

# Design Thinking and Maritime Spatial Planning: similarities, differences and opportunities for design

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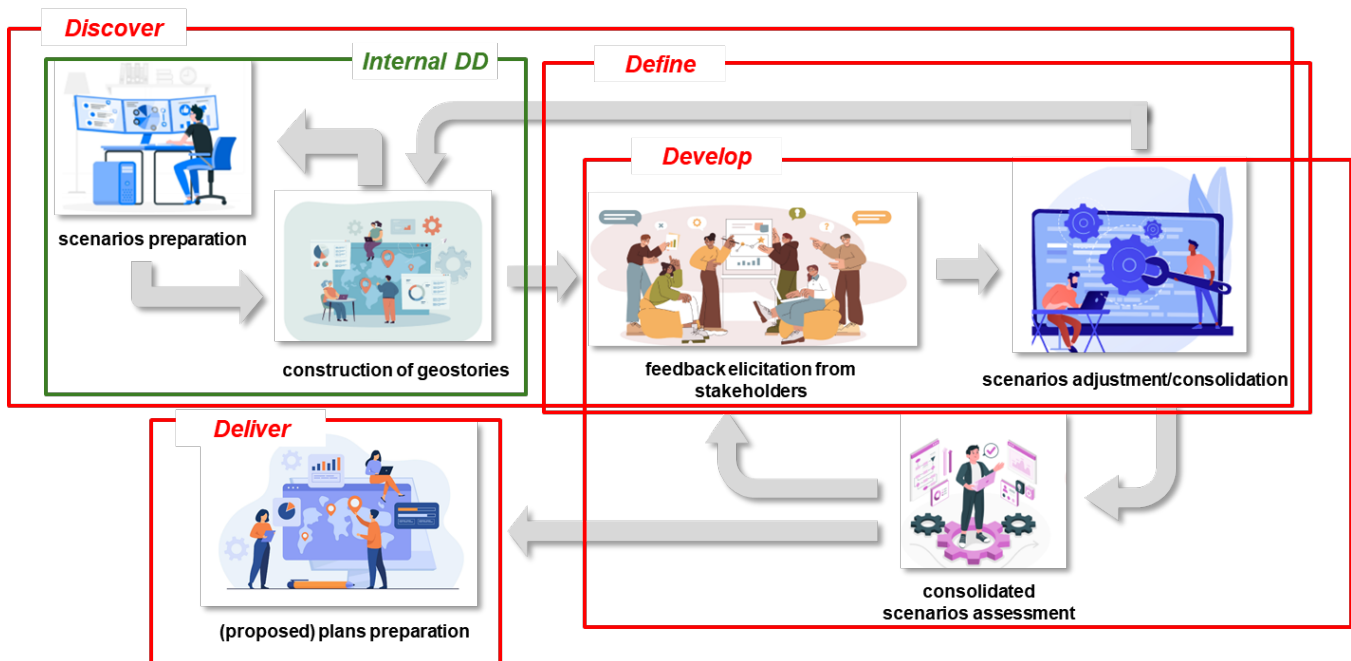


Figure 1: The journey of participative maritime spatial planning (vector graphics from Freepik, freepik.com).

## Abstract

This paper discusses the idea of reframing the process of Maritime Spatial Planning as a special case of a Design Thinking process, as an opportunity to design digital technologies in support of efficiency and stakeholder engagement. In a preliminary design workshop, a group of Maritime Spatial Planning experts discussed the similarities and differences by referring to the phases of the Double Diamond approach to Design Thinking. The reframing of Maritime

Spatial Planning as Design Thinking was helpful for focusing on the phases rather than on the activities themselves. Its main outcomes consisted of a revised journey of a specific implementation of a participative Maritime Spatial Planning, and in a list of design opportunities that will be further refined.

## CCS Concepts

• **Human-centered computing** → **User studies**.

## Keywords

Design Thinking, Maritime Spatial Planning, User research

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## 1 Introduction

Maritime spatial planning (MSP) is a planning process for human uses of the sea that aims to enable integrated and consistent decision making by involving different stakeholders [11]. Recently, the European Commission promoted it as an essential tool to reconcile nature conservation with economic development, as well as to prevent conflict between policies [1]. Beyond its regulatory function, MSP plays a strategic role in fostering cross-sectoral dialogue, enhancing the coherence of marine governance frameworks, and supporting the transition towards more sustainable and ecosystem-based management of marine space. Furthermore, MSP processes provide a platform for the co-development of future visions and scenarios, enabling more resilient responses to environmental, social, and economic challenges.

Design Thinking (DT) is a well-known approach in Human-Computer Interaction that fosters divergent thinking in an iterative process and promotes active participation of users in the entire design process [10].

Although never explicitly mentioned in the literature, there are several aspects for which MSP can be considered an instance of DT. Specifically, it is a design process, albeit quite specific, it has an iterative nature, and it promotes active participation of the stakeholders. On the other hand, the differences between the two are striking. While DT is a general approach to design [10], MSP is a specific set of activities that aim to produce a very peculiar outcome: the analysis and (proposal of) allocation of the spatial and temporal distribution of human activities for a marine area [11]. Although both DT and MSP make a point of involving stakeholders [1], there are no *users* (in a strict sense) in the MSP, since it is not intended to design products or services in the same sense as DT (usually) is. Finally, experts play a more prominent role in the elaboration and assessment of the plans than designers do in a typical design process in which they are usually not themselves experts in the domain, but instead act as mediators between the users' needs and the material's features [15, 25].

Nevertheless, recognition of these similarities—and the differences—may suggest new ways of implementing MSP to make it more efficient and easier to adopt. In this paper, we analyze a specific implementation of the participatory-oriented MSP process used by the National Biodiversity Future Center's project project *MSP4BIODIVERSITY*. We present how an exercise of mapping the activities and deliverables of the MSP process to those of a specific approach to DT may help highlight opportunities to improve it.

## 2 Related Works

This section presents a brief discussion on the state of the art in MSP with the aim of clarifying terminology and the current approach. Furthermore, DT and the specific type of DT used in this paper are also briefly introduced.

## 2.1 Maritime Spatial Planning through scenarios

A *scenario* in MSP lingo is the representation of a 'possible future' [4, 19] analytically coherent and internally consistent [3, 9]. Scenarios are a tool for deciding on courses of actions: though they do not themselves contain plans, they contain hypothesis of plans which constitute a reference to perform 'what if?' analysis, estimating the potential consequences of certain choices. They are used to highlight the predictability and uncertainty of certain choices in order to reduce the risk of being caught off guard or unprepared [19].

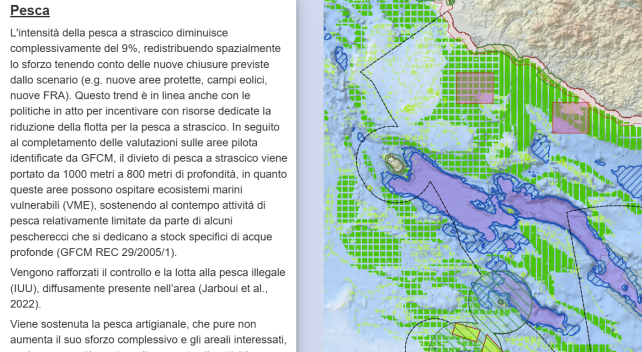
In this respect, the term bears some similarity with the notion of *scenario* in Human-Computer Interaction, for which it is defined as the narrative description of a future system in use [23]. However, *MSP scenarios* lack the narrative nature of *HCI scenarios*: in the words of Rosson & Carroll, scenarios are stories [23].

Nevertheless, MSP scenarios can benefit from narrative descriptions that highlight the ecological, economic, and social impacts of their proposed uses of marine space [7]. In fact, the approach used in the *MSP4BIODIVERSITY* project consists of presenting scenarios to stakeholders through short narrative—called *geostories*—which describe with short narrative texts and maps the spatial and non-spatial implication of the scenarios along a number predefined themes (also called sectors). Those themes are *maritime transport, environmental protection, fisheries, energy - oil & gas, energy - renewables, landscape and cultural heritage* (primary sectors), and *coastal defense, tourism, research and innovation, security and surveillance* (secondary sectors). Recently, the European Marine Observation and Data Network (EMODnet) proposed a Data Model [8] aimed at armonizing MSP at the European level that encompasses 17 themes: *aquaculture, fishing areas, ports, ocean energy facilities, wind farms, maritime traffic flows, military areas, conservation of nature, extraction of raw materials, oil and gas, scientific research, cables, pipelines, tourism and recreation, disposal areas, and other/miscellaneous*. For each theme and a given scenario, a geostory uses maps and multimedia description to describe the proposed uses of the marine space. Of course, geostories can also be combined to focus on a given theme across different scenarios, or combined all theme of one specific scenario.

In summary, the MSP geostories might be considered, in relation to the MSP scenarios, similar to HCI scenarios in relation to design outcomes. However, geostories are usually more structured along one set of predefined themes.

As an example, the *MSP4BIODIVERSITY* project is elaborating three scenarios for the use of sea areas in different study areas: one focused on the *as-is* for which the development of the area follows current trends, with slow progress in innovative elements and limited emphasis on the protection and conservation of the marine ecosystem; one focused on nature conservation for which existing protected areas are expanded, and strict measures are implemented to protect, conserve, and restore valuable and vulnerable marine habitats; and one focused on the opportunities that the innovative aspects of the *blue economy* might bring to the development of the area. For each area considered, a scenario of each of the three categories is co-developed by proposing different uses of the sea space. Then, geostories are prepared to describe the scenarios and show

their spatial implications on the themes. Figure 2 illustrates a section of the geostory dedicated to fishery for the conservation-oriented scenario built for the Strait of Sicily.<sup>1</sup> The geostories are available as dynamic web pages, linked to the Tools4MSP Geoplatform—an Open Source web-based platform designed for geospatial data management—and as printable PDF files.



**Figure 2: A geostory for the effects on fishery of an MSP scenario for the Strait of Sicily**

The reason why scenarios are separated from the narratives that describe them in MSP is because in MSP the scenarios are the main outcome of the process (or, more precisely, the corresponding plan described in the final version of the chosen scenario among the alternative one). On the other hand, in HCI, scenarios are just a means toward the product (or its design specifications). In fact, maritime spatial planning is implemented through the development, adoption, and implementation of one or more plans of action that realize the uses proposed in a given scenario. Directive 2014/89/EU establishes a framework for maritime spatial planning with the aim of promoting the sustainable growth of maritime economies. In Italy, the European directive was actuated by Legislative Decree No. 201/2016, and subsequently, the guidelines containing the principles and criteria for the preparation of maritime spatial management plans were approved by the Decree of the Minister of Infrastructure and Transport No.237 of 25 September 2024. The Italian Maritime Spatial Plan provides strategic and guidance-level indications for each maritime area and for the subareas into which it is divided. These indications serve as a reference for other planning actions (sectoral or local) and for the issuance of concessions or authorizations. Depending on the characteristics of the subareas and planning needs, the Plan provides provides high-level policy directions, priorities, or objectives that guide the future use, protection, and development of maritime space, without prescribing specific operational measures or regulations[22].

## 2.2 Design Thinking

The term Design Thinking refers to both a theoretical stance on design and a set of more or less established practices to conduct a design process [14]. The former mainly refers to an approach to design for which problem formulation and solution are dealt with

in parallel rather than as sequential steps [6]. The latter proposes ‘a way of thinking’, which also non-designers can use, to foster innovation [14].

The innovation perspective has been popularized as a new approach to business by the seminal work of Brown [5] and it has been applied to diverse fields such as education (e.g. [24]), health-care (e.g. [21]), policy making [27], and social change [17]. Recently, it has been advocated as an alternative paradigm for organizational and cultural transformation [28]. This large sample of applications shows that Design Thinking is not just a set of methods and techniques, but an innovative approach to problem-solving and decision-making.

Although there are plenty of approaches and conceptualizations of Design Thinking (see for example, [26], [16], [18]), usually a DT process is divided in the two tightly interconnected parts of (i) problem formulation and (ii) solution ideation. In the approaches that emphasize creativity, each one of those two parts is further divided in a divergent phase, when the ideas are collected in a *out-of-the-box* way, followed by a convergent phase in which the relevant aspects are finalized and grounded. The process is meant to be participative, involving users and all stakeholders, and repeated for the number of times required to work out all the necessary details.

The specific approach discussed in this paper is the *Double Diamond* model (DD) proposed by the UK Design Council [2]. The phases of this approach are named *Discover*—the divergent phase of exploring the insights into the problem, *Define*—the convergent phase of deciding into which aspects of the problem to focus upon, *Develop*—the divergent phase of ideating the potential solutions, and *Deliver*—the convergent phase of finalizing the more promising solutions. The problem formulation part is called *First Diamond* and comprises the first two phases, The other two phases belong to the ideation part called *Second Diamond*. The term *diamond* reminds for its shape to the convergent and divergent style of activities.

## 3 An Exploratory Co-Design Workshop

The co-design workshop has been organized as part of a collaboration project between the research center CNR ISMAR<sup>2</sup> and the ITeCS<sup>3</sup> joint lab between the University of Trento and FBK to co-design new digital tools to better support MSP. The *MSP4BIODIVERSITY* project has been selected as a case study among ISMAR’s several MSP running projects.

The workshop was held on February 17th, 2025 at the premises of ISMAR as a 1-day complete *Double Diamond* interaction (first interaction). The participants included 11 MSP experts from ISMAR at different levels of expertise and seniority, and two HCI experts from the ITeCS lab.

The schedule was organized as a discussion of the current specific approach to MSP adopted by ISMAR in the morning (the first Diamond), and with an initial drafting of a design space to improve it in the afternoon (the second Diamond). Both parts included a divergent phase aimed at brainstorming the challenges and the opportunities, respectively, and a convergent phase.

<sup>1</sup>The full geostory, in Italian only, is available here: <https://geoplatform.tools4msp.eu/apps/1865/embed#/>.

<sup>2</sup><https://www.ismar.cnr.it/web-content/>

<sup>3</sup><https://itecs.dipsco.unitn.it/>

## 4 Results and Discussion

The outcome of the first convergent phase is the *journey* represented in Figure 1, it is discussed in the subsection 4.1, and the outcome of the second convergent phase is the design opportunities which are summarized in the subsection 4.2.

### 4.1 First Diamond's results

The journey depicted in Figure 1 represents the different phases for creating and evaluating scenarios for MSP, from the initial elaboration to the eventual preparation of a proposal for the plan's effective implementation by policymakers, as the specific process implemented at ISMAR. It comprises 6 activities, some of them involved the MSP experts only, while others are participative activities with the stakeholders. As part of the first Diamond, the participant to the workshops discussed the extent to which it can be mapped to the phases of a Double Diamond process.

The first activity consists of the scenarios' preparation and it is managed by MSP experts alone, starting from current policies, foresight visions, and the constraints posed by local, national and supranational norms. This activity may require several interactions among different experts. The second activity consists of the preparation of the geostories that will be used for the subsequent activities to present the scenarios and to stimulate discussions with the stakeholders. The geostories are mainly meant as a form of presentation for the scenarios but they are also useful to discuss among the experts, and they are effectively used in the interactive scenarios' preparation with the first activity.

Regarding the mapping between MSP and DT, the first thing to note, as already anticipated in the introduction, is the difference between the role of the expert and that of the designer: the latter acts as a moderator, while the former is in charge of defining the scenarios that will then be discussed with the stakeholders. The initial discover phase is more complex than in a usual Double Diamond process and it may be considered a smaller Double Diamond process in itself, because it requires an internal iterative cycle among the experts. In Figure 1, this is illustrated with a green box (although, for the sake of simplicity the DT process is not fully detailed in the four phases).

The third activity consists of the feedback elicitation from the stakeholders. This activity is at the same time a way to collect further requirements and constraints by the stakeholders, and a way to choose the more satisfactory solutions among the one proposed in the scenarios. Therefore, it is repeated several times and from the point of view of a DT process, it might be considered as both part of the *Discover* phase and, in a different interaction, as part of the *Define* phase. In both cases, it involves a revision of the scenarios: in the former case the scenarios are revised and fed back to the activities of geostories construction (and in turn, further revisions); in the latter case, the *Develop* phase continues with the assessment of the consolidated scenario.

The activities of scenarios assessment are usually managed by the expert only, using standard procedures [12] as part of the fourth activity. Nevertheless, the MSP process implemented in our case also include a further involvement of the stakeholders (and possibly the common citizens) in assessing some of the dimensions. In this respect, the third activity belong to the *Develop* phase too.

Therefore that activity can be framed in three different way and it can considered to belong to three different phases when analyzed from the point of view of DT.

Finally, the last activity of plan preparation consists of the full technical elaboration of the ideas proposed in the chosen scenario. The outcome of this phase is a proposed plan that then needs to be brought to implementation by policy makers. From the point of view of a DT process, this activity belongs to the *Deliver* phase and it is carried out by experts only.

Together with the mapping between the MSP process and a Double Diamond DT process, the first part of the workshop explored the pain points of the experts in each activity. The conceptualization of some activities in different Double Diamond phases (or in a different Double Diamond process, for the first two activities) made the discussion more effective. Below a summary of the problem space emerged.

- **Activity 1 Scenarios' preparation:**
  - *when in internal DD:* challenges in communication among experts from different fields; difficulty in keeping track of decisions;
  - *when in Discover phase:* difficulty in distinguishing between useful and superfluous data in communicating the gist of each scenario.
- **Activity 2 Construction of geostories,** for both the internal DD and the *Discover* phase:
  - unstructured creation process (mostly relying on experts' storytelling capabilities); being based on maps, difficulty in presenting temporal aspects alongside spatial ones; challenges in maintaining geostories in different forms (for example, for discussion intra-scenario or comparison among scenarios).
- **Activity 3 feedback elicitation from stakeholders:**
  - need to focalize the discussion for the different phases: open brainstorming when part of *Discover*, selecting among alternatives when part of *Define*, validation of criteria when part of *Develop*;
  - tracking feedback while respecting privacy of participants.
- **Activity 4 scenarios revision/consolidation:**
  - difficulty synthesizing large amount of information; challenges of traceability among the various phases of the process;
  - *when part of Define:* it is similar to Activity 1 but it needs to consider the feedback received;
  - **when part of Develop:** the scenarios have to be reduced or collated and the decisions have to be traceable from the feedback obtained.
- **Activity 5 consolidated scenarios assessment**
  - challenges in properly assess the criteria; aspects of traceability of decisions.
- **Activity 6 (proposed) plans preparation**
  - need to properly document the scenarios on the basis of the initial motivations, the feedback received and the assessment; geostories need to be updated to present the final scenarios.

Finally, another important aspect that emerged across various activities is the need to ensure socially inclusive and genuinely representative participation in the MSP process [9, 13]. Beyond simply involving stakeholders, this means actively engaging a broad range of key public and private stakeholders, including underrepresented and socially diverse groups such as local communities and those with limited access to institutional power. Representation should not only be formal but also effective, allowing diverse voices to influence decision-making. Failing to address this can introduce structural imbalances at different stages of the MSP process—such as in the preparation of the scenarios, in the presentation of the geostories, in the way stakeholder feedback is collected, and finally in the way the scenarios are consolidated.

## 4.2 Second Diamond's results

The second part of the workshop—the second Diamond—was devoted to brainstorm on opportunities of improvement of the MSP process, in particular how digital technology might support of the process, but also in possible changes to the process itself. The mapping to a Double Diamond process helped in classifying the opportunities by focusing on the phases rather than on the activities themselves (that was particularly helpful for the activities belonging to more than one phase that have slightly different pain points in the different phases). Below, a summary of the main ideas emerged.

- *for the internal DD*: it has been considered helpful the possibility to have a better support in the construction of the geostories from the scenarios specification: this would improve the efficiency of the process with the possibility of using the geostories to foster the brainstorming on scenarios (possibility that it is now limited by the difficult and time-consuming process of geostory creation);
- *for the Discover and Define phases*: it has been discussed the need of tools to easily transform the geostories in different format for online or offline fruition, for personal reading or for presenting them on a large audience, for presenting an entire scenario with respect to all the themes or for comparing a single theme across scenarios (currently, these aspects are partially addressed but by manually preparing the different geostories at a large cost of time and effort)
- *for the Define phase*: tools for managing feedback from different stakeholders for the sake of traceability, as well as more fine-tuned tools for collecting feedback (currently general-purpose tools are used) has been deemed crucial;
- for the Develop and Deliver phases, it emerged the need of tools to explicitly tracking the revisions of scenarios from either the stakeholders' feedback or the assessment of the criteria.
- in general, a tool for traceability of the decision taken during the project has been envisaged as very useful.

Finally, ensuring adequate stakeholder representativeness and addressing intersectional challenges require a reflection that spans across all the activities. Of course, the first step is to involve a larger group of stakeholders in the third activity by including key representatives of both public and private sectors, associations and of citizen groups that might be affected by the dynamics of power,

privilege, and disadvantage that can be triggered by the scenarios. In this respect, it is important that the geostories include narratives of the impact not only on the themes introduced above but also on the intersectional factors, such as socio-political dimensions, contextual domains, and environmental conditions [9, 13]. However, the very first step is to build an inclusive research team that might be able to quantitatively analyze the data in a robust intersectional framework in both the first and the fifth activities of the MSP process [20]. All the above-mentioned aspects also highlights the need of including metadata within each scenario that captures information about the sectors, associations, and stakeholder groups involved—such (e.g. government bodies, industry, academia, private companies, non-profit organizations, NGOs, civil society, and local communities). Additionally, intersectional information should be documented in order to ensure traceability of the decisions taken and to ensure a full consideration of this perspective.

This approach aligns with the principles of the 2030 Agenda and UNESCO's vision for ocean sustainability, particularly SDG 14 (Life Below Water), SDG 5 (Gender Equality), SDG 10 (Reduced Inequalities), and SDG 17 (Partnerships for the Goals), emphasizing the need for collaborative, cross-sectoral, and transdisciplinary partnerships.

## 5 Conclusion

This paper is an initial attempt to stimulate a discussion about extending the application of Design Thinking to Maritime Spatial Planning. Although the two approaches have different purposes and several differences, their comparison has been useful for stimulating a co-design activity aimed at defining and exploring a design space that supports and augments the participatory nature of Maritime Spatial Planning. On a very concrete level, it allowed the participants to share a common ground to define the specific MSP process and explore its current issues and limitations. It also allowed the MSP experts to envision new possibilities of managing the process, and the whole team to brainstorm opportunities to design supporting tools. On an abstract level, this stimulated the HCI experts to consider DT as a process that aims not only to design products or services but also to facilitate critical thinking participative processes as MSP.

Of course, this work has several limitations. First of all, it presents some limited evidence only collected on a very specific implementation of MSP by a single team. Then, the design process is still in a very preliminary stage, and only few concrete steps have been taken to actually finalize the design ideas—other iterations of the design processes have been scheduled. While the DT process of co-design is continuing, there is no assurance that the proposed mapping between MSP and DT is more than a stimulating metaphor. Nevertheless, we believe that this first steps can open a discussion in the both the research communities of MSP and HCI.

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