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Participatory Governance? A Critical Perspective on Stakeholder Knowledge Integration in the Context of German Baltic MPAs

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Abstract

The ocean is under increasing pressure from various human activities, including overfishing, pollution, and climate change. In response to these challenges, marine protected areas (MPAs) have emerged as important and widely applied tools for conserving and restoring marine ecosystems. Considering the complexity of identifying appropriate management measures and the resulting dynamics of their implementation, the integration of various knowledge types is of crucial importance. Germany has evolved as a leading advocate for marine conservation, playing an influential role in global conservation efforts. This context provides an interesting opportunity for examining the social and political dynamics of MPA implementation. In this study, we investigate the role of participatory approaches to knowledge integration using the case of two MPAs located in the German exclusive economic zone of the Baltic Sea. To this end, we conducted and analyzed 13 interviews with stakeholders from fisheries, environmental protection, public administration, and science. This approach was complemented by the review of documents leading to the adoption of the management plans. Our research addresses two key questions: (a) How much and what kind of knowledge is included in the management plan of the two German Baltic Sea MPAs and (b) how does this institutional framework promote or hinder the integration of diverse knowledge types? Our findings highlight the obstacles (e.g., power imbalances between different participation levels) of participatory governance levels in the two German MPAs. Thus, this study provides valuable insights for enhancing the effectiveness of participatory governance in German MPAs, thereby advancing marine conservation efforts.

Keywords
Baltic Sea; exclusive economic zone; institutional framework; knowledge types; marine protected area; nature conservation; participatory governance; social-ecological system; stakeholder participation

1. Introduction

In response to the growing ocean emergency, marine protected areas (MPAs) have become widely applied tools for conserving and restoring marine ecosystems (Duarte et al., 2020; Gaines et al., 2010; Halpern et al., 2010). MPAs are designated parts of the ocean where human activities are regulated to protect habitats and species (Humphreys & Clark, 2020). Their importance is widely recognized, with MPAs being considered a cornerstone of global marine conservation strategies (Giakoumi et al., 2018). However, they are also criticized for creating imbalances between conservation objectives and societal needs and interests, e.g., in the form of conflicts over access and failures to achieve equitable outcomes underscoring the need for inclusive and adaptive management (Bennett & Dearden, 2014a).

MPAs vary widely in their purposes, management approaches, and regulations, leading to different levels of protection and restrictions on human activities (Day et al., 2012; Horta e Costa et al., 2016; Kriegl et al., 2021). They can range from fully protected marine reserves with strict regulations ("no-take MPAs") to areas that are legally established in policy but lack the management and enforcement to achieve their conservation goals ("paper parks"). Under the right conditions, MPAs have demonstrated significant benefits for species, habitats, and ecological processes (Baskett, 2006; Gaines et al., 2010; Lester et al., 2009).

The success of an MPA primarily depends on its alignment with the unique social-ecological system in which it operates (Fidler et al., 2022; Gaymer et al., 2014; Muhl et al., 2020). Addressing social justice concerns related to MPAs, for example by striving towards an equitable distribution of costs and benefits, is essential for their long-term effectiveness (Bennett et al., 2020; De Santo, 2013; Pike et al., 2024). In this regard, ensuring a fair and diverse representation and inclusion of stakeholders throughout the entire MPA process is key to achieving both ecological and social objectives (Zafra-Calvo et al., 2019). In practice, much of this success hinges on the acceptance, behaviour, and support of local communities (Bennett & Dearden, 2014b; Open Letter to Waldron et al, n.d.). Around the world, inclusive strategies that consider stakeholder engagement and participation have proven critical to achieving successful MPA outcomes (Buxton & Cochrane, 2015). For example, the Great Barrier Reef Marine Park in Australia has seen positive results through its collaborative management approach, involving local communities, traditional owners, and various stakeholders in decision-making processes (Day, 2017). Recognizing this need, the concept of participatory governance has emerged as a promising framework for MPA implementation and management (Di Franco et al., 2020). It emphasizes the inclusion of diverse stakeholders in the decision-making processes, incorporating multiple perspectives, knowledge systems, and values (Bennett, 2018).

Participatory governance strengthens the process of MPA implementation and management by fostering collaboration, transparency, and accountability, thereby reinforcing the sense of ownership and responsibility among stakeholders (Di Franco et al., 2020). Moreover, it can result in sustainable and innovative outcomes, integrating local knowledge and diverse stakeholder perspectives (Newig et al., 2018). However, it also includes pitfalls such as limited stakeholder engagement beyond self-motivated

stakeholders, consultation rather than more inclusive forms of participation, poor timing and trivial or undesirable results for both authorities and/or participants (Dietz & Stern, 2008; Morf et al., 2019). Participative governance frameworks often face significant challenges that limit meaningful stakeholder involvement. For instance, despite aspirations for inclusivity, such frameworks are frequently dominated by established authorities (e.g., governments, scientific councils, and UN organizations in international settings), which restrict the contributions of non-state stakeholders and marginalize diverse perspectives (Esguerra & van der Hel, 2021). These limitations reflect broader critiques that, despite participation aspirations, conventional knowledge systems are often favoured, while sidelining alternative or emerging sources of knowledge (Beck et al., 2017; Sending, 2015). Powerful stakeholders maintain their influence by setting agendas (McCombs, 2005) and excluding options that could redistribute authority, such as granting greater decision-making power to other stakeholders (Esguerra et al., 2017). Unequal representation further exacerbates these issues (Gereke & Brühl, 2019). Additionally, governance institutions prioritize aligning with established audiences, such as scientific committees or political entities, which reinforces the dominance of traditional knowledge bases and limits inclusivity (Esguerra & van der Hel, 2021; Gustafsson & Lidskog, 2017; Haas, 2017). Deliberative democracy as a concept emphasizes equal participation, open dialogue, and collaborative problem-solving (Rosenberg, 2007). However, this ideal form of participation and deliberation might be undermined through previously mentioned pre-existing unequal power dynamics, i.e., power as the possibility for stakeholders to influence and contribute to the decision (e.g., Newig et al., 2018).

The German Baltic Sea, with its extensive MPA coverage and long history of (over)fishing and human impact, provides an interesting case for examining the social and political dynamics of MPA implementation. As MPAs need to balance biodiversity conservation with economic interests (e.g., fishing, tourism, coastal development, or offshore wind projects), while simultaneously addressing critical aspects of the human dimension (e.g., cultural heritage and traditional use, potential displacement and access rights, food security, livelihoods, and the intrinsic value of place), careful consideration of diverse stakeholder objectives and expectations is required (e.g., Bennett & Dearden, 2014b; Cormier-Salem, 2014; Kriegl et al., 2021). An effective governance framework is thus critical to successfully navigate these complex social, ecological, economic, and political realities (e.g., Gaymer et al., 2014; Humphreys & Clark, 2020; McCay & Jones, 2011; Rees et al., 2018), which demands coordination across multiple governance levels. However, after the European Commission initiated an infringement procedure against Germany (infringement number: INFR (2014)2262) the European Court of Justice declared that Germany indeed failed to fulfil the necessary conservation obligations (European Commission, 2021; *European Commission v. Federal Republic of Germany*, 2023). The protected areas declared to be insufficiently protected (i.e., insufficient conservation objectives and no conservation measures) include those examined in this study since deadlines were not met (European Commission, 2020; Figure 1). However, there have been recent efforts for increased protection measures for three MPAs in the Baltic Sea (including our investigated MPAs; European Commission, 2024).

In this article, we explore the role of participatory governance in the establishment of two of the three MPAs in the German Exclusive Economic Zone (EEZ) in the Baltic Sea. In doing so, we illustrate the development process of the management plans of the respective MPAs and address the questions of how much and what type of knowledge is incorporated into these plans as well as how the institutional framework supports or hinders the integration of different knowledge types. In our case, institutional framework refers to the legal (e.g., the Federal Nature Conservation Act), organizational (e.g., one leading agency and different participation levels), and procedural (e.g., first creating a draft of a management plan and then initiating the participation

process) structures that govern the development of management plans of the MPAs. Our findings highlight the challenges of participatory governance in the MPA context, offering practical insights to improve the effectiveness of Germany's MPA network and thereby advancing marine conservation efforts.

2. Material and Methods

2.1. Study Sites

The focus of this study was two MPAs of the German EEZ in the Baltic Sea: Fehmarnbelt and Pomeranian Bay-Rönnebank (Figure 1). Each of these areas allows different uses (e.g., shipping and fishing), which can be restricted in time and space by the implemented management plans (Bundesministerium der Justiz, 2021, 2022). Both MPAs are designated as nature reserves, Natura 2000 areas, and HELCOM MPAs (Bildstein et al., 2020; Bundesamt für Naturschutz [BfN], n.d.-a, n.d.-b; Bundesministerium der Justiz, 2017a, 2017b). The Habitats Directive (Council of the European Communities, 1992) and the Birds Directive (Directive 2009/147/EC, 2010), among others, have declared a wide range of protected goods such as different species (e.g., harbour porpoise [*Phocoena phocoena*]) and habitat structures (e.g., reefs).

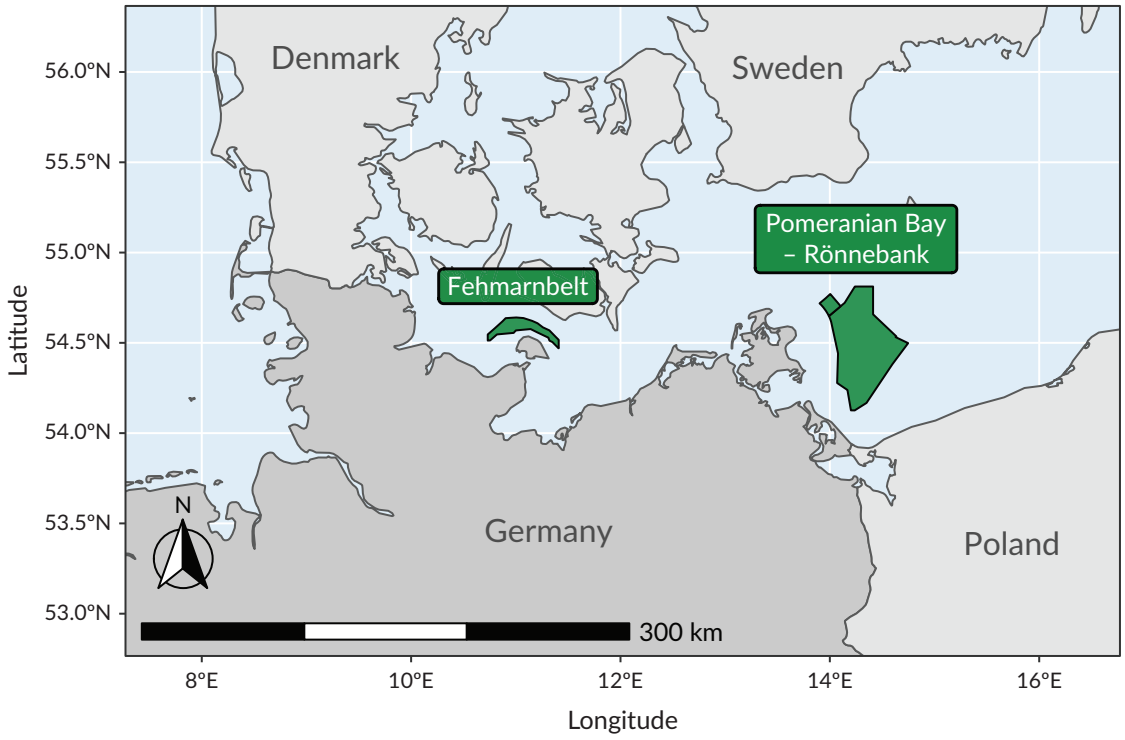

Figure 1. Map of study sites (Fehmarnbelt MPA and Pomeranian Bay-Rönnebank MPA) in the German Baltic Sea EEZ.

The Fehmarnbelt MPA covers 280 km^2 and comprises the protected goods harbour porpoise (Phocoena phocoena), seals (Phoca vitulina), sandbanks, and reefs (Bundesministerium der Justiz, 2017a; Figure 1). The area is mainly used for shipping, commercial fishing, and recreational fishing, with the latter being prohibited by a year-round ban for the western part of the MPA (BfN, n.d.-a; Bundesministerium der Justiz, 2017a).

The Pomeranian Bay–Rönnebank MPA is more than seven times the size of the Fehmarnbelt MPA with an area of 2,092 km^2 and is divided into four areas (Figure 1): Area I: western Rönnebank, Area II: Adlergrund, Area III: Pomeranian Bay with Oderbank, and Area IV: Pomeranian Bay (a special protection area under the Birds Directive, which overlaps in parts with Area II and III; Bundesministerium der Justiz, 2017b). The protected goods include harbour porpoise (Phocoena phocoena), grey seals (Halichoerus grypus), sturgeon (Acipenser oxyrhinchus), twait shad (Alosa fallax), several bird species, sandbanks, and reefs(Bundesministerium der Justiz, 2017b). Fishing (including recreational fishing) is one of the main anthropogenic pressures in these areas (BfN, n.d.-b; Bundesministerium der Justiz, 2017b). In area III (Oderbank), there is a year-round ban on active fishery, i.e., towed gears, in depths < 10 m (BfN, n.d.-b; Council of the European Union, 2005). Moreover, there is a year-round ban on recreational fisheries in the central-eastern part of the MPA (BfN, n.d.-b; Bundesministerium der Justiz, 2017b).

2.2. Data Collection and Analysis

As a first step, we conducted interviews concerning the two German Baltic MPAs, their management as well as the obstacles to their success. A qualitative content analysis was used to identify different categories of barriers to successful MPAs. Since the majority of responses highlighted stakeholder participation as a crucial aspect, we chose to focus on this category in greater depth and conducted follow-up interviews. In a second step, we reconstructed the participation process for the MPA management plan development and identified different participation levels with the combination of stakeholder interview analysis and investigation of official documents. We completed our research by conducting a frequency analysis of submitted statements as part of the development of the MPA management plans for the German Baltic Sea MPAs.

2.2.1. Qualitative Content Analysis of Stakeholder Interviews

To explore and understand the different perceptions and knowledge types regarding the German Baltic MPAs in general, and more specifically, the barriers to their success (e.g., power imbalance between different participation levels), we conducted 10 semi-structured interviews with relevant stakeholders from public administration (n = 1), commercial fisheries (n = 2), environmental non-governmental organization (eNGO; n = 2), recreational fisheries (n = 2), and science (n = 3; Supplementary File, Table A1). The interview guide used for this purpose contained a total of 18 questions (Supplementary File, Table A2). All interviews were voice-recorded and conducted either in person or online.

Interviews allow for a more in-depth exploration of complex issues, providing flexibility to probe further into responses and capture nuanced perspectives that might be missed in structured surveys. This method is particularly suitable for understanding diverse knowledge types in MPA management. Previous studies on MPAs have effectively used interviews to gather rich, qualitative data. For instance, Voyer et al. (2014) employed semi-structured interviews to examine social acceptance of MPAs in Australia revealing complex socio-cultural factors influencing stakeholder perceptions. Similarly, Jentoft et al. (2012) used interviews to examine stakeholder perceptions of MPAs in Spain. This study builds on these approaches by specifically focusing on knowledge integration in the German Baltic context. By doing so, it contributes to a more nuanced understanding of the challenges and opportunities in MPA governance, particularly concerning stakeholder engagement.

We conducted an inductive data analysis by screening and coding the interview data as well as by performing a sequence-based content and thematic analysis (Dawson, 2009; Gläser & Laudel, 2010). Two interviews were selected at random from which we developed initial categories for the analysis. From this process, a total of five analytical categories were developed, further divided into different subcategories: (a) management, (b) management plan, (c) management measures, (d) stakeholder participation, and (e) anthropogenic pressures on MPAs (Supplementary File, Table A3).

Based on the highest number of mentions within all interviews, we focus further on the category stakeholder participation and associated subcategories. To gain a deeper understanding in this regard, three additional interviews were conducted with stakeholders representing a sample of the 10 stakeholders from the first interview series (public administration, science, and eNGO; Supplementary File, Table A4). The 11 questions focused on stakeholders' knowledge about participation and the way stakeholder participation was designed and applied in the German Baltic MPAs (Supplementary File, Table A5).

2.2.2. Document Review

To identify different participation levels and reconstruct the management plan development process, we conducted a review of relevant documents. Those include, for example, The Act on Nature Conservation and Landscape Management, the ordinances, the management plans, the website of the Federal Agency for Nature Conservation (BfN) and an available lecture on law as well as a law template focusing on (participation) procedures (Bildstein et al., 2020; BfN, n.d.-c; Bundesministerium der Justiz, 2009, 2017a, 2017b, 2021, 2022; Heintzen, 2003; Juraforum, 2024).

2.2.3. Frequency Analysis of Stakeholder Statements

We were provided with a list summarizing the written statements submitted on the MPAs. According to this list, 42 statements were submitted between June 2020 and the third of September 2020 by various stakeholder groups including public administration, commercial fisheries, politics, and eNGOs (e.g., Bundesministerium der Justiz, 2021, 2022). Regarding the knowledge integration into the management plans, this list was analyzed by categorizing the statements into different stakeholder groups (public administration, science, fisheries, recreation, eNGOs, tourism, and industry) and by different governance levels (local, i.e., municipal, regional, i.e., state [*Bundesland*], national, i.e., federal, and international). Subsequently, the percentage contribution of each stakeholder group to the total number of statements was calculated. The stakeholder group of public administration include, for example, state offices and ministries with different focus areas from all defined governance levels.

3. Results

This section starts by illustrating the participation process for the management plan development; first, by introducing the three participation levels within the process and second, by reconstructing the process. The basis for both is mainly the document review, however additional insights from stakeholder interviews (especially from public administration) helped to better understand and reconstruct the process. Afterwards, the section continues with the results from the frequency analysis of the submitted written statements that formed the basis to answer the research question regarding knowledge type integration. This basis

(participation levels, process, and knowledge integration) as well as insights from the interviews were used to then answer the second research question regarding the institutional framework at the end of this section. When information is based on an interview conducted, the stakeholder group will be shown in italics as in brackets, e.g., (*science*) at the end of the quote.

In Germany, the legal framework mandates stakeholder participation in the MPA planning process (Bundesministerium der Justiz, 2009, 2017a, 2017b). As such, the development of management plans for the German Baltic Sea MPAs followed a structured hierarchy of participation, divided into three levels: agreement, consultation, and involvement (Figure 2). The agreement level, which includes national authorities with veto rights, represents the highest concentration of power, while the involvement level, encompassing the interested public and associations, had the least power. The participation process itself was divided into two phases: the first focused on the ordinances of the MPAs, and the second centred on gathering feedback on the draft management plans. Each phase began with an initial involvement stage, followed by consultation and agreement (Figure 3).

3.1. Hierarchical Order of Power and Influence

The development of and decision on appropriate measures follows a hierarchical order provided by The Act on Nature Conservation and Landscape Management (Bundesministerium der Justiz, 2009), which is also integrated into the corresponding ordinance of the respective MPAs (Bundesministerium der Justiz, 2017a, 2017b; Figure 2).

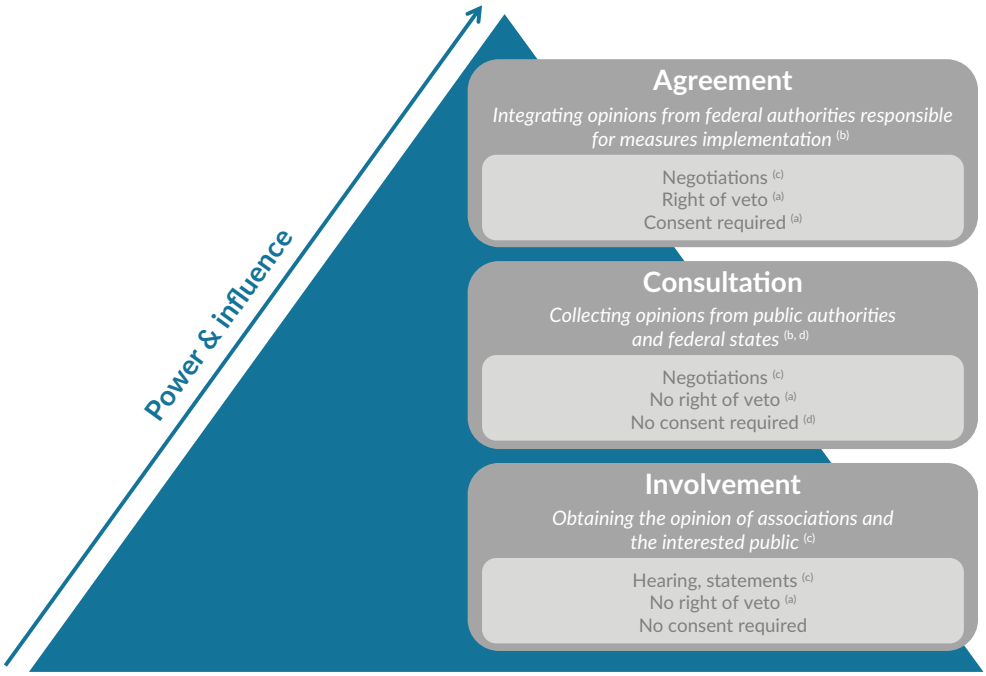

Figure 2. The hierarchical order of power and influence in the various participation forms and associated involved parties in the process of MPA management plan development in the German EEZ. Notes: (a) Bundesministerium der Justiz (1976, § 58); Heintzen (2003); (b) Bundesministerium der Justiz (2009, §57–§58, and §63; 2017a, §7; 2017b, §11); (c) Interviews; (d) Juraforum (2024); (e) "Rechtswissenschaft: Benehmen und Einvernehmen" (2017).

The BfN is the competent authority for the development of management plans for MPAs in the EEZ. The act and ordinances require an agreement between BfN and other federal agencies, such as the Federal Ministry for Digital and Transport, the Federal Ministry of Food and Agriculture, or the Federal Maritime and Hydrographic Agency, that are responsible for the execution of the measures (Bundesministerium der Justiz, 2017a, §7; 2017b, §11). Consent is required and these stakeholders have a right of veto resembling the highest form of power or influence in the decision-making process (Bundesministerium der Justiz, 1976, §58; Heintzen, 2003). A consultation is needed with the neighboring federal states, i.e., countries (e.g., Denmark) and the relevant public agencies, i.e., not directly responsible for implementation or from the respective coastal state (*Bundesland*; Bundesministerium der Justiz, 2009, §57–§58). These stakeholders resemble intermediate power or influence on the decision-making process, since they do not have a right of veto and no consent is required (Heintzen, 2003; Juraforum, 2024). However, consultation is considered as a higher form of participation than involvement, occurring through negotiations ("Rechtswissenschaft: Benehmen und Einvernehmen," 2017). The interested public and federally acknowledged associations (Bundesministerium der Justiz, 2009, § 63, Section 1) are integrated through involvement, i.e., the participation form with the lowest influence or power on the decision-making process. Stakeholders can communicate their opinions and must be heard, yet implementation of their opinions into the management is not legally required and depends on the authority leading the process (Heintzen, 2003):

> We have the opportunity to write statements…and we have been heard in hearings, so to speak. Whether that had a significant influence on what ultimately came about is a question I'll leave open. But I can say that I don't have the feeling that we have a major influence on it. (*eNGO*)

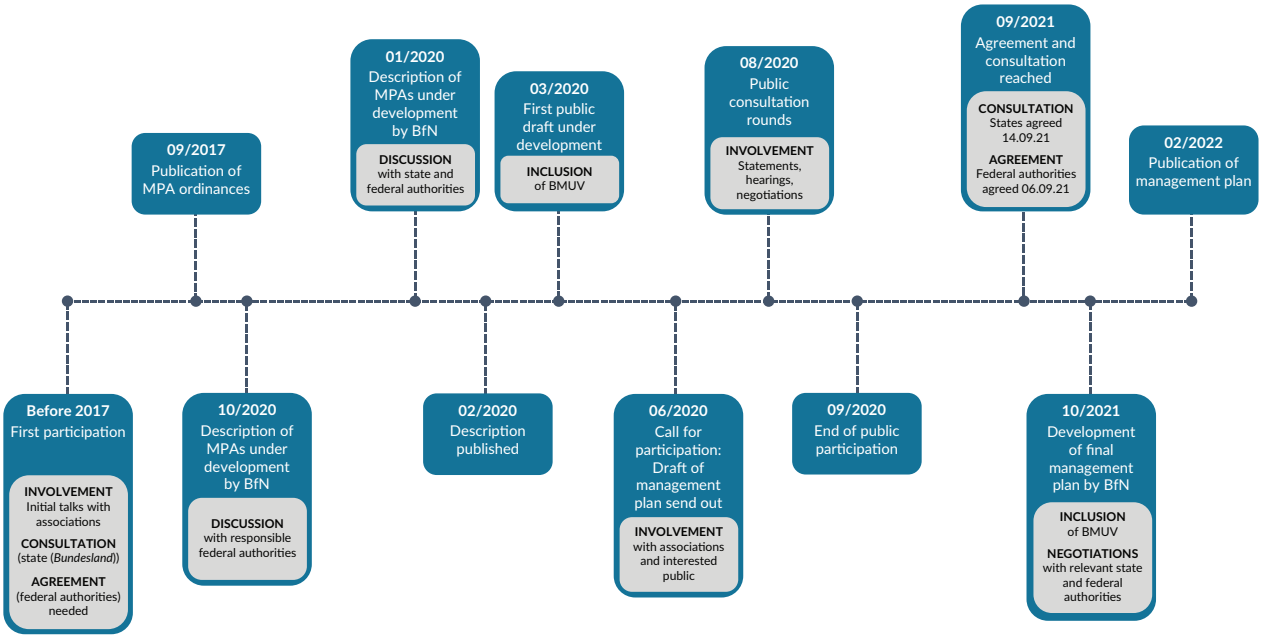

Figure 3. Chronological order of phases in the process of management plan development of the two MPAs (Fehmarnbelt and Pomeranian Bay-Rönnebank) including time frame, description, and identified forms of participation. Notes: BMUV = Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection); BfN (Federal Agency for Nature Conservation); This figure is based on the following literature: Bildstein et al. (2020), BfN (n.d.-c), Bundesministerium der Justiz (2021, 2022), and interviews.

To understand the proceedings, we have visualized the process of management plan development of the two MPAs focusing on participation (Figure 3): Already before 2017, the public was first included through the involvement of relevant stakeholders, such as anglers and fisheries associations, as well as the requirement for the agreement of relevant federal agencies to develop protected area ordinances (*public administration*). In 2017, the ordinances were published, designating the areas as nature reserves under German law. However, most management measures and restrictions are addressed in the management plans. The development of those was initiated in 2020 by BfN, which provided a description of the suggested protected area (Bildstein et al., 2020). This description was discussed with the federal (national) and state (*Bundesland*) authorities. The hereafter coordinated first management plan draft was published in February 2020 (BfN, n.d.-c) and formed the foundation for the management plan. After this, the BfN redrafted the management plan by including the superordinate ministry (i.e., BMUV). By the summer of 2020, the latest draft was published to enable the involvement of public authorities and the broader public. In two public hearings and a subsequent option to submit written statements, the aforementioned stakeholders could express their concerns and comment on the drafted management plan (Bundesministerium der Justiz, 2021, 2022). In total, 42 statements were handed in (see Section 2.2.3). Statements and comments were evaluated individually by BfN. Finally, there were negotiations with the authorities responsible for implementing the measures, but in different stakeholder constellations (*science*). Those negotiations aimed to obtain agreement and consultation as it is a legal requirement for the management plan to become effective. Agreement and consultation were obtained in September 2021 (Bundesministerium der Justiz, 2021, 2022). In early 2022, the final management plans were officially published and thus entered into force.

While we focus only on the activities leading up to the approval of the management plans, it is important to note that the plans themselves include participatory measures, e.g., the establishment of round tables with commercial fisheries (M6.2 in managementplan for Fehmarnbelt MPA; Bundesministerium der Justiz, 2021).

3.2. How Much and What Kind of Knowledge Was Integrated Into the Management Plans?

We define knowledge as a collective term for multiple knowledge types that arise in various ways—though personal experiences, jobs, tradition, norms and values, but also through the interaction with a social-ecological system including observation and spatial operation (Schwermer et al., 2021). Examples include fishers' ecological knowledge (i.e., the knowledge that fishers generate through interaction with the sea) or traditional knowledge (i.e., knowledge that is passed down through generations within communities; Folke, 2004).

The analysis of the 42 submitted statements of the involvement phase indicated that perspectives and knowledge types of public administration stakeholders are most frequently incorporated in the management plans (47.6%; Figure 4). The second largest stakeholder group represented is recreation (14.3%), followed by eNGOs (11.9%) as the third largest stakeholder group. Industry (9.5%), tourism (7.1%), fisheries (7.1%), and science (2.4%) each accounted for less than 10% of the statements submitted.

Regarding the governance level, most statements (59.5%) have been submitted by stakeholders from the national level, the highest governance level within Germany, followed by the regional (33.3%), local (4.8%), and international level (2.4%; Figure 5).

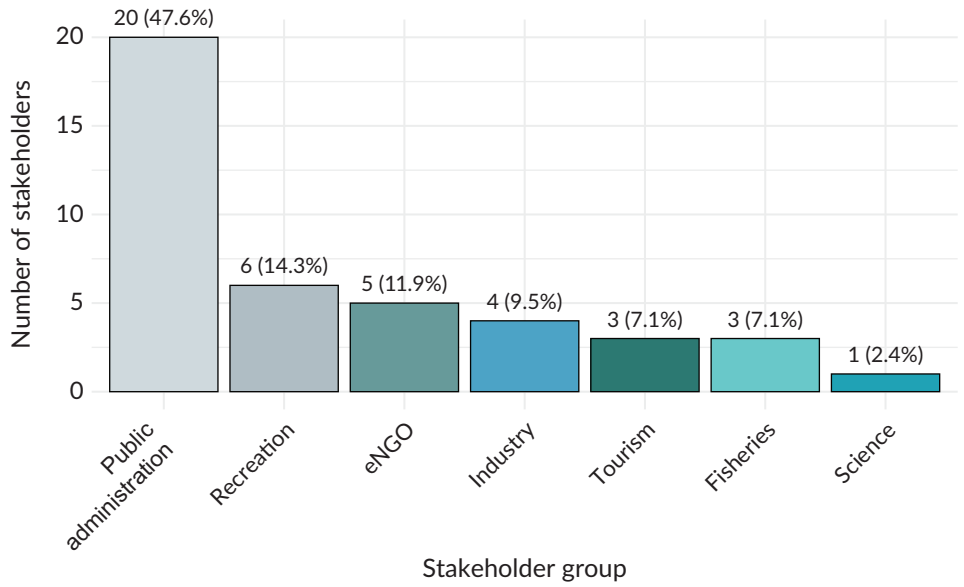

Figure 4. Bar chart displaying the total number of submitted statements in the involvement phase by each stakeholder group.

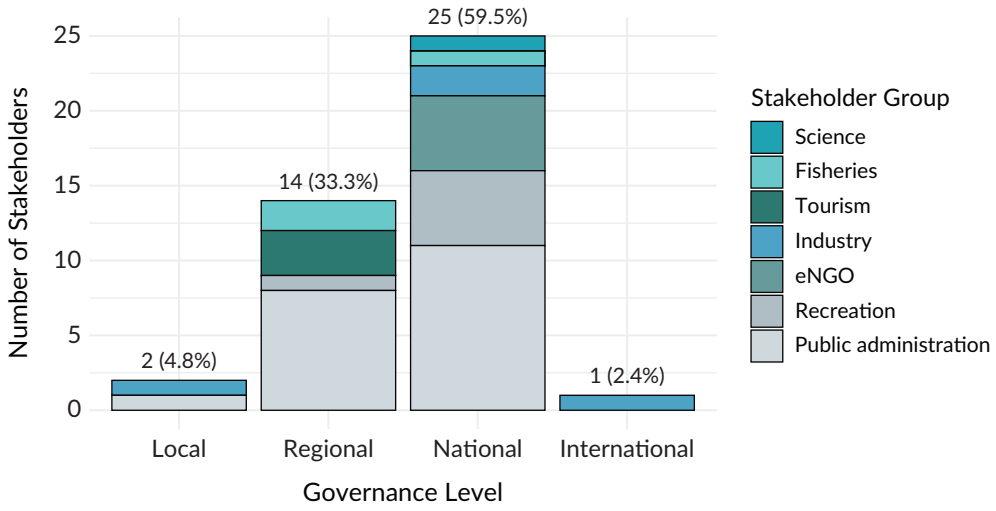

Figure 5. Sectoral representation of the 42 submitted stakeholder statements in the involvement phase across governance levels. Note: The stacked bar chart displays the distribution of stakeholder groups across different governance levels: local, regional, national, and international.

3.3. How Does the Institutional Framework Support or Hinder the Integration of Different Knowledge Types?

Analyzing the interviews generally revealed that the process of developing MPA management plans is perceived and described as top-down:

> Ultimately, this is a top-down approach. It is not the case, that all stakeholders are involved in the process. (*eNGO*)

However, a key aim of the legally mandated participation process is the integration of diverse knowledge types, whereby the integration of public authorities from different fields of specification is mandatory. Therefore, a bias towards this knowledge type was observed, even though their viewpoints differ according to the field of specification, especially noticeable at the agreement level where consensus is required.

Moreover, interviews indicated that the authority leading the process strongly preferred scientific knowledge when drafting the management plans (*science*). Despite only one formal submission from the scientific community, the plans were significantly informed by informal consultations with scientists:

> It was precisely these plans that were deliberately written to be science-based. That was…simply an important concern for BfN. And [in] this production process, not only were papers read, of course, but we also repeatedly spoke to scientists who were familiar with these areas, but that was also more informal, i.e., not that an appointment was scheduled. (*science*)

Non-scientific knowledge, such as local ecological knowledge (e.g., knowledge of environments that accumulate while operating in resource use activities; Hind, 2014) or traditional knowledge (Folke, 2004) faced challenges in being integrated unless supported by concrete data or evidence, like scientific publications (*public administration*). While the involvement phase did help to identify and incorporate some stakeholder interests, the integration of different knowledge types was further complicated by diverging statements from various stakeholders:

> At the same time, however, and this is prescribed by the EU Habitats Directive, meaning that if the establishment of protected areas is of no use for highly migratory species in particular, measures must be taken in these areas to protect the species. And that brings us to the use of pingers. And at this point, there can be indeed a real socio-political conflict between our views and that of the BfN, where we say that such pingers can also be used in protected areas and the BfN says no, as the animals are to be left alone in these areas. (*science*)

4. Discussion

A majority of statements during the involvement phase concerning the draft management plans have been submitted by administrative stakeholders, predominantly from the national level. Although a detailed analysis of the degree of consideration of these submissions was not possible due to limited access, the high proportion of statements from administrative stakeholders implies a dominant influence on the creation of management plans. The predominance of national-level submissions likely reflects the fact that these MPAs are located in Germany's EEZ, placing them under national authority. This, combined with the greater power of national authorities and involvement at all three participation levels, likely fostered a primarily administrative and political discourse about these MPAs, potentially marginalizing other perspectives. Even though at the involvement level, there is a legal obligation to acknowledge all statements received during public participation, there is no obligation to integrate them. If, for example, an association was not officially listed to be contacted or did not regularly visit the authority's website, it might have missed the call for participation. This highlights that the way how the broader public is addressed is limiting its reach to a smaller group of highly interested public, such as people or groups who feel directly related or impacted. Hence, despite legally mandated stakeholder participation, their influence is limited. Similar challenges can

be observed in other cases, such as at the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) and Future Earth, where the design of participation frameworks constrains the involvement of diverse stakeholders (Esguerra & van der Hel, 2021). Even though these platforms aim for inclusivity, decision-making power remains concentrated in the hands of established authorities—such as governments, scientific councils, and UN organizations—which restricts the ability of non-state stakeholders to influence decisions and limits the integration of new perspectives and various knowledge types. In our case, the initial drafting of management plans by the BfN focuses heavily on scientific knowledge (potentially limiting the integration of other perspectives and knowledge types later in the process), while the consensus finding then takes place in the political area (agreement phase and highest degree of power). A key strength of the current system from our case is its emphasis on achieving consensus at the agreement level, where decisions must be unanimous rather than based on majority votes. On one hand, this requirement ensures that all involved authorities are committed to enforcing the measures they agree upon, fostering greater acceptance of the final decisions. On the other hand, this approach leads to fewer agreements, as reaching a unanimous consensus can be challenging.

As the institutional framework and participation structure for the German Baltic Sea MPAs favoured the integration of administrative and scientific knowledge, particularly from national authorities, this may have limited the inclusion of more diverse perspectives, particularly those arising from the involvement level, thereby complicating the process of developing comprehensive management plans. Most contributions supported by evidence, such as data or scientific publications, were brought to the next level of participation. However, the emphasis on conventional knowledge hinders the inclusion of more diverse or alternative perspectives. A reason for this could be that participatory ambitions can create tensions between conventional and new foundations and sources of knowledge (Haas, 2017). Thus, institutional designs and frameworks influence what kind of knowledge is considered legitimate and integrated into decision-making processes (Esguerra & van der Hel, 2021). Our cases reflect this and what is also occurring in broader contexts like with IPBES, indicating that the institutional frameworks support rather scientific knowledge and consensus as the dominant foundations for decision-making (Beck et al., 2017; Sending, 2015). Furthermore, other knowledge types such as local ecological knowledge or non-scientific expertise, are typically introduced through written statements during the involvement phase, which (a) holds the least influence and (b) is a rather formal way that could imply some hierarchy. Despite favouring the integration of scientific knowledge, science was the least involved stakeholder group. This incongruity can be traced back to the involvement of scientific articles by the public administration, by consulting scientists from different relevant scientific fields in an indirect way. Therefore, it is more advisable to rather employ an independent scientific advisory board with scientists from all relevant disciplines, as was the case with the public participation process in the German marine spatial planning processes, instead of limiting scientific advice to selected scientific articles and scientists (Bundesanzeiger Verlag, 2021; Kannen, 2021).

The drive for embeddedness into existing administrative and scientific contexts is rooted in desired recognition. Esguerra and van der Hel (2021) demonstrate how the resulting institutional decisions depend on the interactions with different audiences from which knowledge platforms or institutions pursue recognition (e.g., scientific committees and certain administrative/political stakeholders; Gustafsson & Lidskog, 2017; Sending, 2017). This is applicable in our case, where broad acceptance and recognition of the management plans are sought.

Additionally, the varying personnel strength among different administrative and political authorities, especially during the agreement phase, might have created an imbalance within this group, affecting the likelihood of certain topics and measures being included: "Although [these MPAs are] the area of competence of the environment department, they were significantly weaker in terms of personnel…than some other authorities" (*science*).

Since the environmental stance of participating stakeholders was identified as an important predictor for environmental governance outcomes (Newig et al., 2023), this becomes especially important for MPAs that are designed for conservation: The environmental priorities and interests of participating stakeholders will be evident in the decisions made (Newig et al., 2023). Ultimately, MPAs may be legally bound to administrative borders, but their effectiveness can only be ensured when established according to their natural functioning. Therefore, the consideration of adjacent marine areas, i.e., responsible regional and international authorities, is crucial for the success of an MPA. Cross-border communication with respective regional and international authorities makes public participation a tool to improve marine spatial planning (García-Sanabria et al., 2021) and potentially also MPAs.

In our study, the institutional framework and power disproportions emerged as critical barriers to meaningful participation. While Esguerra et al. (2017) argue that powerful stakeholders with decision-making power maintain control over decision-making by excluding options that could induce power shifts (e.g., granting other stakeholders voting rights) from the agenda of negotiations, Gereke and Brühl (2019) highlight the unequal representation. On the international scene of political agenda-setting, there is an over-representation of NGOs from the Global North in comparison to NGOs from the Global South, leading to a disproportionate representation of different perspectives (Gereke & Brühl, 2019). Scaling this argument down to our case, unequal representation was observed in the involvement phase, mainly with administrative statements and particularly at the agreement level amongst ministries. Disproportionately weighted decisions according to who is at the table are the undesired results, i.e., some stakeholders, including those from eNGOs and administrative bodies, have expressed concerns that the process lacks balance, because economic interests are often prioritized over nature conservation. Ensuring equal parity among ministries has been suggested as a potential solution in the interviews. Similarly, hierarchies between different levels of participation can create additional power disproportions. Through this hierarchical structure, power—as the possibility for stakeholders to influence and contribute to the decision (Newig et al., 2018)—lies with ministries at the agreement level and not with the stakeholders in the involvement phase, which reinforces existing power imbalances. It has been shown that participation improves environmental governance outputs (Newig et al., 2023). Thus, in the context of MPAs, where environmental protection is the core objective, the role of participation becomes even more critical.

While the legal obligation for participation theoretically promotes a wide knowledge integration, the hierarchical structure of the participation process favours political and administrative stakeholders, particularly at the agreement level. Such a static institutional framework hinders the incorporation of more diverse knowledge types. Especially those perspectives from the involvement phase represent the broader range of knowledge types, which should be integrated further up the participation process if the latter is aimed to be a bottom-up and just process. This observation is consistent with other cases in which participation was anticipated and addressed through participatory norms, but (a) only served to establish "legitimacy" and (b) remained limited in scope and relevance (Connelly et al., 2006; Esguerra et al., 2017; Turnhout et al., 2015).

The empirical insights from our case reflect broader patterns that can also be observed across a wide range of platforms, including IPBES, Future Earth, and international climate change negotiations (Esguerra et al., 2017; Esguerra & van der Hel, 2021; Gereke & Brühl, 2019). Institutional constraints (e.g., the legally pre-defined hierarchical structure of participation), power asymmetries, limited staff to exercise participation, and limited participation (e.g., due to disinterest and non-involvement) continue to hinder the integration of diverse knowledge types into decision-making processes. This also becomes important as organizations and institutions are increasingly judged not only by their effectiveness in delivering results but also by how transparent, fair, and inclusive they are in decision-making processes (Tallberg & Zürn, 2019). Failure to embrace inclusivity may thus erode their legitimacy.

4.1. Recommendations for Improvement

Based on the findings of our study, we propose six key recommendations to enhance stakeholder participation and the integration of diverse knowledge types in MPA establishment processes.

Beyond formal instruments of public participation: implement a broader range of participation tools (besides written statements and formal hearings), such as stakeholder meetings, online surveys, multi-sector forums, post-meeting feedback, and regional panels (Buxton & Cochrane, 2015; Kannen, 2014). Additionally, introducing less formal and more interactive methods could encourage broader public involvement. Efforts should be directed towards ensuring equal representation of various stakeholder groups. Challenges, such as reconciling contradictory perspectives and integrating different knowledge types (e.g., Schwermer et al., 2021), can be mitigated by employing neutral moderators. These moderators, accepted by all stakeholders, can foster more effective collaboration and enhance concensus, ultimately improving the acceptance of management measures.

Accepted methodologies: establishing and adhering to universally accepted definitions and methodologies to establish baseline data as well as incorporating unconventional data sources (Buxton & Cochrane, 2015) could enhance collaboration and trust among stakeholders. Anticipated outcomes of the MPA process should be continuously and transparently discussed with involved and affected stakeholders and communities (Buxton & Cochrane, 2015). In the case of fisheries, involving stakeholders in data collection and/or improving communication about methodologies and findings could further enhance participation and support of, e.g., management measures (de Graaf et al., 2023).

Revised involvement phase: obtain input from stakeholders during the involvement phase before and after the publication of the draft management plan. This approach used effectively in the Australian MPA process, could lead to better integration of stakeholder knowledge and greater acceptance of the final plan (Buxton & Cochrane, 2015). Currently, the German process invites public input only after the draft is published, limiting early influence. A successful example of early stakeholder integration is the Boddenpike project (https://www.igb-berlin.de/en/project/boddenpike), where fisheries scientists and various stakeholders collaborated to better understand and manage the fishery use of pike in lagoons in Germany. As a result: a list of collaboratively developed and agreed management measures for the protection and harvesting of this species has been submitted to the responsible ministry (Ehrlich et al., 2023). Adopting similar early engagement strategies in MPA processes could lead to stronger, more inclusive management plans.

Committees for social, economic, and cultural impacts: establishing dedicated committees focused on the social, economic, and cultural impacts of MPAs, similar to the Great Barrier Reef Marine Park (Thompson et al., 2004). These committees could, e.g., aim at minimizing impacts on existing users as far as possible (Thompson et al., 2004). This is in line with literature calling for not only assessing environmental, but also potential socio-economic impacts (Goti-Aralucea, 2019) and considering the "triple bottom line" (of economy, environment, and society) in MPA planning and implementation (Rees et al., 2018). Moreover, investigating knowledge types and perceptions of various stakeholders might be a first step to overcoming issues regarding stakeholder participation and thus lead to a successful MPA (Dimech et al., 2009; Pita et al., 2011; Schwermer et. al., 2021).

Multiple protection options: offering multiple options for achieving protection goals, rather than presenting a single draft plan. Providing alternative paths to reaching the desired outcomes could encourage broader stakeholder involvement. Thinking about and testing divergent protection concepts (e.g., no-take areas, multi-use; Przedrzymirska et al., 2021) could also increase the acceptance of measures. However, appropriate monitoring protocols and a clear time frame should be defined in advance. Co-management arrangements, where stakeholders share management responsibilities, could provide an ideal framework for considering and implementing different protection options (Di Franco et al., 2020).

Scientific advisory board: appoint an advisory board with scientists of relevant disciplines (e.g., marine biology, geography, and sociology) to promote the inclusion of diverse scientific knowledge in the participation process and ensure an independent scientific assessment (e.g., Bundesanzeiger Verlag, 2021; eMSP NBSR, n.d.; Kannen, 2021; National Oceanic and Atmospheric Administration, n.d.).

5. Conclusion

Stakeholder knowledge integration ranges from providing information for research and management (Stephenson et al., 2016) to active participation of stakeholders in research and/or governance following a transdisciplinary approach (Grünhagen et al., 2022). However, integration requires more than just participation: it demands legally binding inclusion in, for example, decision-making processes (Stepanova, 2019). While legal obligations for participation may exist (as in the case of the German Baltic Sea MPAs), they do not guarantee the integration of stakeholders' knowledge which may cause conflicts such as the lack of acceptance of management measures and trust (Stepanova, 2019). Our study highlights this issue, with unequal power distribution allowing dominant stakeholders to influence decisions (Flyvbjerg, 1998). To ensure fair outcomes, balancing power through equal representation and legally mandated stakeholder involvement is crucial for successful MPAs (Busch et al., 2010; Stepanova, 2019).

In this regard, attributes of deliberative democracy become important: The theoretical framework of deliberative democracy highlights the value of equal participation and open dialogue in decision-making processes (Rosenberg, 2007). This collaborative approach is characterized by clarification, elaboration, and revision of common conceptions and values when addressing specific problems thus offering a framework to address the mentioned shortcomings (Rosenberg, 2007).

The development of management plans for the two German Baltic Sea MPAs underscores the complexities of stakeholder participation within a legally mandated, hierarchical framework. This framework, divided into

three levels—agreement, consultation, and involvement—reveals a structure where the most power resides at the agreement level, dominated by administrative stakeholders with veto rights. While this ensures that consensus is necessary for decision-making, it also limits the integration of more diverse knowledge types, particularly those from stakeholders at the involvement level.

Our findings indicate that the majority of contributions were submitted by representatives from public administration particularly at the national level, indicating that the management plans were probably strongly influenced by these perspectives and knowledge types. To enhance the integration of multiple perspectives and knowledge types, as well as to achieve a more balanced and effective management plan, the participation process could benefit from several key improvements: (a) broader and more inclusive participation tools, (b) earlier stakeholder engagement, and (c) stronger emphasis on social and economic considerations. Ensuring that all relevant stakeholders have a voice in the process, supported by legal frameworks that require their input to be genuinely considered, is essential for overcoming the current imbalances. Without this, the process risks being dominated by a narrow set of interests, potentially undermining the broader goals of conservation and sustainable use.

Future research should focus on the scientific evaluation of the management plan implementation and its efficiency not least in order to discuss and establish adaptative management concepts using various participatory tools. This also includes the introduction of no-take-areas whose monitoring and evaluation in a transdisciplinary approach could increase the acceptance of this most discussed management measure across various stakeholder groups. The sustainability transformation in the German Baltic Sea could thus be advanced using the example of MPAs.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

The data presented in this study are available on request from the corresponding author. The data are not publicly available due to restrictions, i.e., privacy and ethics.

Supplementary Material

Supplementary material for this article is available online in the format provided by the author (unedited).

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