos, C., Agardy, T., Andrade, F., Crowder, L. B., Ehler, C. N., & Orbach, M. K. (2021).  
447 Major challenges in developing marine spatial planning. *Marine Policy*, 132, 103248.  
448 <https://doi.org/10.1016/j.marpol.2018.08.032>

449 Frazão Santos, C., Domingos, T., Ferreira, M. A., Orbach, M., & Andrade, F. (2014). How  
450 sustainable is sustainable marine spatial planning? Part I-Linking the concepts. *Marine*  
451 *Policy*, 49, 59–65. <https://doi.org/10.1016/j.marpol.2014.04.004>

452 Halpern, B. S., Frazier, M., Afflerbach, J., Lowndes, J. S., Micheli, F., O'Hara, C., Scarborough, C.,  
453 & Selkoe, K. A. (2019). Recent pace of change in human impact on the world's ocean.  
454 *Scientific Reports*, 9(1), 11609. <https://doi.org/10.1038/s41598-019-47201-9>

455 Hughes, T., Bellwood, D., Folke, C., Steneck, R., & Wilson, J. (2005). New paradigms for  
456 supporting the resilience of marine ecosystems. *Trends in Ecology & Evolution*, 20(7),  
457 380–386. <https://doi.org/10.1016/j.tree.2005.03.022>

458 IUCN. (2021). *IUCN Definitions—English*. International Union for the Conservation of Nature.  
459 [https://www.iucn.org/sites/dev/files/iucn-glossary-of-definitions\\_en.pdf](https://www.iucn.org/sites/dev/files/iucn-glossary-of-definitions_en.pdf)

460 Jones, P. J. S., Lieberknecht, L. M., & Qiu, W. (2016). Marine spatial planning in reality:  
461 Introduction to case studies and discussion of findings. *Marine Policy*, 71, 256–264.  
462 <https://doi.org/10.1016/j.marpol.2016.04.026>

463 Jouffray, J.-B., Blasiak, R., Norström, A. V., Österblom, H., & Nyström, M. (2020). The Blue  
464 Acceleration: The Trajectory of Human Expansion into the Ocean. *One Earth*, 2(1), 43–  
465 54. <https://doi.org/10.1016/j.oneear.2019.12.016>

466 Laffoley, D., Baxter, J. M., Amon, D. J., Claudet, J., Hall-Spencer, J. M., Grorud-Colvert, K., Levin,  
467 L. A., Reid, P. C., Rogers, A. D., Taylor, M. L., Woodall, L. C., & Andersen, N. F. (2021).  
468 Evolving the narrative for protecting a rapidly changing ocean, post-COVID-19. *Aquatic*  
469 *Conservation: Marine and Freshwater Ecosystems*, 31, 1512–1534.  
470 <https://doi.org/10.1002/aqc.3512>



471 Margules, C. R., & Pressey, R. (2000). Systematic conservation planning. *Nature*, *405*(6783),  
472 243–253. <https://doi.org/10.1038/35012251>

473 Norwegian Ministry of Climate and Environment. (2017). *Update of the integrated management*  
474 *plan for the Norwegian Sea* (Report to the Storting Meld. St. 35).  
475 [https://www.regjeringen.no/contentassets/e24684b247d64455a90070daba993291/en-](https://www.regjeringen.no/contentassets/e24684b247d64455a90070daba993291/en-gb/pdfs/stm201620170035000engpdfs.pdf)  
476 [gb/pdfs/stm201620170035000engpdfs.pdf](https://www.regjeringen.no/contentassets/e24684b247d64455a90070daba993291/en-gb/pdfs/stm201620170035000engpdfs.pdf)

477 OECD. (2018). *Mainstreaming Biodiversity for Sustainable Development*. OECD Publishing.  
478 <https://doi.org/10.1787/9789264303201-en>

479 Reimer, J. M., Devillers, R., & Claudet, J. (2021). Benefits and gaps in area-based management  
480 tools for the ocean Sustainable Development Goal. *Nature Sustainability*, *4*, 349–357.  
481 <https://doi.org/10.1038/s41893-020-00659-2>

482 Sandelowski, M., Voils, C. I., & Knafl, G. (2009). On Quantitizing. *Journal of Mixed Methods*  
483 *Research*, *3*(3), 208–222. <https://doi.org/10.1177/1558689809334210>

484 Schupp, M. F., Bocci, M., Depellegrin, D., Kafas, A., Kyriazi, Z., Lukic, I., Schultz-Zehden, A.,  
485 Krause, G., Onyango, V., & Buck, B. H. (2019). Toward a Common Understanding of  
486 Ocean Multi-Use. *Frontiers in Marine Science*, *6*, 165.  
487 <https://doi.org/10.3389/fmars.2019.00165>

488 Secretariat of the Convention on Biological Diversity, Food and Agriculture Organisation of the  
489 United Nations, The World Bank, United Nations Environment Programme, & United  
490 Nations Development Programme. (2016). *Biodiversity and the 2030 Agenda for*  
491 *Sustainable Development Biodiversity Is Essential for Sustainable Development*.  
492 <https://www.cbd.int/development/doc/biodiversity-2030-agenda-technical-note-en.pdf>

493 Secretariat of the Convention on Biological Diversity & Technical Advisory Panel-GEF. (2012).  
494 *Marine spatial planning in the context of the convention on biological diversity: A study*  
495 *carried out in response to CBD COP 10 decision X/29.* (No. 68; Technical Series, p. 44).  
496 <http://www.deslibris.ca/ID/242835>

497 Seddon, N., Mace, G. M., Naeem, S., Tobias, J. A., Pigot, A. L., Cavanagh, R., Mouillot, D., Vause,  
498 J., & Walpole, M. (2016). Biodiversity in the Anthropocene: Prospects and policy.  
499 *Proceedings of the Royal Society B: Biological Sciences*, 283(1844), 20162094.  
500 <https://doi.org/10.1098/rspb.2016.2094>

501 Skjott Linneberg, M., & Korsgaard, S. (2019). Coding qualitative data: A synthesis guiding the  
502 novice. *Qualitative Research Journal*, 19(3), 259–270. [https://doi.org/10.1108/QRJ-12-](https://doi.org/10.1108/QRJ-12-2018-0012)  
503 [2018-0012](https://doi.org/10.1108/QRJ-12-2018-0012)

504 The Scottish Government. (2015). *Scotland's National Marine Plan: A Single Framework for*  
505 *Managing Our Seas.*  
506 [https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-](https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2015/03/scotlands-national-marine-plan/documents/00475466-pdf/00475466-pdf/govscot%3Adocument/00475466.pdf)  
507 [plan/2015/03/scotlands-national-marine-plan/documents/00475466-pdf/00475466-](https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2015/03/scotlands-national-marine-plan/documents/00475466-pdf/00475466-pdf/govscot%3Adocument/00475466.pdf)  
508 [pdf/govscot%3Adocument/00475466.pdf](https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2015/03/scotlands-national-marine-plan/documents/00475466-pdf/00475466-pdf/govscot%3Adocument/00475466.pdf)

509 Trouillet, B. (2020). Reinventing marine spatial planning: A critical review of initiatives  
510 worldwide. *Journal of Environmental Policy and Planning*, 22(4), 441–459.  
511 <https://doi.org/10.1080/1523908X.2020.1751605>

512 Trouillet, B., & Jay, S. (2021). The complex relationships between marine protected areas and  
513 marine spatial planning: Towards an analytical framework. *Marine Policy*, 127, 104441.  
514 <https://doi.org/10.1016/j.marpol.2021.104441>

515 UNESCO-IOC/European Commission. (2021). *MSPglobal International Guide on*  
516 *Marine/Maritime Spatial Planning* (IOC Manuals and Guides No 89, p. 152). UNESCO.

517 United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable  
518 Development. *General Assembly 70 Session, 16301*(October), 1–35.  
519 <https://doi.org/10.1007/s13398-014-0173-7.2>

520 Vaughan, D., & Agardy, T. (2020). Marine protected areas and marine spatial planning –  
521 allocation of resource use and environmental protection. In *Marine Protected Areas* (p.  
522 35). Elsevier Ltd. <https://doi.org/10.1016/b978-0-08-102698-4.00002-2>

523 Welsh Government, W. (2019). *Welsh National Marine Plan*.  
524 [https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-](https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan-document_0.pdf)  
525 [marine-plan-document\\_0.pdf](https://www.gov.wales/sites/default/files/publications/2019-11/welsh-national-marine-plan-document_0.pdf)

526 Zuercher, R., Motzer, N., Magris, R. A., & Flannery, W. (2022). Narrowing the gap between  
527 marine spatial planning aspirations and realities. *ICES Journal of Marine Science*,  
528 fsac009. <https://doi.org/10.1093/icesjms/fsac009>