



Recycling data for Marine Spatial Planning: A review of maritime plans in Europe

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1 Introduction

2 The area of environmental data is attracting growing attention due to the important role it
3 plays in the management of marine areas. Indeed, recent observations made by
4 environmental activists engaged in ocean protection and working within the European
5 Commission highlight a major problem: the withholding of data by some government, thus
6 compromising informed decision-making for the conservation of marine ecosystems. The
7 lack of data provided to the European Commission, despite its crucial need for scientific
8 advice to shape evidence-based policies, reveals a major gap in data availability and
9 accessibility. Policies such as Directive 2008/56/EC¹ establishing the strategic framework for
10 the sea and Directive 2014/89/EU² for Marine Spatial Planning (MSP), show the importance
11 that governments place on the protection and sustainability of the marine ecosystem
12 (Guinan et al., 2021), which can only be guaranteed by access to high-quality data to guide
13 environmental policies in this evidence-based process. To support this ambition, European
14 Union (UE) member states are working on a set of criteria and standards for a more
15 consistent ecological status. To illustrate, this is achieved through a number of marine data
16 collection and sharing initiatives, such as the European Marine Observation and Data
17 Network (EMODnet) or the European Ocean Observing System (EuroGOOS), which aim to
18 promote access to and sharing of marine data and information, with a view to addressing
19 societal challenges related to marine space. All these initiatives are part of Directive
20 2007/2/EC (INSPIRE), which established a common infrastructure for spatial information.
21 But, on the one hand, EMODnet, for example, still requires to improve the coverage, quality,
22 and resolution of the data, as well as the consistency, harmonisation and interoperability of
23 the various accessible thematic areas (Martín Míguez et al., 2019). As it stands, EMODnet
24 results in data degradation in enabling European standardisation at similar scales, leading to
25 the loss of significant detail (Guinan et al., 2021). On the other hand, a strictly spatial
26 approach to data through visualization tools cannot take into account non-spatialized data,
27 despite the fact that this could minimize the risk of incomplete information (Holzhüter et al.,
28 2019), particularly when implementing marine planning policies. Directive 2014/89/EU places
29 data at the core of the MSP process, since EU member states must organize MSP on
30 'reliable', 'evidence-based' data, in short, 'the best available data'. In fact, MSP is, in theory,
31 an evidence-based process (MSP Data Study, 2016). This means that the success of MSP
32 is closely linked to the quality and availability of data (Stamoulis & Delevaux, 2015). While
33 some organizations are working on cross-border harmonisation (e.g. HELCOM-VASAB),
34 particularly in areas where maritime activities are densest, such as the Baltic Sea in Europe,
35 the main focus is on harmonizing spatial representations (Zaucha, 2014), particularly
36 through the production of homogeneous data. However, this does not yet apply to all areas
37 covered by Directive 2014/89/EU, which severely hampers the implementation of
38 transborder maritime plans, as each state defines its own indicators of good ecological
39 status (European MSP Platform, 2019) and its own interpretation of "the application of an
40 ecosystem-based approach will contribute to promote sustainable development and growth
41 of maritime and coastal economies and sustainable use of marine and coastal resources".
42 (Directive 2014/89/EU). Therefore, it seems necessary to study the data mobilized in the
43 MSP context to understand what are the potential challenges and limits to the application of
44 the European directive. To do so, we will examine the existing marine plans in Europe and
45 especially the data lifecycle to produce an evidence-based plan.

46
47 This study focuses on the data used for MSP, examined through its lifecycle
48 (collection/selection, processing, mapping...). In this article, the term lifecycle refers to the
49 genealogy of the data, from the production to the representation on a map. The lifecycle
50 consists of all the phases through which data pass from their creation through to their
51 deletion. Given the datafication of the world, data abundance and, above all quality, must be

¹ Directive establishing a framework for community action in the field of marine environmental policy (Marine Strategy Framework Directive), 2008/56/EC (2008). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32008L0056>

² Directive establishing a framework for maritime spatial planning (MSP directive), n° 2014/89/EU (2014). <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0089>

interrogated at each stage of an MSP process (Holzhüter et al., 2019). It is also worth examining the multiscale approach of European spatial planning in order to assess the coordination of marine plans for a space that cannot be delimited in a fixed way, as is then the case on maps. This study was carried out to understand what knowledge is produced by these data, how, by whom, and why? As critical data studies have shown, answering these questions will help to understand the power relationship that shapes planning.

The results of this study will greatly contribute to extend the existing literature on this subject with a critical approach in order to document the following questions: Do the data created and used in marine spatial plans capture the entanglements between human activities and the marine environment? Our hypothesis is that if the data used do not enable us to assess impacts and multidimensional relationships in marine environments, then they do not enable us to satisfy the environmental protection goals required by the European directive. Unless, as Batty (2022) argues, the data are used only downstream in the planning process. In that case, data serve simply to justify political decisions. By validating or invalidating this hypothesis, we will not only document the power-knowledge relationships that crystallize through data, but also discuss their quality external and internal, as claimed by Devillers and Jeansoulin (2005). To do so, we need to balance the notion of abundance when discussing data and interrogating their spatial representation, especially in a marine case study, because spatial boundaries are not static.

This article is organized as follows: Section 1 examines the literature gap to fill in. Section 2 presents the methodology and justifies the focus on European planning documents to carry out a comparative study based on the common requirements set out in Directive 2014/89/EU. Of all the data available for MSPs, we will also explain why we have chosen to focus on environmental data in this paper. In Section 3 we present the results. This is followed by Section 4, which enables us to discuss the data lifecycle to understand planning and conclude in Section 5.

Section 1. The use of data in Marine Spatial Planning: How to frame marine challenges with data?

Data harmonization has become a major topic in recent studies; it is repeatedly discussed in the scientific literature as an urgent need in order to meet the goals posed by MSP (Elher, 2008; Hattam et al., 2015; Holzhüter et al., 2019; MSP Data Study, 2016; Stamoulis & Develaux, 2015). Strain et al. (2006) suggested that spatial information is recognized as a decisive element in decision-making since it provides the geographical context for plans. Results reported by Holzhüter et al. (2019) or Schaefer & Barale (2011) suggest that the temporal dimension is also important for the management of human activities at sea, since both ecosystems and human activities are subject to seasonal shifts, making it necessary to adjust their compatibility. Marine space must also be taken into account in a three-dimensional way, while including the temporal dimension, which makes the management of marine space more complex and reinforces the decisive role of geographical information relating to it. In their 2014 paper, Shucksmith and Kelly reported the limited implementation of spatial and temporal aspects of the dataset used for MSP.

However, despite this acknowledgement, the actual integration of spatial and temporal aspects into datasets remains limited. Various studies have been carried out to examine the data used in MSP, revealing significant gaps and disparities between states in the processing of data for planning purposes (e.g. Shepperson et al., 2018 ; Trouillet, 2019, 2020). These studies reveal the growing attention given to data in planning, but also highlight the need to deepen our understanding of the power-knowledge dynamics involved in the production and use of data.

Few researchers have addressed the question of data quality used in MSP. The last five years have witnessed and increased the number of multinational projects involved in MSP data studies. UNESCO has recently conducted an inventory of marine environment in the

Mediterranean, highlighting gaps in data according to activities or spatial representations (UNESCO-IOC, 2021) on the basis of a survey completed by stakeholders in the Mediterranean. The eMSP-NBSR project also supported the implementation of a survey on the use of data and information to better understand consistency, limitations, and improvements regarding the data used in MSP for the Baltic Sea and Northern European countries (Lequesne and Souf, 2023). This survey reveals once again the attention paid to data in planning. Both the UNESCO survey and the eMSP-NBSR project demonstrate that there are major disparities between countries in the way data are handled for planning purposes.

These studies on data used in planning need to be taken further since, although they are valuable for taking a snapshot of how data is used, they do not provide an understanding of the power-knowledge relationships at work in the data factory. Therefore, when Batty (2022) reveals that (urban) planning is based on data only downstream and not upstream of the process, and encourages a change in this practice to meet the challenges of planning, this area needs to be deeply investigated in marine planning as well. Furthermore, critical data studies have shown that data processing is never neutral and emanates from a multitude of choices (Dalton & Thatcher, 2014; Kitchin, 2021). MSP has been invested by critical data studies, and some of them focus on one activity, and thus reveal the production of knowledge and the missing layer (St. Martin & Hall-Arber, 2008). In particular, the lack of information relating to some specific activity is well documented in the literature (e.g., fishing activity has been studied by Leroy, 2018 and Trouillet, 2019). Generally, studies of data used in MSP often focus on environmental data (McGowan et al., 2013; Ryan et al., 2018; Weatherdon et al., 2015) and question the quality and use. Environmental data are particularly interesting in view of the MSP goals, as it must enable 'ecosystem and biodiversity conservation' (paragraph 1, Directive 2014/89/EU) and ensure that "the collective pressure of all activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised, while contributing to the sustainable use of marine goods and services by present and future generations" (paragraph 14, Directive 2014/89/EU). Data quality issues cannot be addressed without documenting the internal and external quality of data (Devilliers & Jeansoulin, 2006), which has so far eluded analyses of environmental data in planning. In addition to data quality, other studies have looked at the production of data more suited to the challenges faced by MSP and at data harmonization (Dosell et al., 2021; Guinan et al., 2021; Holzhüter et al., 2019), but again, only a few examples are given, and these do not cover the full range of issues potentially linked to data production for planning purposes.

Finally, academic research has focused on the 'ecosystem-based' approach promoted by Directive 2014/89/EC (e.g. Domínguez-Tejo et al., 2016; Douvere, 2008; Douvere & Ehler, 2009; Gilliland & Laffoley, 2008), which in theory meets the need for a balanced approach between offshore activities development and environmental conservation. In practice, Domínguez-Tejo et al. (2016) points out, using a comparative study, the relevant characteristics of applying an ecosystem-based approach are rarely present, in particular the assessment of human activities pressures, but also social values or non-market activities. Considering the above-mentioned issues, it is necessary to pursue further reflections through the study of the environmental data production in MSP, in particular through the notion of an ecosystem. To better understand the meaning of an ecosystem, in this paper, we will refer to the intra-action theory to offer an innovative conceptual framework for understanding the construction of environmental data and the complex relationships between humans, non-human actors and their environment. According to Barad (2007) and applied to data, intra-action can be considered as recognizing the interconnection between various entities involved in the production and use of data, and this approach highlights the co-construction of environmental reality. We will explore this theory through the concept of information in-formation (Kaufmann and Leese, 2021), which allows us to understand the creation of new information through the entanglement of environmental and human activities data. For example, the use of intra-action theory to marine planning makes it possible to

move beyond traditional conceptions of human-environment interaction and recognize the intertwined nature of relationships between human being, nature, and technology (Lehman, 2016). This framework offers a new understanding of governance processes and underlines the importance of taking into account the complex interactions between the different actors and factors involved in the production and use of environmental data. Ultimately, applying intra-action theory allows us to recognise the complexity of interactions of human/non-human/environment interactions in MSP. This leads to a more holistic and integrated approach to the management of marine resources, taking into account various social, economic, and environmental dimensions involved in marine space. By applying it to the case of European MSP, this ensures a basis of common environmental requirements for conducting a comparative study.

Section 2 : Materials and Methods

The method used in this research is a content analysis of the maritime plans in Europe. More specifically we used a comparative perspective to analyze all the plans that fall within the scope of Directive 2014/89/EU for the first MSP cycle. This methodological proposal must be mobilized in the light of the theoretical framework developed and particularly through the intra-action approach to understand the production of data in an ecosystem approach promoted by the European directive.

To establish whether the data used are aligned with the ecosystem approach mentioned in Directive 2014/89/EU, Barad (2007) theory is used. Indeed, based on Barad (2007) and Kaufmann and Leese (2021) research, we understand the importance of carefully analyze the specifics of the relationships between data and its lifecycle. For this reason, we use the concept of 'information in-information' (Kaufmann and Leese, 2021), to describe the entanglement of data in planning. By exploring what it means to form information in a policy context for managing marine space, particularly from an ecosystem-based policy perspective, it should be possible to show how interactions between data and humans generate knowledge and action.

Directive 2014/89/EU promotes a cross-sectoral integrated and cross-border approach. The application of an ecosystem-based approach (paragraph 14) is intended to help promote the sustainable development and growth of marine and coastal economies, as well as the sustainable use of marine and coastal resources. The directive also mentions (paragraph 13) the pressures on ecosystems and resources resulting from human activities, climate change, and natural risks. Encourages consideration of land-sea interactions, as well as human and non-human interactions (paragraph 16). MSP also needs to take into account the temporal aspect of activities and, in particular, possible long-term variations (paragraph 19). To this end, states implementing MSP must base their plans on "reliable data [...] [and] use of the best available data and information by encouraging relevant stakeholders to share information and [use] existing instruments and tools for data collection" (paragraph 24). Our approach is mainly based on three key aspects: (1) knowledge of ecosystems and the variations they may undergo; (2) the superposition of data to assess interactions; (3) the use of impact indicators derived from these data. These three points of data evaluation will make it possible to document interactions between natural environments, as well as between human and non-human aspects of marine space. Analysis of the diversity of available data should enable us to assess the potential differences that exist in data production. By documenting ecosystems and the parameters that influence them, it is possible to see the 'information in-information' if certain information, taken independently, has a different meaning when put together. The impact indicator approach helps to document data entanglement since it results from the combination of several data to assess an overall state. Given Directive 2014/89/EU, the study of data production through environmental data is particularly interesting, since this aspect of offshore planning is relatively circumscribed by the text of the directive. This method has been already used in previous comparative studies, at the

European level or beyond (e.g., Trouillet, 2020). On this basis, we define three questions with reference to the ecosystem approach as framed by Directive 2014/89/EU:

- Question 1 (Q1): What types of data are available to map ecosystems?
- Question 2 (Q2): Are data available to map entanglements (or intra-action)?
- Question 3 (Q3): Can the data produced support a multidimensional approach?

By studying this from the information available on European marine plans and documenting how they mobilize data, particularly the cartographic part of the documents, and by looking specifically at the data used and which must enable the directive to be met, the aim is to understand which (f)actors (technical or human) influence maritime spatial planning. The three questions that we seek to answer by analyzing our corpus, are broken down into several indicators (Tab.1):

Table 1. Indicators applied to European MSP initiatives

Questions	Indicators	Labels (<i>and comments</i>)
Q1	I1	Ecosystem representation <i>Factual assessment of whether data are available to represent ecosystems.</i>
Q2	I2	Data overlay <i>Creation of new information ("information in-information")</i>
	I3	Indicator resulting from the combination of several data items <i>Highlighting co-construction relationships (intra-action)</i>
Q3	I4	Potential conflicts documented <i>Multidimensional approach to offshore activities</i>

These four indicators will be applied to our corpus and should enable us to document the answers to the three main questions as factually as possible, in order to draw general conclusions.

Corpus

Because we were interested in comparing different marine plans, we considered only plans under Directive 2014/89/EU. Based on the scope of application of Directive 2014/89/EU, we built up a corpus of marine plans back in 2021. The plans were selected on the basis of the census carried out by the European Commission within the framework of the European MSP Platform³ before 2022, which is an information and communication website designed to offer support to all EU member states in the implementation of MSP (see details in Appendix 1). Directive 2014/89/EU requires all EU coastal member states to have an intersectoral plan for their marine area by 2021. The principal advantage of this method is that the European directive calls for a certain homogenization of plans, at least with a view to meeting the requirements, which enables us to apply an analysis grid that should be compatible from one plan to another. Conversely, the main limitation is that the plans cannot summarize all the documents produced as part of the planning exercise. It is therefore likely that some elements will be overlooked in this analysis. Based on the European MSP Platform, the inclusion of the United Kingdom within this corpus deserves attention, despite its departure from the EU. Previously, the development plans for its seafronts fell under the purview of Directive 2014/89/EU. In particular, Norway, although not part of the EU and thus not obligated to comply with the aforementioned directive, adheres to approximately 95% of EU directives through other European environmental policies. This raises pertinent concerns regarding its exclusion from the corpus. To maintain coherence, we align with the corpus outlined by the European MSP Platform before 2022, choosing to exclude Norway but include the United Kingdom in our analytical framework from the corpus. For the sake of

³ <https://maritime-spatial-planning.test.ec.europa.eu/>

consistency, we have decided to follow the corpus proposed by the European MSP Platform and not to include Norway but to include the United Kingdom in our analysis.

In order to analyze the most tangible planning materials, we build up our corpus with planning documents, in particular maps, to identify the dataset that are mobilized, and thus understand how they are produced. So, when we look at planning documents, we analyze the maps they contain, with the aim of tracing them back to the data. Consequently, the corpus is made up of 38 planning documents (under development or finalized) in 23 countries. Each country is responsible for developing its own marine plan. Therefore, it is necessary to extract plans that are not in French or English and therefore unintelligible to us, which brings us to 19 plans spread over 11 countries. Our analysis grid will be applied to 19 marine plans.

Section 3 : Results

The study presented in this paper offers an in-depth examination of a crucial moment in the operational component of MSP, but does not aim to be exhaustive.

Given the sum of compiled elements, we have opted to provide a synthesis of the results in this section, while reserving detailed listings for the Appendices. The analysis of 19 marine planning documents (Table 2 and Appendix 2) yielded the following outline results – focusing solely on trends and overall proportions, rather than conducting a statistical analysis, which would lack significance due to the limited number of MSPs included:

- Indicator I1: Marine ecosystems are documented for the entire planning area of 8 out of 19 MSP initiatives and are partially documented, particularly when they correspond to protection zones, in 11 MSP initiatives in the maps published.

To be more explicit, we decided to illustrate our result with some examples. All plans and maps mentioned in the results section are detailed in our Appendices 1 and 2. A comparison of marine ecosystem mapping data for Ireland and the Netherlands reveals significant disparities. Ireland benefits from the support of exhaustive coverage of its exclusive economic zone, as illustrated in the associated geoportal (<https://atlas.marine.ie>) used to produce maps. In addition, consultation of the online atlas reveals the diversity and richness of available datasets, ranging from biodiversity to climate change and environmental monitoring. However, in the Netherlands, only areas of ecological interest, in particular Natura 2000, are mapped in the environmental part of the MSP. Closer observation reveals that these data are not specifically produced for planning purposes, but are derived from other management projects.

Looking closely at data production, it is clear that, both for Ireland and the Netherlands, the data come from various government bodies and are neither necessarily produced for planning purposes, but are often derived from other projects and recycled for MSP. It is also important to note that access to metadata, which is essential for understanding how data are produced, is often limited or not available in a language that the authors of this paper understood, as is it in Denmark, where, surprisingly, the metadata are only available in Danish. This situation is particularly challenging when it comes to understanding the choices and processes involved in the production and representation of data.

- Indicator I2: In 9 of 19 MSP initiatives, the plans use a combination of data related to ecosystems and human activities to generate new information to guide an ecosystem-based approach. In 10 MSP initiatives, the use of data related to ecosystems and human activities only results in the overlaying of information graphically, but does not generate any new information.

To understand this result, we can, for example, use the case of Bulgaria, where the data made available to document ecosystems are treated as zoning. On the map proposed in the MSP document, there is an overlay of certain zonings, but this does not result in any new

information. The map is mainly descriptive and the lack of information resulting from the overlapping of zones illustrates the difficulty of taking into account all the dimensions of marine areas. Also, in this case, one possible explanation for this could be the lack of information on the overlaying zones due to missing datasets, but it can also be the result of representation choices. As we cannot access the metadata as we are performing this analysis, because the document has not yet been finalized, no significant correlation can be noted.

- Indicator I3: In 8 of 19 MSP initiatives, the choice of an ecosystem-based approach led to the creation of map-based impact indicators between data on natural ecosystems and human activities. In 11 MSP initiatives, the document did not establish impact indicators cartographically.

To illustrate this indicator, we can use the example of the French Mediterranean coast, where local authorities chose to employ an independent consulting firm to set up a system for assessing the impact of activities affecting the marine environment. The approach used is detailed in the appendix of the planning document, but concerning the data creation, it derives from the use of a scale for assessing impacts in relation to the actions set out in the plan. This impact assessment method shows its limitations when data are not complete or available. For example, according to the MSP document notes, in the case of marine mammals in the Mediterranean Sea, the distribution is not well known by the national institute for biodiversity (named *Office Français de la Biodiversité*), which provided data for MSP. The lack of available datasets means that it is not possible to assess the impact quantitatively. In this case, the lack of information means that no indicators can be mapped.

- Indicator I4: Finally, the 19 MSP initiatives provide partial multidimensional mapping, either because not all human activities are included, or marine biological areas are missing, or one of the multidimensional variables of maritime space is absent (e.g. depth or time variable).

To illustrate this indicator, we use the case of Wales, where data is used for MSP provided by the state and collected on an one-off basis. Besides, most of the data comes from the Marine and Coastal Access Act 2009. Once again, for this last indicator, it is difficult to know whether all the multidimensional aspects of marine space are not accessible due to the lack of specific data creation, processing, representation choices, or technological limitations of geoportals associated with marine plans (Davret et al., 2024).

Table 2 summarizes the results following analysis of 19 MSP initiatives (see details in Appendix 2).

Coding	Value	Indicators	Comment	Count
I1		Are ecosystems areas documented ?		
	2	Yes	The entire marine zone is documented	8
	1	Partially	Only certain areas are mentioned	11
	0	No	No mention of ecosystems	0
I2		Is there data overlay ?		
	2	Yes, resulting in new information	Information is generated and displayed from data overlay	9
	1	Yes, but it does not result in a new information	Information from the overlay data is not mentioned	10
	0	No	No overlaying of information	0

I3		Are there indicators of impact on the marine area?		
	2	Yes		8
	1	Partially	Impact indicator not established for all activities	0
	0	No		11
I4		Is a multidimensional approach to marine space documented?		
	2	Yes		0
	1	Partially	The multidimensional approach concerns only part of the marine area or part of marine activities	19
	0	No		0

As highlighted in Table 2, our analysis of 19 MSP documents around Europe reveals that an ecosystem-based approach to marine spaces is often incomplete, particularly when it comes to mapping. From the data shown in Table 2, it is apparent that given the multidimensional nature of marine space, a wide range of data is required (such as spatial sea bottom and surface data, temporal data, etc.). However, these requirements are likely to encounter limitations in terms of techniques, knowledge, tools, or mediums used to transcribe them. Table 2, which answers our three main questions, demonstrates the following:

- (Q1) Plans with detailed ecosystem mapping tend to use data that highlight the spatial variability of ecosystems, while those with partial mapping often use fragmented data, including zoning data.
- (Q2) Plans that incorporate data overlay to generate new information generally provide mapped impact indicators, unlike maps that overlay data without creating new information.
- (Q3) Data manipulated and used in plans examined do not allow for a complete multidimensional approach, and the limitations inherent in this problem, such as technological constraints, data production, processing, and representation choice, often remain unidentified.

In general, these results indicate gaps in ecosystem-based approaches, particularly in terms of mapping. Although some plans comprehensively document marine ecosystems, others present partial documentation, highlighting disparities between MSPs. While some initiatives effectively integrate data from ecosystems and human activities to generate new information and impact indicators, others simply overlay data without creating meaningful new insights. Data limitations and technological constraints often impede a comprehensive multidimensional approach in MSPs, highlighting the need to improve data accessibility, comprehensiveness, and integration for more effective marine planning. This result highlights the differences in the availability and nature of environmental data between European countries, as well as the challenges associated with understanding data production in the context of maritime planning.

Section 4 : Discussion

Our paper examines a variety of facets pertinent to MSP, focusing on the analysis of data used in the planning process. Our study offers valuable information to reflect on the quality and completeness in MSP. Then we delve into the intra-action theory and we demonstrate the interest of doing research on the data lifecycle align with critical data studies to better understand governance of marine space.

4.1 Examining data quality through map-making

Interestingly, the results reveal that beyond the factual responses to the indicators, analysis of the data approach to marine planning reveals that the majority of data is produced by the State for previous management project, but rarely specifically for planning purposes, as can be observed from the sources and creation year of the data used in the plans analyzed. It is clear that data production analysis is closely related to information processing, representation, and dissemination choices. In the absence of systematic and intelligible access to all metadata, it is difficult to distinguish each stage of the data lifecycle. These findings raise questions about the quality and completeness of the data used to achieve the ambitious objectives of the ecosystem-based approach.

The results reinforce the need to reflect on the analysis and evaluation of data, from any pre-processing carried out to the representation choice for a specific purpose like planning.

The results of the plan review reveal significant gaps in ecosystem mapping: ecosystem mapping is often partial (in 11 cases of 19), the combination of information does not lead to new information (in 10 cases of 19), or the multidimensional approach is flawed (in all cases) based on our indicators. This weakness is often the result of technical constraints, data availability, or conscious or unconscious political choices. These findings highlight the limits of the 'evidence' available to guide planning decisions in the so-called evidence-based planning.

Critical studies are used to discuss the relationships between decision-making and data. Thus, as Gregg (2015) points out when speaking of the 'spectacle of data', data visualisation can be a 'fantasy of command and control through seeing' (p. 1) by delivering an ordered and prescriptive vision of space. In fact, MSP maps can be used as a tool of governance and power. Maps are not neutral representations of reality, but are shaped by political choices and specific interests. Consequently, maps can hide or marginalize certain claims or used for marine space, while favoring others (Bridge et al., 2013). McCarthy & Thatcher (2019) point out in this respect that it is mostly collective claims and informal use that are missing from maps due to lack of data. Finally, two ways of assessing the effect that maps and, by extension, the data used in maps, can have on the public stand out: (1) following Li (2014), Scott (1998) or Wood & Fels (1992) maps are a tool or power in themselves, or (2) maps do nothing in themselves but depend on how people use them (Fogelman & Bassett, 2017 ; Kitchin & Dodge, 2007, 2014). In line with McCarthy & Thatcher (2019) and Kitchin & Dodge (2007), we argue that maps are dependent on the social network in which they act and evolve, but also strongly constrained by the data and geotechnologies used.

Although the expected finding was to be able to trace the data lifecycle in planning, this study showed the difficulty of accessing the metadata. This was particularly the case because the planning process was still underway when we carried out this study and not all the planning geoportals were available, for example.

Altogether, what particularly stands out is that the ecosystem-based approach advocated and expected by MSP is based on data collected on a one-off basis, for example, data collected on an irregular basis and not containing all the parameters needed to represent the marine space (i.e., temporal or seasonal dimension is often absent), or data collected at high frequency and automatically (i.e., fishing activity is often represented with automatically collected data), but which have not been produced with planning in mind. High-frequency and automated data are often monitoring data, not management data (Said & Trouillet, 2020). This means that planning decisions are made without relying on the creation of specific data to meet their needs but are then justified by preexisting data. Our findings provide support for Batty (2018, 2022) theory that raised the same issue for urban planning, deploring the fact that planning is based on downstream rather than upstream data.

The mismatch between MSP needs and the data used is highlighted in our results (Q1), which show that ecosystems are partially documented in 11 of 19 cases. Evidence-based planning requires a meticulous approach to produce adequate data to address spatial management challenges, which is not the case, according to our results. This implies

recognizing the limitations of bioeconomic data which do not capture the complexity of socio-spatial relationships, such as for leisure activity. Our results reveal inconsistencies between needs and data used in MSP, illustrated, for example, in Malta or Denmark MSP, where zoning plans do not fully capture environmental reality. Furthermore, it is crucial to anticipate potential biases related to data collection (Trouillet, 2019), particularly taking into account the 'internal' and 'external' quality of data (David & Fasquel, 1997; Devillers & Jeansoulin, 2006). External data quality depends on its suitability for the project's need, as defined by Wang and Strong (1996). However, MSP is facing data gaps based on two aspects: (1) time constraints imposed for the production of the first plans (Directive 2014/89/EU in place in 2014 for the plan implementation by 2021 at the latest), which are the focus of this paper, and (2) not all sea activities are monitored in a way that allows data to be generated, which is what St. Martin & Hall-Arber (2008) call 'the missing layer', particularly for activities such as small-scale fishing and for social, cultural, and sentimental aspects of marine space. Indeed, this aspect of planning has recently been the subject of studies (see, for example, Flannery et al., 2022; Gee et al., 2017; Ntona & Schröder, 2020; Pennino et al., 2021) demonstrating the incompleteness of planning approaches that fail to mention these aspects of marine areas. Despite the importance of non-spatial data, as highlighted by Shucksmith and Kelly (2014), the academic literature often focuses on spatial data. This gap underscores the need for a more holistic approach to data collection and use in planning.

4.2 Reading MSP through intra-action theory

This article illustrates several crucial aspects of ecosystem-based planning. Firstly, it reveals an inconsistency both across borders and within national boundaries with regard to marine plans. This divergence between national policies and the lack of harmonization between regional plans underscores the challenges faced in seeking a coherent management of marine ecosystems. For example, MSP for the French North Coast, placed side by side with Belgium, reveals a major contradiction, since the vocation of the French side border is to promote shipping, fishing, harbor, and offshore energy. On the other hand, the Belgian border creates a large marine protection zone that has no continuity on the French side and therefore comes to an abrupt halt between the two EEZs. Secondly, our findings point to a disparity in the data used to develop the MSP. Although some plans effectively integrate different data sources to generate new information, others simply overlay data without creating significant new knowledge (Q2). In fact, 9 out of 19 cases use data overlay to generate new information. However, 10 plans out of 19 use a data overlay without creating new information from this combination. This cumulative use of data underlines the importance of considering not only the availability of data but also its interpretation and integration for an integrated understanding of marine space. Thirdly, the ecosystem-based approach to MSP reveals complex interactions between data, human and non-human actors, and the resulting policies. Such mutual relationships result in the notion of intra-action, which underlines the constant dynamics that exist between the different elements of marine systems. Indeed, only 8 out of 19 plans provide a mapped assessment of impacts, although these plans are based on available data, which, as we point out in the first part of this discussion, are highly dependent on the quality and processing of the data. These results provide support for Kaufmann and Leese (2021) concept of information information to understand the data lifecycle and the numerous trajectories that data can take, depending on its 'interactions' and 'intra-action' with human and nonhuman actors as theorized by Barad (2007). The notion of 'intra-action' is particularly interesting when thinking about MSP, because unlike 'interaction', it is defined by a constant dynamic movement that acts mutually between components of a system. Therefore, when planning for the multiuse of marine space, each element becomes linked to another, and it is difficult to understand the inner relationship between the 'node' of activity. In fact, this notion seems particularly well suited to dynamic and mobile spaces such as marine space. This discussion highlights the importance of rethinking data collection, analysis, and use practices in MSP to promote fairer and more transparent governance. According to McCarthy & Thatcher (2019), critical

data studies are essential to understand governance. Firstly, because critical data studies make it possible to break the 'hidden technocracy' (Obermeyer, 1995), in particular by providing access to decision-making methods through geotechnologies or by understanding which data are included and excluded from the process. This again brings us to the notion of intra-action, where the entanglement of different components is a prior condition, rather than the results of action. In line with this, Lupton (2016) argues that it is equally difficult to understand the entanglement between data and society, since data act on society and society acts on data through various assemblages (Kaufmann & Leese, 2021).

Finally, our paper shows the importance of understanding the data lifecycle and its impact on decision-making. Considering the limited number of plans analyzed, more research is needed to carefully analyze power-knowledge relations and study the various journeys of a dataset to better understand their role in the policy-making process and marine space governance. Furthermore, the lack of undigitized datasets (Gautreau, 2021) and social dimensions (Cornu et al., 2014 ; Gee et al., 2017) in MSP raises questions about the representativeness and inclusiveness of planning, especially in developing countries where greater attention is even more required (Trouillet et al., 2023).

Section 5. Conclusion

This paper has demonstrated that the ecosystem-based approach expected in MSP relies heavily on fragmented data, which is often incomplete and lacks essential parameters such as the temporal dimension. Data collected at high frequency and automatically is used, but often distorted from its original purpose to meet planning need, raising concerns about its relevance. Our research has highlighted that the absence of data specifically designed for planning purposes leads to gaps in multidimensional plans, especially when it comes to marine space, limiting their effectiveness. Technical constraints, data availability, and political choices influence planning results, particularly with regard to ecosystem mapping and the illustration of marine activities. Biases in the use of data and its mapping raise questions about governance and information justice, highlighting the importance of a critical approach to data and considering its use in the decision-making process for marine planning. Also, by seeing things from a different angle, data could be a lever for including stakeholders in participation. Despite this, today, data exclude (collection, processing, interpretation...) more than they include stakeholders.

The Europe-wide examination which in theory should enable us to obtain a common framework from Directive 2014/89/Eu in order to be able to compare data factory for each plan, turned out in practice to be limited by the lack of intelligibility of the non-English-speaking plans and the limitations of access to the databases. Despite limitations due to the limited number of plans analyzes and the difficulty of following the data lifecycle through the marine plan, we believe our work helps to highlight the different strategies used to develop an ecosystem approach.

In this paper, we have highlighted the crucial role of data in marine planning, revealing that it is not only a tool for visualizing state interest and economic visions of marine spaces, but also a means by which these interest and visions are shapes because data are difficult to access and, therefore, not easily questioned (McCarthy and Thatcher, 2019). These findings underscore that, contrary to the ideal of an 'evidence-based' approach, MSP seems to be driven more by political decisions justified *a posteriori* by the available data (Batty, 2022) and validate our hypothesis based on the analysis of the first round of MSP. In addition, data deserts are hidden or at least not explained, and processing algorithms are not explained or justified, let alone discussed.

More research should investigate the map making of MSP such as those used to translate the MSP into visual form in Europe. But once the map has been produced, it is already too late to question the information and, above all, the data. This suggests the need to develop upstream research to understand the relationships between states, technologies, and MSP

in order to open up the mapping process, since this is one of the main action drivers for states that implement a marine plan.

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References

- Barad, K. (2007). *Meeting the Universe Halfway : Quantum Physics and the Entanglement of Matter and Meaning*. Duke University Press. <https://doi.org/10.1215/9780822388128>
- Batty, M. (2018). *Inventing Future Cities*. MIT Press.
- Batty, M. (2022). Planning data. *Urban Analytics and City Science*, 0(0) 1-5. <https://doi.org/10.1177/23998083221105496>
- Bridge, G., Bouzarovski, S., Bradshaw, M., & Eyre, N. (2013). Geographies of energy transition: Space, place and the low-carbon economy. *Energy Policy*, 53, 331–340. <https://doi.org/10.1016/j.enpol.2012.10.066>
- Cornu, E. L., Kittinger, J. N., Koehn, J. Z., Finkbeiner, E. M., & Crowder, L. B. (2014). Current Practice and Future Prospects for Social Data in Coastal and Ocean Planning: Social Data in Coastal and Ocean Planning. *Conservation Biology*, 28(4), 902–911. <https://doi.org/10.1111/cobi.12310>
- Dalton, C., & Thatcher, J. E. (2014). What does a critical data studies look like, and do we care ? *Society + Space*. <https://www.societyandspace.org/articles/what-does-a-critical-data-studies-look-like-and-why-do-we-care>
- David, B., & Fasquel, P. (1997). *Qualité d'une base de données géographique: Concepts et terminologie* (p. 53). Institut de géographie national. hal-02372984
- Davret, J., Trouillet, B., & Toonen, H. (2024). The digital turn of marine planning: A global analysis of ocean geoportals. *Journal of Environmental Policy & Planning*, 26(1), 75–90. <https://doi.org/10.1080/1523908X.2023.2283081>
- Devillers, R., & Jeansoulin, R. (2006). *Fundamentals of Spatial Data Quality* (p. 312). ISTE Publishing Company. <https://hal-upec-upem.archives-ouvertes.fr/hal-00622300>
- Domínguez-Tejo, E., Metternicht, G., Johnston, E., & Hedge, L. (2016). Marine Spatial Planning advancing the Ecosystem-Based Approach to coastal zone management : A review. *Marine Policy*, 72, 115-130. <https://doi.org/10.1016/j.marpol.2016.06.023>
- Dosell, A., Edwards, D., Gregory, A., Ponteen, A., O'Garro, J., Cornick, L., & Hawkrigde, J. M. (2021). Using evidence from voluntary fisheries data collection programmes to support marine spatial planning and resolve multiple-use conflicts. *Frontiers in Marine Science*, 8, 635890. <https://doi.org/10.3389/fmars.2021.635890>
- Douve, F. (2008). The importance of marine spatial planning in advancing ecosystem-based sea use management. *Marine Policy*, 32(5), 762-771. <https://doi.org/10.1016/j.marpol.2008.03.021>

- Douveire, F., & Ehler, C. (2009). Ecosystem-Based Marine Spatial Management : An Evolving Paradigm for the Management of Coastal and Marine Places. *Ocean Yearbook Online*, 23(1), 1-26. <https://doi.org/10.1163/22116001-90000188>
- Ehler, C. (2008). Conclusions : Benefits, lessons learned, and future challenges of marine spatial planning. *Marine Policy*, 32(5), 840-843. <https://doi.org/10.1016/j.marpol.2008.03.014>
- European MSP Platform. (2018). *Technical Study « Maritime Spatial Planning (MSP) for Blue Growth »*, *Handbook on MSP Indicators Development*. <https://www.msp-platform.eu/practices/handbook-msp-indicatorsdevelopment>
- Flannery, W., Ounanian, K., Toonen, H., van Tatenhove, J., Murtagh, B., Ferguson, L., Delaney, A., Kenter, J., Azzopardi, E., Pita, C., Mylona, D., Witteveen, L., Hansen, C. J., Howells, M., Macias, J. V., Lamers, M., Sousa, L., da Silva, A. M. F., Taylor, S., ... Saimre, T. (2022). Steering resilience in coastal and marine cultural heritage. *Maritime Studies*. <https://doi.org/10.1007/s40152-022-00265-2>
- Fogelman, C., & Bassett, T. J. (2017). Mapping for investability: Remaking land and maps in Lesotho. *Geoforum*, 82, 252–258. <https://doi.org/10.1016/j.geoforum.2016.07.008>
- Gautreau, P. (2021). *La Pachamama en bases de données: Géographie politique de l'information environnementale contemporaine*. Éditions de l'IHEAL. <https://doi.org/10.4000/books.iheal.9362>
- Gee, K., Kannen, A., Adlam, R., Brooks, C., Chapman, M., Cormier, R., Fischer, C., Fletcher, S., Gubbins, M., Shucksmith, R., & Shellock, R. (2017). Identifying culturally significant areas for marine spatial planning. *Ocean & Coastal Management*, 136, 139–147. <https://doi.org/10.1016/j.ocecoaman.2016.11.026>
- Gee, K., Kannen, A., Adlam, R., Brooks, C., Chapman, M., Cormier, R., Fischer, C., Fletcher, S., Gubbins, M., Shucksmith, R., & Shellock, R. (2017). Identifying culturally significant areas for marine spatial planning. *Ocean & Coastal Management*, 136, 139–147. <https://doi.org/10.1016/j.ocecoaman.2016.11.026>
- Gilliland, P. M., & Laffoley, D. (2008). Key elements and steps in the process of developing ecosystem-based marine spatial planning. *Marine Policy*, 32(5), 787-796. <https://doi.org/10.1016/j.marpol.2008.03.022>
- Gregg, M. (2015). Inside the Data Spectacle. *Television & New Media*, 16(1), 37–51. <https://doi.org/10.1177/1527476414547774>
- Guinan, J., McKeon, C., O'Keeffe, E., Monteys, X., Sacchetti, F., Coughlan, M., & Nic Aonghusa, C. (2021). INFOMAR data supports offshore energy development and marine spatial planning in the Irish offshore via the EMODnet Geology portal. *Quarterly Journal of Engineering Geology and Hydrogeology*, 54(1), qjeh2020-033. <https://doi.org/10.1144/qjeh2020-033>
- Hattam, C., Atkins, J. P., Beaumont, N., Börger, T., Böhnke-Henrichs, A., Burdon, D., Groot, R. de, Hoefnagel, E., Nunes, P. A. L. D., Piwowarczyk, J., Sastre, S., & Austen, M. C. (2015). Marine ecosystem services : Linking indicators to their classification. *Ecological Indicators*, 49, 61-75. <https://doi.org/10.1016/j.ecolind.2014.09.026>
- Kaufmann, M., & Leese, M. (2021). Information In-Formation: Algorithmic Policing and the Life of Data. In A. Završnik & V. Badalič (Eds.), *Automating Crime Prevention*,

Surveillance, and Military Operations. Springer International Publishing.
<https://doi.org/10.1007/978-3-030-73276-9>

Kitchin, R. (2021). *Data lives: How data are made and shape our world*. Bristol University Press.

Kitchin, R., & Dodge, M. (2007). Rethinking maps. *Progress in Human Geography*, 31(3), 331–344. <https://doi.org/10.1177/0309132507077082>

Kitchin, R., & Dodge, M. (2014). *Code/space: Software and everyday life*. Mit Press.

Lehman, J. (2016). A sea of potential : The politics of global ocean observations. *Political Geography*, 55, 113-123. <https://doi.org/10.1016/j.polgeo.2016.09.006>

Lequesne, B., & Souf, A. (2023). *Policy Brief on Strengthening Data sharing for informed decision-making in Maritime Spatial Planning*. Policy brief of the eMSP NSBR Data Sharing, Information & Communication Technologies Serving MSP Learning Strand. <https://www.emspproject.eu/results>

Leroy, Y. (2018). *Cartographie critique de réalités géographiques* [Thèse de doctorat]. Université de Nantes.

Li, T. M. (2014). What is land? Assembling a resource for global investment. *Transactions of the Institute of British Geographers*, 39(4), 589–602. <https://doi.org/10.1111/tran.12065>

Lupton, D. (2016). Digital companion species and eating data: Implications for theorising digital data–human assemblages. *Big Data & Society*, 3(1), 205395171561994. <https://doi.org/10.1177/2053951715619947>

Martín Míguez, B., Novellino, A., Vinci, M., Claus, S., Calewaert, J.-B., Vallius, H., Schmitt, T., Pititto, A., Giorgetti, A., Askew, N., Iona, S., Schaap, D., Pinardi, N., Harpham, Q., Kater, B. J., Populus, J., She, J., Palazov, A. V., McMeel, O., ... Hernandez, F. (2019). The European Marine Observation and Data Network (EMODnet) : Visions and Roles of the Gateway to Marine Data in Europe. *Frontiers in Marine Science*, 6, 313. <https://doi.org/10.3389/fmars.2019.00313>

McCarthy, J., & Thatcher, J. (2019). Visualizing new political ecologies: A critical data studies analysis of the World Bank’s renewable energy resource mapping initiative. *Geoforum*, 102, 242–254. <https://doi.org/10.1016/j.geoforum.2017.03.025>

McCarthy, J., & Thatcher, J. (2019). Visualizing new political ecologies: A critical data studies analysis of the World Bank’s renewable energy resource mapping initiative. *Geoforum*, 102, 242–254. <https://doi.org/10.1016/j.geoforum.2017.03.025>

McGowan, J., Hines, E., Elliott, M., Howar, J., Dransfield, A., Nur, N., & Jahncke, J. (2013). Using seabird habitat modeling to inform marine spatial planning in central California’s National Marine Sanctuaries. *PLoS One*, 8(8), e71406. <https://doi.org/10.1371/journal.pone.0071406>

MSP Data Study. (2016). *Executive Summary, Technical Study under the Assistance Mechanism for the implementation of Maritime Spatial Planning*. (p. 136). European Commission European Climate, Infrastructure and Environment Executive Agency. <https://doi.org/doi:10.2826/25289>

- Ntona, M., & Schröder, M. (2020). Regulating oceanic imaginaries: The legal construction of space, identities, relations and epistemological hierarchies within marine spatial planning. *Maritime Studies*. <https://doi.org/10.1007/s40152-020-00163-5>
- Obermeyer, N. J. (1995). The Hidden GIS Technocracy. *Cartography and Geographic Information Systems*, 22(1), 78–83. <https://doi.org/10.1559/152304095782540609>
- Pennino, M. G., Brodie, S., Frainer, A., Lopes, P. F. M., Lopez, J., Ortega-Cisneros, K., Selim, S., & Vaidianu, N. (2021). The Missing Layers: Integrating Sociocultural Values Into Marine Spatial Planning. *Frontiers in Marine Science*, 8, 633198. <https://doi.org/10.3389/fmars.2021.633198>
- Ryan, K., Danylchuk, A., & Jordaan, A. (2018). Is Marine Spatial Planning Enough to Overcome Biological Data Deficiencies? *Journal of Environmental Assessment Policy and Management*, 20(04), 1850012. <https://doi.org/10.1142/S1464333218500126>
- Said, A., & Trouillet, B. (2020). Bringing ‘Deep Knowledge’ of Fisheries into Marine Spatial Planning. *Maritime Studies*. <https://doi.org/10.1007/s40152-020-00178-y>
- Schaefer, N., & Barale, V. (2011). Maritime spatial planning : Opportunities & challenges in the framework of the EU integrated maritime policy. *Journal of Coastal Conservation*, 15(2), 237-245. <https://doi.org/10.1007/s11852-011-0154-3>
- Scott, J. (1998). *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed* (Yale University Press).
- Shepperson, J. L., Hintzen, N. T., Szostek, C. L., Bell, E., Murray, L. G., & Kaiser, M. J. (2018). A comparison of VMS and AIS data: The effect of data coverage and vessel position recording frequency on estimates of fishing footprints. *ICES Journal of Marine Science*, 75(3), 988–998. <https://doi.org/10.1093/icesjms/fsx230>
- Shucksmith, R. J., & Kelly, C. (2014). Data collection and mapping – Principles, processes and application in marine spatial planning. *Marine Policy*, 50, 27–33. <https://doi.org/10.1016/j.marpol.2014.05.006>
- St. Martin, K., & Hall-Arber, M. (2008). The missing layer: Geo-technologies, communities, and implications for marine spatial planning. *Marine Policy*, 32(5), 779–786. <https://doi.org/10.1016/j.marpol.2008.03.015>
- Stamoulis, K. A., & Delevaux, J. M. S. (2015). Data requirements and tools to operationalize marine spatial planning in the United States. *Ocean & Coastal Management*, 116, 214-223. <https://doi.org/10.1016/j.ocecoaman.2015.07.011>
- Strain, L., Rajabifard, A., & Williamson, I. (2006). Marine administration and spatial data infrastructure. *Marine Policy*, 30(4), 431-441. <https://doi.org/10.1016/j.marpol.2005.03.005>
- Trouillet, B. (2019). Aligning with dominant interests : The role played by geo-technologies in the place given to fisheries in marine spatial planning. *Geoforum*, S0016718519303008. <https://doi.org/10.1016/j.geoforum.2019.10.012>
- Trouillet, B. (2020). Reinventing marine spatial planning: A critical review of initiatives worldwide. *Journal of Environmental Policy & Planning*, 22(4), 441–459. <https://doi.org/10.1080/1523908X.2020.1751605>

773 Trouillet, B. et al (2023) Chapter 10. The information challenges of marine spatial planning.
 774 Lessons learned from small-scale fisheries in Senegal. In Bertrand, S., & Bonnin, M. (Eds)
 775 Marine spatial planning in the tropical Atlantic. From a Tower of Babel to collective
 776 intelligence. IRD Editions, 229-256. <https://doi.org/10.4000/books.irdeditions.46650>
 777
 778 UNESCO-COI. (2021). *Rapport technique sur les conditions actuelles et la compatibilité des*
 779 *usages du milieu marin en Méditerranée occidentale* (n° 160; Série technique de la COI).
 780 UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000376068_fre
 781
 782 Wang, R. Y., & Strong, D. M. (1996). Beyond Accuracy: What Data Quality Means to Data
 783 Consumers. *Journal of Management Information Systems*, 12(4), 5–33.
 784 <https://doi.org/10.1080/07421222.1996.11518099>
 785
 786 Weatherdon, L., Martin, C. S., Mcowen, C., & Hannah, T. (2015). Towards a global dataset
 787 of seagrass occurrences : Current progress, knowledge gaps and challenges. *PeerJ*
 788 *PrePrints*. <https://doi.org/10.7287/peerj.preprints.1161v1>
 789
 790 Wood, D., & Fels, J. (1992). *The Power of Maps*. Guilford Press.
 791
 792 Zaucha, J. (2014). *The key to governing the fragile Baltic Sea: Maritime spatial planning in*
 793 *the Baltic Sea region and way forward*. VASAB.