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The digital turn of marine planning: a global analysis of ocean geoportals

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ABSTRACT

Recent research highlighted the use and role played by digital technologies supporting marine spatial planning (MSP), especially geoportals. This research seldom considers to study an overview of the role of digital technologies and examines the digitalization of marine governance in planning. Employing a critical cartography framework and assemblage theory, we elaborate on the use of geoportal and public involvement in the digital turn of MSP. We show how the digital turn in marine planning is taking place at different levels depending on: the functionalities present on geoportals, the political support for MSP implementation, the regions of the world, and the level of plan development. According to the three dimensions of digital (marine) governance (Kloppenburg et al., 2022), we reveal that the role of geoportal in MSP is a part of the first dimension by seeing and knowing, sometimes the second dimension by self-engagement and in the most advanced forms of geoportal part of the third dimension by leading actions and interventions. In general, we find that the geoportal is more of a facade than a tool for doing MSP. The digital turn in marine planning is real but does not yet allow the public to be a real stakeholder in the process.

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Geoportal; marine spatial planning; digital turn; participation; governance

Introduction

Marine Spatial Planning (MSP), as planning in general, encourages the increasing use and dependency of geoinformation and geotechnologies (Boland et al., 2022; Douvere & Ehler, 2009; St. Martin & Hall-Arber, 2008; Trouillet, 2019, 2020). Geoinformation is indispensable for guiding decisions as MSP is about 'analyzing and allocating parts of three-dimensional marine spaces to specific uses, to achieve ecological, economic, and social objectives that are usually specified through the political process' (Douvere, 2008, p. 766). Geotechnologies are supporting the use of geoinformation, particularly relevant given the rapid digitalization of (marine) environmental governance (Kloppenburg et al., 2022). In that sense, geoinformation is '(digital) data for communicating local spatial meanings' (McCall & Dunn, 2012, p. 81), i.e. spatially referenced data that reproduce the characteristic features of a phenomenon in space in different forms. Geotechnologies refers to technologies that allow the collection, analysis, processing, representation and circulation of geoinformation. They include tools such as Geographic Information Systems (GIS), Decision Support Tools (DST), and geoportals. In this paper, we focus on geoportals, defined as follows: 'A geoportal is a type of web portal used to find and access geographic information and associated geographic services (display, editing, analysis, etc.) via the Internet. Geoportals are important for effective use of GIS and a key element of Spatial Data Infrastructure' (Karabegovic & Ponjavic, 2012, p. 916).

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Geoportals are becoming central to MSP, because they have the promise of bringing together and integrating data from different sectors and sources. Such integration is needed by policy-makers to come to better decisions (as argued in the EU Directive 2007/2/EC, establishing Infrastructure for Spatial Information in the European Community – INSPIRE-). Geotechnologies contribute to '[modeling] the environment as layers of data to be queried, combined, and analyzed in various ways' (St. Martin & Hall-Arber, 2008, p. 780). However, geoportals, as many other technical tools in marine governance, are often seen as neutral means, while they are rather socio-technical and political in nature (Fairbanks et al., 2018; Kloppenburg et al., 2022; St. Martin & Hall-Arber, 2008; Toonen & Bush, 2020). Going beyond a technical approach to geoinformation allows thus for asking questions about how geoportals shape MSP, and with what socio-political consequences.

This paper contributes to that body of work by analyzing what geoportals 'do' in marine governance. In our analysis, we use the three dimensions as defined by Kloppenburg et al. (2022) who argue that digital technologies shape environmental governance through enabling (and potentially constraining) policy-makers, stakeholders and the wider public to (1) see and know; (2) participate and engage; and (3) intervene and act. Seeing and knowing refers to identifying and understanding what is made visible and how; participating and engaging refers to opening up new possibilities to include stakeholders (private actors as well as the wider public) in governance; and finally intervening and acting refers to increased automatization for optimized decision-making (Kloppenburg et al., 2022). Through the looking glass of these three dimensions, we stay in line with critical cartographers who emphasize the power of maps, but join the current shift in scholarly attention to digital mapping.

The paper's outline is as follows: after a brief theoretical framing, the paper presents a mixed-methods approach which enabled us to 'zoom out' and provide an overview of geoportals worldwide, while allowing for an analysis of the relationship between the functionality of geoportals and the MSP progress. In the subsequent section, we present the results using the three dimensions of digitalized governance, as formulated by Kloppenburg et al. (2022). In the final section, we return to debate on the digital turn in planning, discuss the use of digital tools for public engagement in particular, and present our conclusion.

Understanding marine mapping in the digital planning age

The recent literature on digital turn in planning has emphasized the increasing impact of digital technologies on the way planning is approached and carried out (Daniel & Pettit, 2021, 2022; Wilson & Tewdwr-Jones, 2020). More specifically, some studies have shown how technologies are transforming planning processes, both from the governments' or planners' perspective (Boland et al., 2022; Potts & Webb, 2023) and from the citizens' side (Wilson & Tewdwr-Jones, 2020). Indeed, these studies have revealed the growing significance of digital technologies in modernizing and democratizing the planning process. Moreover, there are high expectations about digital technologies changing the way in which environmental challenges are addressed and solved (Kloppenburg et al., 2022). Particularly, Rankin stated that a digital shift in mapping, from paper to GPS-based, changes the way of knowing, as it designs 'a radically different relationship between user, landscape and authority' (Rankin, 2016, p. 2). Noucher (2017) argued, when examining this digital turn from a critical cartography perspective, the multiplication of 'petites cartes du web' ('small web maps') allow for emancipation from government maps. Next to a transformation of state authority, a 'distinct form of power created through geographic knowledge' (Rankin, 2016) is emerging.

Critical cartography provides an understanding of the power of maps, as it is the study of various propositions underlying maps and mapping processes, aimed at revealing the construction of a particular geographical reality, which is shaped by, and has consequences for the stability of power relations (Law & Lien, 2013; Leroy, 2018; Mol, 1999). Land and urban planning have taken a digital turn for representation and decision-making (Batty & Yang, 2022) supported by digital tools (Batty & Densham, 1996; Geertman & Stillwell, 2003). Kitchin and Dodge (2007) remind us that representational work (as mapping) is above all a practice and therefore has never really finished its work, especially in the structuring of power/knowledge relations. In this context, Bittner et al. (2013) pay particular attention to web 2.0 cartographies, which 'are often promoted as facilitating public participation and democratizing geographic knowledge' (p. 935) using

critical cartography to show the social dimensions of web 2.0 cartographies and geoweb practices. Because the marine environment is difficult to grasp due to its fluidity, ecosystem dynamics and vastness (Laclau, 2005; Smith & Brennan, 2012; Toonen, 2013), its representation captured in maps is significant for dealing with and deciding on environmental and spatial challenges of human activities. Through maps, ideas and discourses reinforcing the way MSP 'is', are implemented (Bittner et al., 2013; Laclau, 2005). Indeed, MSP studies are increasingly bringing up critical questions focusing on the ways and extent to which geographic information shapes MSP, and more recently, how geo-technologies, like geo-portals, play a formative role (Boucquey et al., 2019; Campbell et al., 2020; St. Martin & Hall-Arber, 2008; Stamoulis & Delevaux, 2015; Toonen, 2013; Toonen & van Tatenhove, 2020; Trouillet, 2019).

While a geoportal and the information it disseminates can help in planning (Ash et al., 2018; Pınarbaşı et al., 2017), the field of critical cartography shows that the portals, maps and the mapping are productions as they are shaped by the type of information that passes through them, the techniques and uses of the representations, the functionalities offered, or the organization of the geoweb (Crampton et al., 2013; Gautreau et al., 2013; Gautreau & Noucher, 2013; Joliveau et al., 2013; Mericskay, 2011). The range of functionalities offered by geoportals is potentially very wide, with some limited to simple consultation while others offer functionalities that allow more interaction (e.g. adding data). Boucquey et al. (2019) argued that the two web-based geoportals, Northeast and Mid-Atlantic data portals, used in MSP processes in the United States are the center of 'realities' production, which represents power relationships. Campbell et al. (2020) demonstrated that the geoportal they studied could be understood as a tool that questions the relationships between institutional and non-institutional actors in ocean planning. Also, their case study showed that the data that are integrated into the geoportal has a strong impact on the types of decisions that are made. Campbell et al. (2020) showed that the geoportal could even replace a marine plan, because data integrated into the geoportal strongly impacts the types of decisions that are made. Additionally, by producing 'realities', a geoportal can bring stakeholders together through the functionality of adding data and visualization (Campbell et al., 2020; Fairbanks et al., 2018), resulting in the creation of a 'community'.

To understand what geoportals are, and can do, in an MSP process, we conceptualize a geoportal as part of the planning assemblage. Assemblage thinking helps to explain the socio-spatial formations at work in planning, in Campbell et al. words: 'the 'processes-in-motion' and shifting relations among governance actors' (Campbell et al., 2020, p. 289). An assemblage approach to MSP is open to consider human as non-human influence. Geoportals as focal point in the assemblage allows thus for an articulation of how power can flow between technological tools with diverse functionalities and data layers, people who design and use the portal for planning purposes, the representations of the (marine) environment and policy objectives captured in data and information (maps) (cf. Toonen & Bush, 2020). At the same time, the assemblage also includes distinct elements of the planning process, like the objectives based on which MSP is initiated, the level (local, national, transboundary), the different planning phases, and the extent of stakeholder involvement (Boucquey et al., 2019; Campbell et al., 2020). According to Flannery et al. (2018), for MSP to be effective, participation must contribute to improving involvement in decision-making, spaces for debate and recognize the complexity of socio-spatial relationships in the marine environment. Geotechnologies can help to document the social landscape by collecting data and involve at the same time stakeholders and communities in the process (St. Martin & Hall-Arber, 2008). Participatory GIS offers the possibility to include actors without necessarily having access to the institutional keys of the portals (Boucquey et al., 2019), and geoportals allow the inclusion of new hybrid layers. Despite their limitations, geoportals remain highly modifiable, accessible, and mutable (Boucquey et al., 2019).

Given the ambition of this paper to capture the rise of geoportals in MSP by giving a global overview, we defer from Campbell et al. (2020) in our approach. Rather than an in-depth case study using qualitative research methods (e.g. interviews), conducting a global study requires pre-defining general premises to allow for qualitative comparison. Critical cartography and assemblage theory, as outlined above, provide our underlying rationale but are not explicit in what actions help to analyze how geoportals perform in MSP, in other words, what geoportals 'do'. We therefore use the three dimensions as defined by Kloppenburg et al. (2022), who argued that digital technologies affect the ways in which policy-makers, stakeholders

and the wider public as introduced earlier: (1) see and know the environment and sustainability issues; (2) participate and engage with each other in informational and policy processes; and (3) intervene and act to address environmental challenges and push forward sustainability solutions and innovations. In the next section, we operationalize these dimensions by the functionalities geoportals (might) have, however, first the approach to setting up the global overview of MSP portals is explained.

Methodology: build a marine geoportals corpus

This study is based on an analysis of an overview corpus of MSP geoportals around the world. We used a mixed-methods approach (quantitative and qualitative) to analyze the geoportals associated with MSP and the relation between geoportals, the three dimensions of digital governance and the planning phases in MSP.

To identify an overview corpus, we followed a stepwise approach (see Figure 1). The first step was to cross-check with sources and studies that had been undertaken to identify MSP initiatives and sometimes to indicate geoportals. These sources/studies were: Frazão Santos et al. (2019); UNESCO/IOC (2021); and MSP IOC – UNESCO, which in 2022 was replaced by MSPGlobal2030 (UNESCO/IOC, 2019). Due to the migration from MSP IOC – Unesco to MSPGlobal2030, we considered both versions for our data collection, accounting

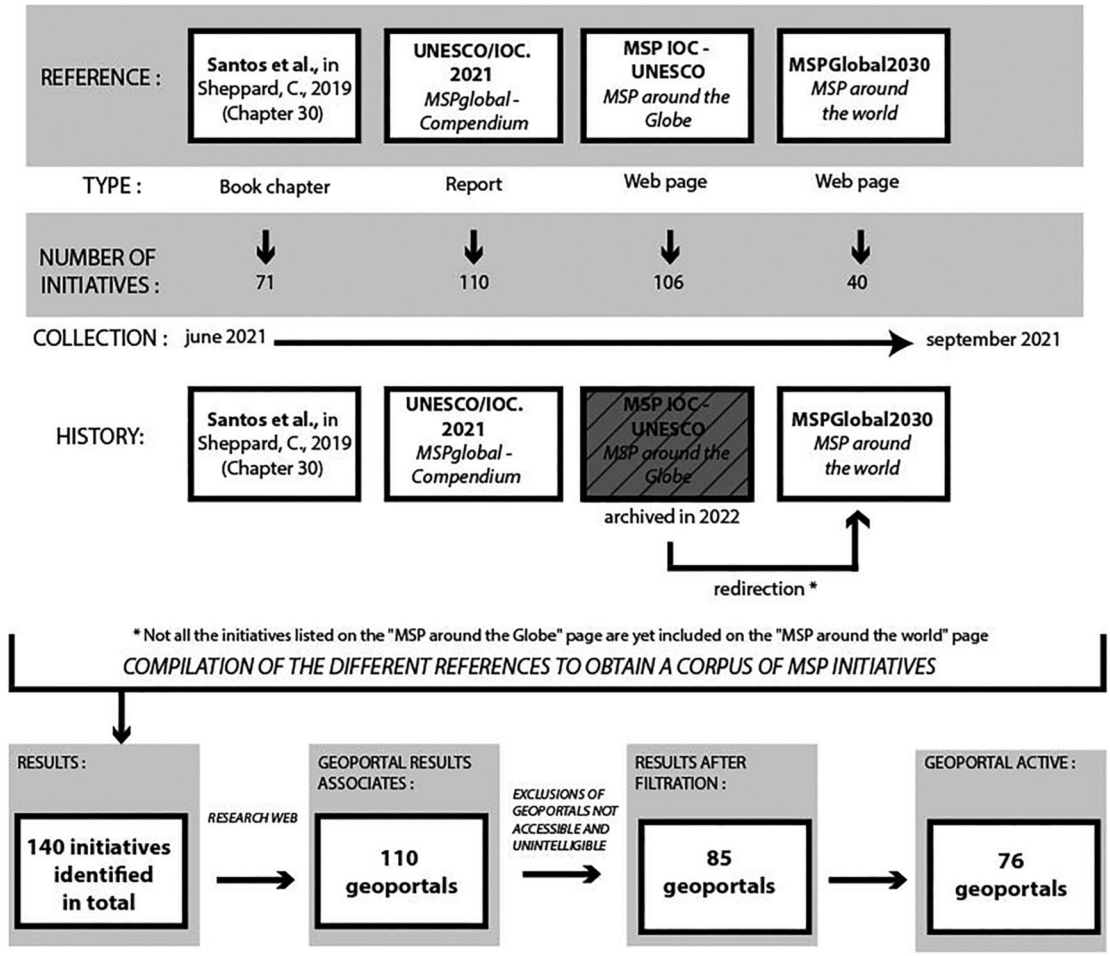

Figure 1. Process to build the corpus.

for any differences. After compiling the MSP initiatives mentioned, we undertook a search for the associated geoportals through Google. This investigation was done from the website dedicated to the MSP project or from a keyword search[1] if the first situation was not successful. In total, 110 geoportals were identified, after considering how a geoportal was connected to MSP initiative. On the one hand, different initiatives can be linked to a single geoportal. This is the case, for example, when there are different subnational initiatives for a single national geoportal (i.e. French or German MSPs have different plans but a common geoportal). On the other hand, some geoportals bring together several national initiatives, such as the PacificMap portal, which brings together part of the Pacific islands, or the Alboran portal, which brings together information for Spain, Morocco and Algeria. From the corpus of 110 geoportals, the geoportals with restrictive access and not intelligible have been excluded,[2] resulting in a corpus of 85 geoportals (Figure 1). However, nine geoportals turned out to be temporarily unavailable at the time of the study, therefore not included in this study. The total number of geoportals analyzed was consequently 76 (see details in Appendix 1).

To understand the role of geoportals in the MSP process, more particularly *how* and *when* the portal affects the process, we operationalized the portal assemblage in terms of functionalities relevant for the three digital dimensions of governance and the different planning phases in which the portal could be put in action.

Functionalities have been selected iteratively. While MSP literature guided the selection, the functionalities being actually integrated in the geoportals in the corpus, were also important in the consideration. Eight functionalities were defined (see Table 1), using the three dimensions as defined by Kloppenburg et al. (2022) as overarching categories.

Concerning the ways in which portals enable seeing and knowing, three functionalities were selected, which we refer to as catalog functionalities. First, access to metadata is a key functionality of a geoportal (Boucquey et al., 2019) to understand and identify how many layers are behind the maps. This can either be an integral part of the portal or provided by a secondary web page. Second, visualization of data and information is a main functionality of geoportal: what data is selected to represent the environmental state, which marine uses are highlighted (which not?) and what synergies, conflicts and impacts can be shown (and what not?) (Kloppenburg et al., 2022; Shucksmith et al., 2014). Third, the opportunity to visualize the MSP plan allows portal users to see and know the products which will inform the policy process. The geoportal becomes at the same time the plan, like in case of Northeast and Mid-Atlantic US regional ocean planning (Campbell et al., 2020). We selected two functionalities that allow stakeholders and the wider public to participate and engage. One functionality, observed in some geoportals part of the corpus, refers to the possibility to add and view an external dataset for personal use, and even to visualize this data in relation to other layers present on the geoportal. The other also came from the corpus, as we found that some geoportals allow users to leave comments online, or even respond to them in order to start an online discussion. We labeled these two 'self-engagement functionalities'. These functionalities allow for participation, but it is limited to self-engagement. However, another level of interaction lies in what we call 'participatory functionalities' which enable intervention and action by stakeholders or public, who are involved in or concerned by MSP (Kloppenburg et al., 2022). According to Kloppenburg et al. (2022), 'a key promise of digital technologies is that they collect and process data to automate and optimize decision-making processes and interventions' (p. 237). While the collaborative functionalities we defined are not necessarily leading to direct automated interventions, they shape action by setting down how stakeholder and public opinions can be included. Successful forms of collaboration are through participatory mapping and GIS, drawing on non-institutional knowledge (Amelot, 2013; Chambers et al., 2004; Chapin et al., 2005; Rambaldi et al., 2006; Weiner et al., 2002). The sixth and seventh functionalities we studied therefore refer to the possibility to propose alternative plans, and whether users can post collaborative data online. Lastly, we included the possibility of geoportals serving as decision support tools (DST). Pınarbaşı et al. (2017) argued that a participatory geoportal is necessarily interactive and might overlap with a DST. In planning, DSTs and geoportals are spatially explicit tools, comprising maps, communication modules and models to explore layer combinations. DSTs include additional elements to solve planning problems, such as automated decision-making, so they can be considered as the most advanced geoportals (Pınarbaşi et al., 2017). When we constituted the corpus, some geoportals explicitly mention that they are used as DST, and it is in this condition that they are considered as the eight functionalities in our study.

This can be summarized as follows (Table 1):

Table 1. Functionalities of the three dimensions in digitalize governance.

Dimension	Functionality group	Functionalities
Seeing and knowing	Catalog functionalities	1. Infrastructure of metadata storage 2. Infrastructure for the visualization of geographic information 3. Infrastructure for the visualization of plans
Participation and engagement	Self-engagement functionalities	4. Adding datasets to the geoportal (personal use) 5. Posting comments online
Interventions and actions	Collaborative functionalities	6. Proposition of alternative plans 7. Posting collaborative data online 8. Decision support tool

To understand whether the functionalities, or their accumulation allow the plan to evolve, it is necessary to cross-reference the database of 76 geoportals with the seven phases of progress for an MSP initiative identified in the UNESCO database (MSP IOC-UNESCO, 2020) (Table 2). From the pre-planning (phase 1) to the revision of the plan (phase 7), 54 geoportals from our corpus correspond to an initiative identified by the UNESCO MSP reference list.

Analysis of marine geoportals: what, when, where, why?

Our corpus consists of 76 geoportals spread around the world (Figure 2). We see a particularly strong concentration in Europe and North America with subnational geoportals, while some parts of the world share one geoportal for several countries (i.e. African Coastal & Marine Atlas).

The functionalities of the 76 geoportals are represented in the matrix (Figure 3), allowing to visualize the different dimensions of digital governance based on Kloppenburg et al. (2022).

This matrix illustrates that only eight geoportals have functionalities that meet the three dimensions of digital governance, though none of these have all eight functionalities in place. 33 geoportals provide access to functionalities corresponding to two of the dimensions of digital governance. Most of them combine functionalities to 'see and know' and to 'engage and participate', which is the case for 21 geoportals. Only 12 geoportals combine 'seeing and knowing' and 'interaction and action' functionalities. No geoportal allows access to 'engage and participate' functionalities associated with 'intervention and action'. Finally, if a geoportal only responds to one dimension of digital governance, it is by offering functionalities to 'see and know': our corpus has 35 which only allows access to catalog and data visualization functions.

Seeing and knowing through geoportals

Our results show that geoportals in general help their users to see the marine world: the majority (89%) of the portals have the functionality to visualize geoinformation. By providing access to metadata, 84% allow users to

Table 2. Seven phase of MSP process (Source: MSP IOC-UNESCO, 2020 – Status of MSP https://web.archive.org/web/20200807074045/http://msp.ioc-unesco.org/world-applications/status_of_msp).

1. Pre-planning	Authority identified; Financing obtained; Work Plan drafted; Stakeholders engaged; Initial problems identified; Principles and Goals defined; SMART objectives specified; Planning boundaries defined; Planning horizon defined
2. Analysis for Planning	Data collection and organization initiated; Analysis of existing conditions; Analysis of future conditions; Spatial/temporal conflicts/compatibilities; Data atlas/data portal development
3. Management Plan Development	Preliminary management actions identified; performance indicators identified; Performance monitoring and evaluation plan completed
4. Management Plan Completion	Management plan completed, but not yet approved
5. Management Plan Approval	Management plan approved by relevant level of government
6. Management Plan Implementation	Management plan actions put in place; Performance monitoring and evaluation underway
7. Management Plan Revision	Management plan revised, amended, adapted

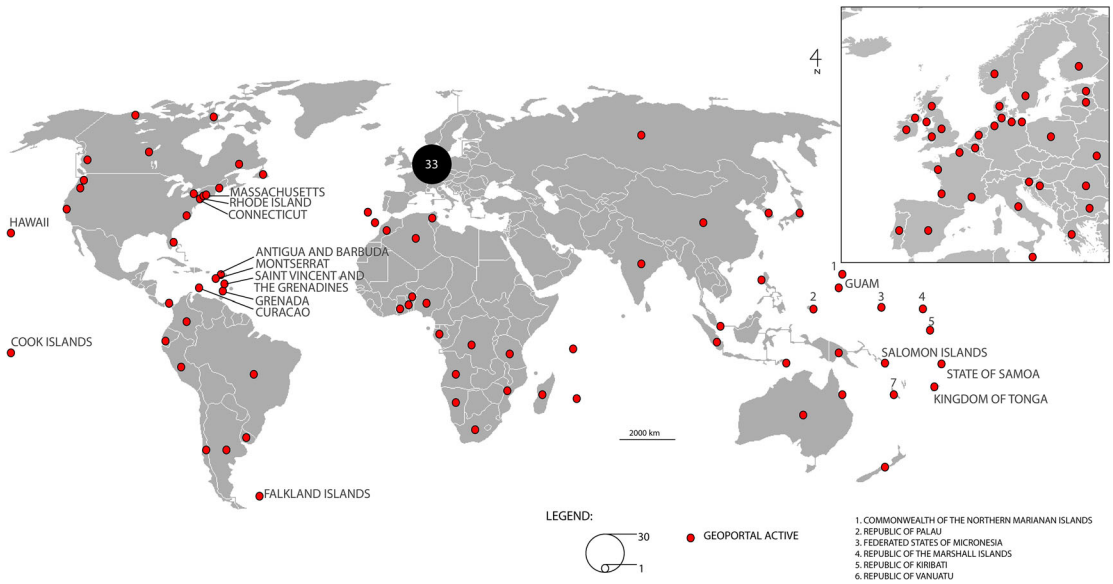

Figure 2. Geoportals active around the world.

enhance their understanding of how the marine ecosystem and the diverse economic activities form a multi-layered reality. In 73% of the geoportals, these two functionalities were both present. In the case of most European and North American geoportals, for example as Germany or US regional plans, these both functionalities are present. But, for some part of Canada (i.e. Nunavut and Placentia Bay) or France, the metadata functionality is uncorrelated with the visualization.

Less than half (40%) of the geoportals present a marine plan. Interestingly, for only 35% of portals this functionality was combined with the other two functionalities of the same dimension, allowing users to explore the broader range of informational processes underpinning decision-making. Again, this configuration mainly concerns European or North American geoportals such as Portugal, Denmark or the American state of New York. None of the geoportals only allows the visualization of the plan, to help users see and understand the marine space and plan, geoportals allow access to at least another functionality. If this was not the case, the geoportals would simply be a digital map of the plan.

The results are also analyzed with regard to the phases of progress of the MSP to understand when geoportals are accessible in the process. For this, we cross our corpus of geoportals with the MSP initiatives identified by UNESCO (MSP IOC-UNESCO, 2020) applicable to 54 geoportals of the corpus (Figure 4). These 54 geoportals were only national or regional geoportal. Supranational geoportals are not connected to planning phases.

From our analysis, MSP initiatives tend to have a geoportal in place in a more systematic way and with proportionally more functionalities after the approval of the plan (phase 5). On the one hand, these geoportals are mainly focused on Europe and North America and correspond to a global political trend of MSP being more mature in the global North (McAteer et al., 2022). On the other hand, initiatives under construction

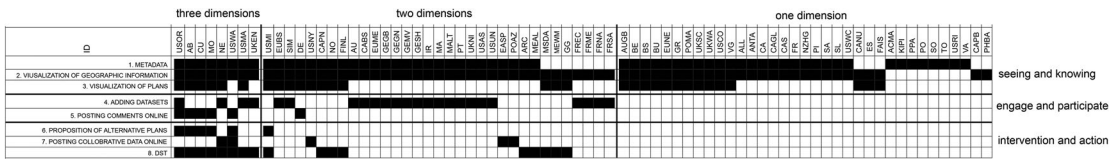

Figure 3. Matrix of corpus geoportals (ID detailed in Appendix 1).

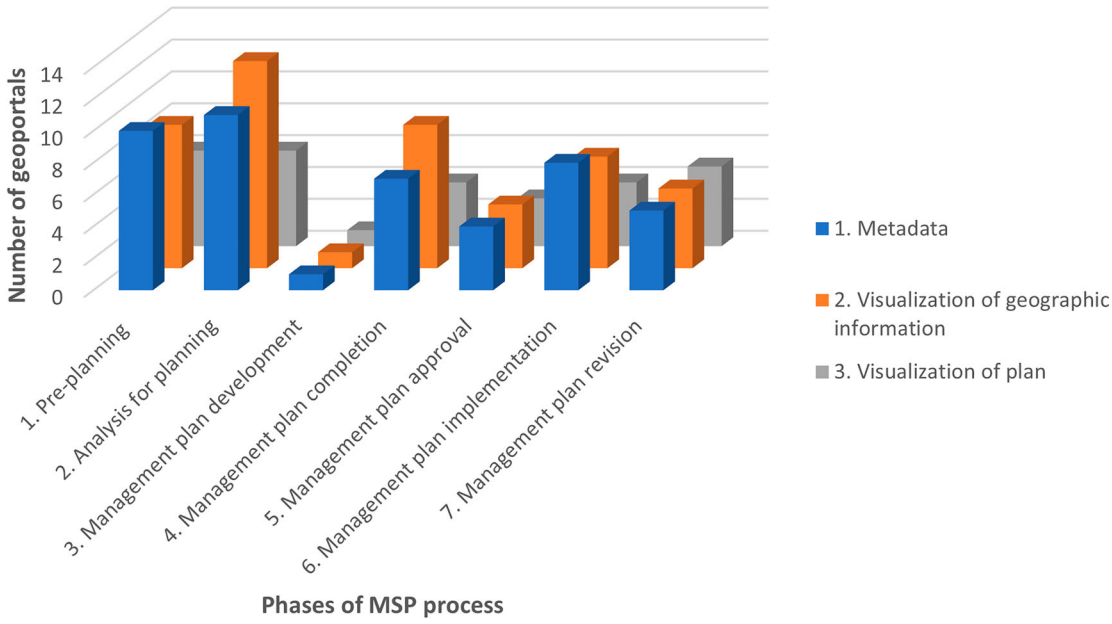

Figure 4. The first dimension of digitalized governance compared to the phases of progress in MSP.

(from phase 1 to phase 4) are very strongly associated with a geoportal (i.e. Grenada; Vanuatu; Tonga). All three catalog functionalities are not systematically present, but at least 88% of geoportals connected to an MSP initiative referenced by UNESCO (MSP IOC-UNESCO, 2020) allow the visualization of marine information. The proportions of geoportals with at least one of the three identified functionalities is very high in the early phases of the initiatives. This is particularly significant as the initiatives in the development phases (phase 1 to phase 4) are less focused on Europe and the USA and therefore do not necessarily have the political support of this part of the world. Furthermore, once the plan has been approved, the percentage of geoportals with information visualization functionality is always at least 50%, which demonstrates the high use of the geoportal once the plan is finalized to disseminate information. But also – and this seems all the more revealing of the digital shift that the MSP is taking – the presence of all three functionalities is significantly more constant after the plan has been approved.

Engaging and participating through geoportals

Of the 76 geoportals, 38% have combined functionalities which facilitate (self-)engagement. The functionality enabling active participation in the geoportal for the public is the ability to add datasets for personal visualization (this does not involve any data sharing on the platform). More than 30% of the geoportals in our corpus have this functionality. This is mostly the case for European countries (66%) which seems to be in line with the data sharing set up by the INSPIRE directive. This function allows the public to have the feeling of participating and being able to interact in the geoportal even though the interaction with others is lacking.

Less than 8% of geoportals allow comments to be posted online. This function, which is essential to allow the public to express themselves and to be engaged in the MSP process, is in five out of six cases associated with Central or North American and European portals (i.e. Oregon state, Washington state, Denmark, Antigua and Barbuda, Montserrat). Posting comments online is always associated with access to metadata and visualization but also very frequently with two other functionalities allowing direct intervention by the public that we discuss below (see Intervention and Act through Geoportals section).

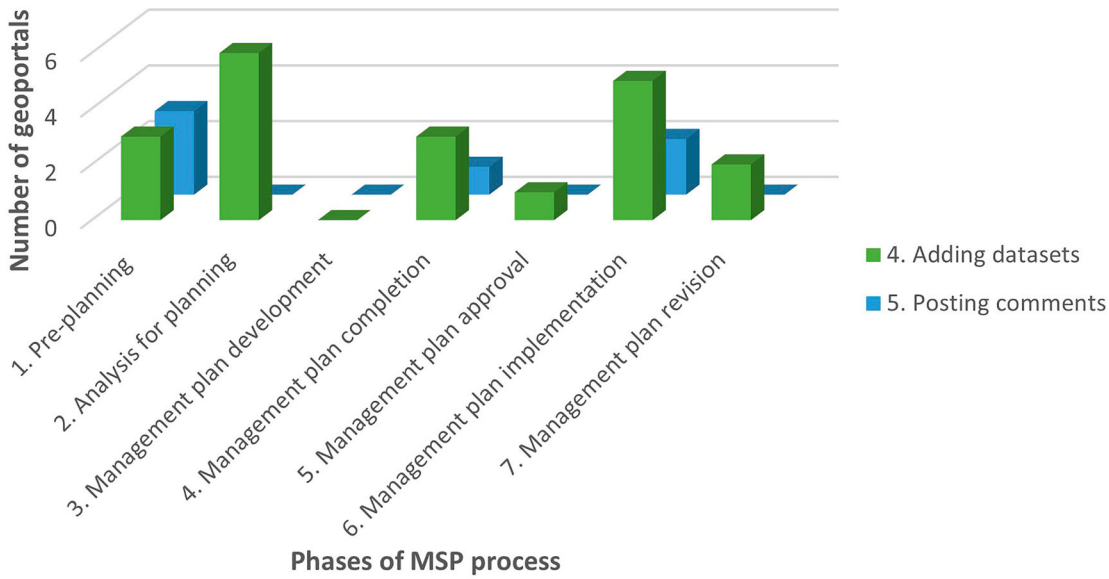

Figure 5. The second dimension of digitalized governance compared to the phases of progress in MSP.

The relationship between the phases of the MSP process and the second dimension of digitized governance (Figure 5) is, as mentioned before, based on 54 geoportals.

The functionalities corresponding to the second dimension of digital governance do not only concern the construction phases of the plan but are also present after the approval of the plan (33%). However, participation cannot influence the already-approved plan. Furthermore, the participatory functionalities are focused on Northern countries since among the 29 geoportals studied with one of these functionalities, 17 European geoportals and 9 geoportals are from North or Central America. When the plan is not yet approved, it appears that the geoportals offering the addition of personal data are barely more than 10% of cases associated with a functionality allowing an intervention. While the geoportals offer the functionality of posting comments online, in 80% of cases they offer other functionalities allowing more public intervention developed below.

Intervention and act through geoportals

Functionalities associated with the third digitalized governance dimension are present in 26% of the 76 geoportals of our corpus.

The functionality allowing public intervention offers the possibility of proposing an alternative plan from the geoportal. There are less than 10% of geoportals with this functionality and they are all from Central or North America (i.e. Montserrat, Curaçao) and are mostly supported by the SeaSketch (https://www.seasketch.org/home.html) tool. Proposition of alternative plans, which is not widely adopted in the portals, allows the public to propose its own vision of the maritime space and thus to include it in the production of the plan. It is also an educational function allowing the public to realize the extent of the challenges that must be met by MSP (i.e. 'MSP Challenge', see Jean et al., 2018; Keijser et al., 2018).

The functionality allowing interaction and collaboration in using an online dataset has been identified in only four geoportals (i.e. Azores, East Asian sea, New York state, Washington state). They are mainly used for recreational activities data (surf spot for example) or maritime fauna data (whale for example). This function allows the public to have an intervention by creating data that could then be used for planning. In this case, the public could be part of the creation of knowledge for maritime space.

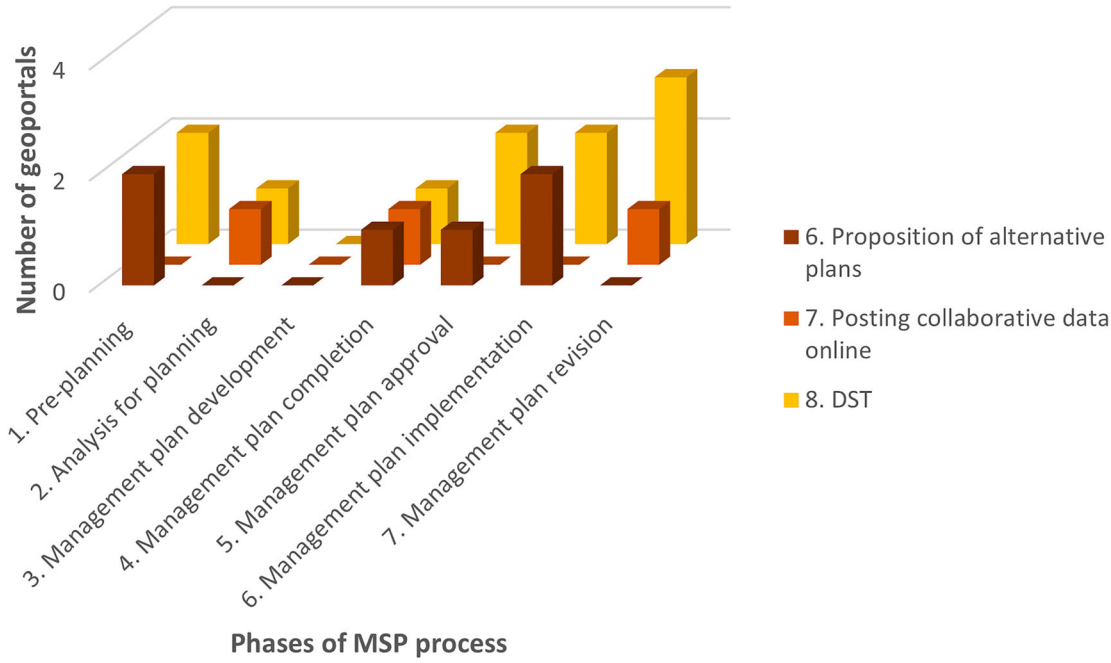

Figure 6. The third dimension of digitalized governance compared to the phases of progress in MSP.

The final functionality concerns 22% of geoportals who are used as DST according to the information presented on the geoportal websites. The DST-functionality of geoportals is identified as being accessible to the public. However, it should be noted that we have no information on its operation or what results it produces.

Based on the 54 geoportals listed by UNESCO, only 22% have one of these three functionalities and the third dimension of digital governance shows that geoportals with these functionalities, and in particular the DST functionality, are linked to finalized plans (Figure 6).

Geoportals that can be connected to the last dimension of digitalized governance are partly the result of countries that started an MSP in the early 2010s (i.e. Norway, the Netherlands and US regional initiatives) or had completed their first plan by the time of the geoportal census (i.e. Finland) and in the overseas territories dependent on European countries (i.e. Curaçao and Montserrat). These geoportals are therefore either the result of a completed MSP process or the result of the deployment of technology that supports the constitution of MSP. They come mainly from European countries or the United States. This can be understood as the result of the European Directive 2014/89/EU, or in the USA, of the encouragement by the government (Boucquey et al., 2019). These geoportals are linked to initiatives that started a few years ago, but mostly, initiatives that have developed technical tools related to the development of plans. However, the elements described above are related to states having a national or supranational basis to support the development of MSP. Also, the presence of these three functionalities allowing public intervention is anecdotal since barely ten or so geoportals have one of these functionalities and, moreover, they are mostly present after the plan has been approved.

Discussion and conclusion: challenges and potential for ocean geoportals

The abundance of geoportals in MSP showcases the digital turn in marine governance. This study identified 76 active geoportals worldwide which are publicly accessible. These results show the development of geoportals have become an important part of processes of MSP, especially given the short history of MSP. New initiatives, currently in the first two phases of progress, seem to take advantage of the general trend of developing

geoportals, and to introduce them from the start of the project. Also, in building our corpus, we found that most new initiatives are linked to a geoportal, while some older and already approved initiatives were not (and therefore were excluded from the study).

The focus of our study was to build an understanding of what geoportals 'do' in processes of MSP. We did not find a geoportal that is just a map in digital format. Our results show that the oldest and already approved initiatives tend to have a geoportal with a large number of functionalities, while the most recent initiatives under construction have proportionally fewer functionalities. Overall, our corpus shows that geoportals serve mainly as digital catalogs. The catalog functionalities allow users to find and access geographic information relevant to mapping and planning of marine space, so to help users 'to see and know' data and information important in MSP. However, about half (46%) does not provide 'associated geographic services' (Karabegovic & Ponjavic, 2012), as these geoportals do not have functionalities allowing for engagement and participation, and for intervention and action.

Emphasis on seeing and knowing rather than engaging and intervening indicates that portals are more a product of the plan than the plan is a product of the portal. While Campbell et al. (2020) show that the two US geoportals (ID: USUN and USMI) are the plan, these findings cannot be generalized. From our global analysis, studying geoportals is not the same as studying plans: the lack of participatory functionalities means that involvement of stakeholders and the public is likely to take place outside of the geoportal. A number of studies, particularly in the field of urban planning (Daniel & Pettit, 2022), have demonstrated the capacity of technologies to empower citizens to engage in the future of places (Wilson & Tewdwr-Jones, 2021). In particular, Wilson and Tewdrw-Jones (2020) have highlighted the significance of accessible and free technologies in lowering barriers to public participation, especially through creative functionalities. The analysis presented in this paper does, however, not validate this trend applied to marine planning, as there is a notable scarcity of functions that actively promote direct action from the public. This aspect could be attributed to one of the six challenges identified by Falco and Kleinhnans (2018) in the use of digital participatory functions by the government, particularly an 'organizational' challenge. Indeed, marine planning is a relatively new process, and establishing a culture of public engagement for both the public and planners requires time and resilience (Daniel & Pettit, 2021). Also, we must not rule out the idea that certain digital tools, other than geoportals, are used internally. In that case, there is an informational issue at stake that takes place before the implementation of geoportals. For instance, Campbell et al. (2020) showed a control upstream of the data being put on the line that is completely beyond the public's knowledge, so the data put online is the result of selection processes which remained obscure. While a geoportal, in theory, could help stakeholders and the public to become involved in this selection, but also to get familiar with information and mapping processes inherent to MSP, the current absence of self-engagement and participatory functionalities seem to work as a reinforcement of obscurity and power imbalance in MSP processes. In the realm of geoportals, the issue of ownership could be closely intertwined with their functionalities. Should users possess the capability to personalize the tool through the integration of their distinct datasets, thereby establishing a framework of openness and collaboration, the significance of ownership experiences a certain diminution. Conversely, within the domain of exclusive governmental control over restricted geoportals, citizen engagement could be relegated to a rudimentary level. Correspondingly, within an unconfined geoportal governed by the user community, a latent peril might materialize – that a potential misuse or unauthorized appropriation of the tool. Moving beyond this dualistic perspective, it becomes imperative to acknowledge also the existence of influential private entities endowed with substantial resources, increasingly dedicated to crafting geoportals that possess the audacity to encapsulate the entire world (e.g. GAFAM). Technology thus not put an end to the issue of power and knowledge disparity in marine planning as discussed in the literature (see McAteer & Flannery, 2022; Tafon, 2019). The data presented here suggest that the use of technology reinforces power relations.

The lack of self-engagement functionalities and participatory functionalities reflect the 'illusion of participation' and does not lead to any meaningful advancement in public engagement. In its current form, MSP is described in critical literature as a post-political process (Flannery et al., 2016, 2018; Tafon, 2018) with minimal stakeholder involvement and based on technocratic managerial governance (Clarke & Flannery, 2020). MSP is also seen as post-political to the extent that public engagement does not counterbalance the power

of decision-makers, hence the use of geoportals as a tool for 'seeing and knowing' rather than for co-constructing decisions enabled by participatory functionalities. The portals related to newer initiatives have mostly just catalog functionalities, but even portals with participatory functionalities, corresponding to the older initiatives, do not allow for real participation since they are linked to phases 4 and 5 of the planning process, so when plans are approved.

This also speaks to the known gap between the conceptualization of MSP participation and its implementation (Clarke & Flannery, 2020; Ritchie & Ellis, 2010). As Clarke and Flannery (2020) explain, the reduction of conflict in MSP covers the debate on the potential of MSP to imagine alternative futures. In our study, the self-engagement functionalities enhance personal imagination, but there is little use of geoportals to collectively imagine alternative futures. This seems to be a missed opportunity. McAteer and Flannery (2022) argue that participation can lead to the co-production of knowledge, make governance more transparent, socially relevant, and democratic, where digital tools can support participation provided that they balance, in a maritime context, the rationalization of economic knowledge and the marginalization of local communities. At the same time, we need to realize that digital tools can also freeze debates, especially if there is no appropriate format or method to conduct this type of consultation (Guyot-Tephany et al., 2022).

While the geoportals are a mark of the digital turn in MSP, there is ongoing balancing between digital tools for, and non-digital forms of public participation, related to the highly technical and procedural approach of digital tools (Tewdwr-Jones & Wilson, 2022). Tewdwr-Jones and Wilson (2022) note that digital tools for engaging the public operate mainly for immediate problems: the long-time frame of MSP is not aligned with the attention peak sparked by a digital tool. Another challenge for digital tools for planning is to tune participatory technologies and processes to better align with the way people live, feel, and express themselves. Also, the digital tool may involve more people in the participation process, but this does not mean that participation will be more efficient (Tewdwr-Jones & Wilson, 2022). Solman et al. (2021) investigate public participation and stakeholder participation to characterize three modes of co-production in public participation (local, collective and virtual modes) 'in contrast to the dominant approach of invited stakeholder participation' (p. 6). Virtual co-production, mediated through information technology tools, enables new ways of participation by engaging citizens in governance. We agree with Solman et al. (2021) that digital tools, like geoportals, can be an opportunity to involve more of the concerned public and not only the stakeholders, whereas the fact that the 76 geoportals in our corpus are publicly accessible (and being active) is a promising starting point. But some critics also point to the democratic illusion in decision-making (Kloppenburg et al., 2022; Pritchard & Gabrys, 2016) given the central role of private actors in providing data and technology (Kloppenburg et al., 2022). The digital turn in MSP could reinforce the imbalance between decision-makers, stakeholders and the public and even if planning seems to move towards virtual co-production, it remains primarily a planner's policy and reinforces formalization of knowledge and power relations (St. Martin & Hall-Arber, 2008; Trouillet, 2019).

To address this imbalance it is necessary not only 'to 'digitalize' the planning system, but fundamentally to 'digitalize' planning methodology' (Batty & Yang, 2022 p. 10) to move towards 'Planning 3.0', to have a real interconnection between planning theories and the impact of digitalization in our society (Potts, 2020). The development of an integrated digitally enabled approach to spatial planning will help to achieve the objectives of MSP, namely, to develop the blue economy while respecting the environment and considering social issues and, meanwhile, geoportals integrated in spatial governance tend to format oceans (Boucquey et al., 2019) by connecting MSP issue to a discernible reality (i.e. data selection, mapping representation, etc.) that tends to minimize the local specificities. Integrated digitally enabled spatial planning should, however, strengthen the commitment of the various stakeholders in the process (Batty & Yang, 2022). To achieve this, it is necessary, on the one hand, to make the geoportals accessible from the beginning of the MSP process and, on the other hand, to clarify the role of the geoportal in the process and the involvement of the public through these digital tools. So public participation through digital tools must be seen as taking a real methodological position in decision-making that needs to be detached from the post-political logic of MSP. In taking a position, we suggest to follow Joliveau et al. (2013) to consider how geoportal becomes a geoportal 2.0 (Joliveau et al., 2013). A 2.0-version means a geoportal is halfway between a digital tool corresponding to the first and

second dimensions of the digitalized governance and participatory mapping tools allowing the third dimension to the stakeholders and public to influence decision-making (Kloppenburg et al., 2022). This means a change of a tool for visualizing expert opinion into a tool for public participation in the planning process, and even to some extent a tool for public consultation (Joliveau et al., 2013). Ultimately, unless the way decisions are made in MSP is changed considerably to make it more inclusive, these changes can only be the responsibility of the planning authorities to redefine the power/knowledge relationships in marine governance.

To conclude, we suggest that the digital turn in planning can strengthen and support decision-making for the marine space using digital tools, which is still not well known and does not always attract public attention. However, at the same time, it is necessary to learn from the experience of land planning to achieve an inclusive MSP and that this digital turn is not a '*support for governance*' to illustrate the action of the decision-maker, but a '*mode of governance*' (Campbell et al., 2020, p. 296) to make more democratic decisions by engaging stakeholders and the public in the planning process, and the consequences of this digital turn in marine planning will be worth following as generations of plans develop. According to the three dimensions of digital (marine) governance (Kloppenburg et al., 2022) we show that the role of geoportal in MSP is part of the first dimension by seeing and knowing, sometimes the second dimension by self-engagement and in the most advanced forms of geoportal part of the third dimension by leading actions and interventions. Based on these findings, the digital turn in planning proves to be a valuable asset for broadening the range of public participation methods. However, participatory functionalities can only serve the purpose of participation if they are present (which is not the case for most new initiatives) or if they are accessible before decisions are made. Currently, geoportals designed with engagement and action in mind, are merely of a facade and do not have an important role since participatory functionalities are often accessible after the approval of the plan. At the same time, we can be optimistic and believe that the findings from this work could raise awareness of the role that digital tools can play in digital governance for future planning cycles.

Notes

1. Keywords used are: 'geoportal + name MSP project', 'data portal + name MSP project', 'marine data portal + name MSP project'. At the end of this systematic research, considering that geoportals can be strictly linked to the MSP initiative or used for multiple projects requiring maritime data, we end up with 110 geoportals.
2. Geoportals using other languages than English or French.

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