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Boundary Spanning in the Planning Process of Marine Protected Areas

A case study on the science-policy interface and boundary spanning activities within the planning process of German Marine Protected Areas

Submitted by Karolin Fonk

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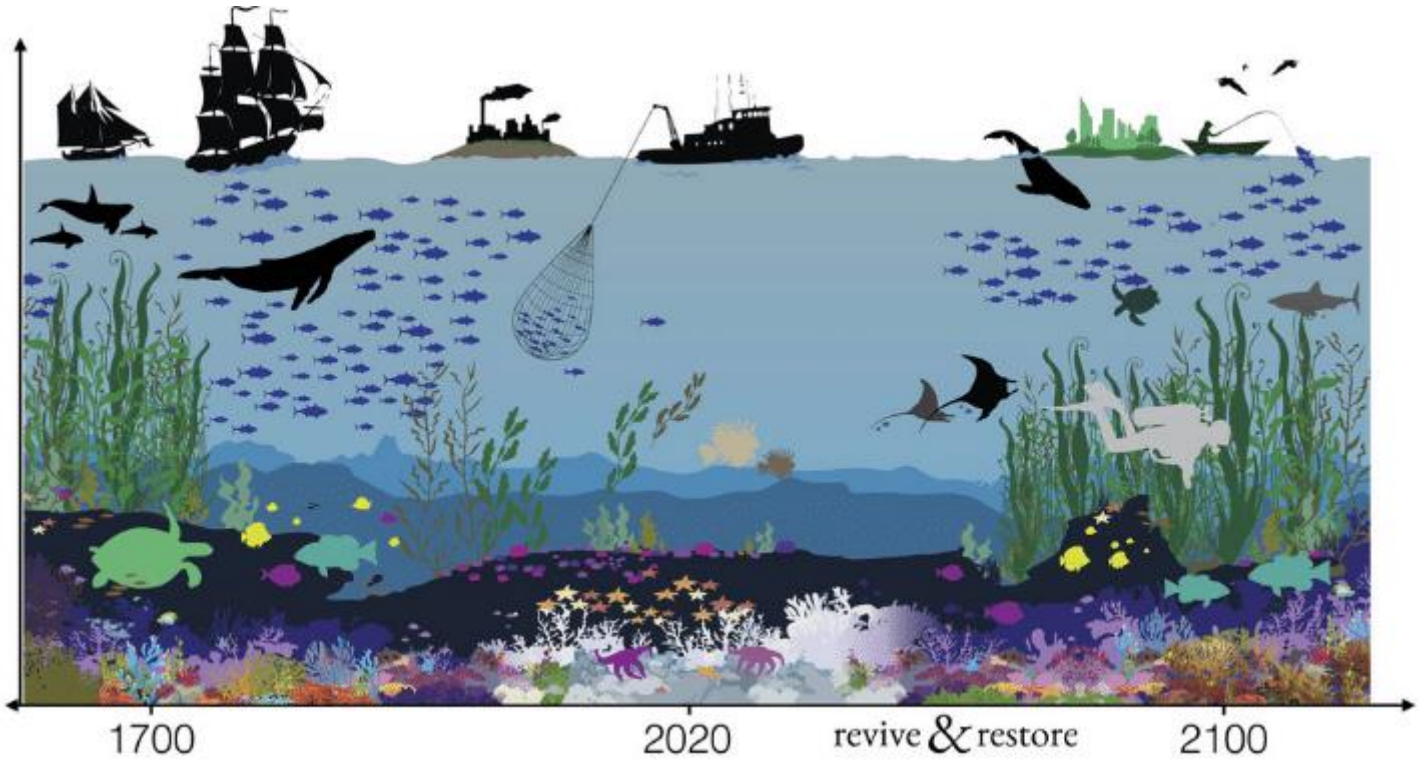

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Abstract

Within the last decades, the use of marine space and marine resources increased rapidly on a global scale. However, this development does not come without any consequences for the marine environment, which in the end, can also affect human well-being. Because of this, many international and national conventions exist, aiming at an improvement of the marine environment. One main tool for achievement are marine protected areas (MPAs) which covered roughly 7 % of the world's oceans in 2018. Unfortunately, according to literature, many of these remain ineffective as their management plans are not based on current scientific information. This thesis investigates into the science-policy interface and the role of boundary spanning approaches within a German case study. To gain research results, a qualitative document analysis and semi-structured interviews were conducted. The results show that the science-policy interface within the development process of the management plans for three marine protected areas in the German EEZ in the North Sea, is not characterized by such a strong boundary of communication and interaction. Further, different approaches of boundary spanning are already conducted. However, another problem was identified: a high number of involved stakeholders is reducing the quality of protection measures to low-impact compromises. Concluding, it can be said that German MPAs run the risk of being seen as 'paper parks'. It is recommended to set focus on the development of synergies between human activities and marine conservation practices as well as to create stronger and clear management measures for protection.

Keywords:

marine conservation – marine protected areas – boundary spanning – knowledge broker – boundary organizations – co-production – embedded adviser – marine spatial planning – barriers and enablers

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List of Abbreviations

AWI – Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research

BfN – Federal Agency for Nature Conservation

BMU – Federal Ministry for the environment, nature conservation and nuclear safety

BMJV – Federal Ministry of Justice and Consumer Protection

BO – Boundary Organization

BSA – Boundary Spanning Activities

BS – Boundary Spanning

BSH – Federal Maritime and Hydrographic Agency

CBD – Convention on Biological Diversity

EEZ – Exclusive Economic Zone

EIA – Environmental Impact Assessment

ENGO – Environmental Non-governmental Organization

IMO – International Maritime Organization (United Nations)

IOW – Institute for Baltic Sea Research

IUCN – World Conservation Union

MG – Measuring groups

MSFD – EU Marine Strategy Framework Directive

MSP – Marine Spatial Planning

MPA – Marine Protected Area

NABU – Naturschutzbund Deutschland

NGO – Non-governmental Organization

SAC - Special Areas of Conservation

SDG – Sustainable Development Goal

SPA – Special Protection Areas

UN – United Nation

UNCLOS – United Nation Convention on the Law of the Sea

1 Introduction

Within the last decades, the use of marine space and the utilization of its resources increased rapidly on a global scale (Posner et al., 2020). However, the ongoing “industrialization of the oceans”, as it is called by several researcher, does not come without any consequences; many impacts on marine ecosystems, marine species and hence on the human well-being itself are already manifested (Posner et al., 2020). Among others, the extinction of species and the destruction of important habitats. To counteract a non-environmentally friendly “industrialization” as happened on land, several regulations and conventions on different scales are existing to reduce the human impact on the marine environment. One well established convention is the *Convention on Biological Diversity (CBD)* by the United Nation (UN), aiming for "the conservation of biological diversity and the sustainable use of its components” of all types of ecosystems (UN, 1992, p. 2). The convention was followed by the *Aichi Biodiversity Targets* 2011 and the *2030 Agenda of Sustainable Development* in 2015. Both contain specific goals to improve and restore biological diversity in every type of ecosystem, including the marine environment. Just recently, early 2021, the *UN Decade of Ocean Science for Sustainable Development* started, aiming at improving and ensuring that science conducted, support the actions taken by countries to sustainably manage the ocean (UN, 2019).

The oceans do not only provide food and beautiful spaces for recreation but are also of high importance for the global climate system. Protecting them means, on small scale, to secure the life of different marine species, from the smallest organism to top predators, to conserve and stabilize whole ecosystems and their functions and, additionally, on large scale, to keep the current conditions of the earth’s climate system. Other direct benefits of a healthy ocean to humanity are found in the various ecosystem services the oceans provide, divided into the four categories: supporting, provisioning, regulating and cultural services (Hattam et al., 2015). Ecosystem services, in addition, also provide economic benefits which are relevant to federal policy making (Posner et al., 2020).

The growing marine biodiversity loss and the decline of marine resources due to human activities and climate change consequences (Santo, 2013) has pushed marine conservation as a main objective for marine managers (Angulo-Valdés and Hatcher, 2010). After different

international and national conventions such as the OSPAR Convention (of 2003 and 2010) or the Aichi Biodiversity Targets (of 2011) adapted targets to increase the amount of conservation measures, a common vision for the protection of the marine environment again has been established by the World Conservation Union (IUCN) member states. The new target for marine conservation is the designation of 30 % of the world's marine area as Marine Protected Areas (MPAs) by 2030 (Hilborn, 2018).

MPAs are seen as powerful management tools in ocean governance and marine conservation (Barreto et al., 2020; Dehens and Fanning, 2018). They are helpful to achieve ecological benefits (Christie et al., 2017), to counter human impacts, to safeguard biodiversity, and to increase the resilience of the whole ecosystem (Reker, 2015). In addition, they have several positive side effects for the economy (e.g. improving fishery management) (Bennett and Dearden, 2014).

In 2018, roughly 7 % of the world's oceans were covered with around 15.000 MPAs (Giakoumi et al., 2018) and more, especially large-scale MPAs are to come "in order to meet international protected area targets" (Santo, 2013, p. 137). However, the rapid growth of implemented MPAs is deceptive, as many MPAs remain inefficient (Christie et al., 2017; Dehens and Fanning, 2018).

2 Research framework

2.1 Problem definition and relevance

Beside the overall positive attitude towards marine protected areas (MPAs), several researchers still question the real effectiveness of them (Angulo-Valdés and Hatcher, 2010; Pendleton et al., 2018). A popular assessment of the 90's showed that only 31 % of the implemented MPAs were effective (Kelleher et al., 1995). This shows that the term MPA is often used to designate areas while there is no observable change in human pressure on the ocean (Jennings, 2009).

As the literature research shows, the problem is known for more than two decades and remains until today (Hameed et al., 2017), which stresses the urgency to improve MPAs' effectiveness now, in regard to strengthen marine conservation. In order to achieve an improvement of effectiveness, the present performance must be evaluated first. However, how can effectiveness be measured?

Marine conservation includes several challenges such as dealing with uncertainty (e.g., global warming or unforeseeable disaster events such as oil spills), limited scientific information (the ocean is still under-researched) and multiple anthropogenic uses (causing direct or long-term impacts) (Santo, 2013). Thus, combined with context specific characteristics (Dehens and Fanning, 2018) and a lack of empirical design for evaluation, measuring effectiveness in ecological terms is possible but difficult (Giakoumi et al., 2018). Consequently, there must be an alternative option for evaluation. Unfortunately, there are no common assessment criteria (Reker, 2015) or a blueprint solution (Fox et al., 2012) to provide the full effectiveness of MPAs. This is based on the different contexts an MPA can be designated in. In addition, the size of the protected area must be in relation to the desired objectives to be able to reach an achievement (Pendleton et al., 2018).

Meanwhile, scientifically based management plans are identified as an important factor for MPA success (Giakoumi et al., 2018). Their application and the control of management objectives are accepted as criteria to measure the effectiveness (Alder et al., 2002; Angulo-Valdés and Hatcher, 2010)). The establishment of management objectives and a strategy to achieve them are not yet mandatory for the planning of MPAs, however, it is highly

recommended to incorporate them by the European Environment Agency (Reker, 2015), Pendleton et al. (2018), Santo (2017) and several other researchers. The achievement of simple and clear (sub)objectives can be used to measure the progress of conservation actions and to evaluate how effective an MPA is (used) (Alder et al., 2002). Thus, an MPA is considered to be 'effective' if it accomplishes with its objectives and a 'failure' if the management is "insufficient, inappropriate or neglected" (Giakoumi et al., 2018, p. 2).

Nevertheless, a common problem of MPA management plans is that they are insufficient which is based on a missing incorporation of science (Jameson et al., 2002). While it is well known that scientific information is necessary to establish MPAs that meet the objectives of the CBD (Fox et al., 2012; van Cleve et al., 2009), i.e., are managed effectively and equitably, ecologically representative and well connected (Convention on Biological Diversity (CBD), 2010), it is hampered by a science-policy interface. As result, marine protected areas are often called 'paper parks', areas legally designated for marine protection but not achieving any conservation objectives (Jameson et al., 2002).

The critical point here is not an absence of scientific information in general but its lacking involvement in the planning and final decision process of measures. According to Mc Conney et al. (2016) there are many boundaries for policy makers and managers to use scientific information and knowledge, among others: access to information, non-awareness of relevance of science to policy questions, credibility of research and/or wrong interpretation of scientific information. These problems can be traced back to a general issue of communication between science and policy, leading to a limited/reduced distribution of scientific information to the relevant audiences (Mc Conney et al., 2016). This science-policy interface affects the planning process of MPAs (Jennings, 2009; Mc Conney et al., 2016), leading to MPAs which fail their stated aim and thus, create a delay in the achievement of conservation goals (Santo, 2013).

2.2 Research gap and research question

According to Posner et al. (2020), an improvement of the science–policy interaction is needed to increase the uptake of scientific information in decision processes and achieve a more sustainable ocean development while enhancing marine conservation measures. The concept of boundary spanning is well-known in such cases, bridging the boundaries between actors,

increasing their knowledge exchange, coordination and relationship building (van Meerkerk, 2014). In the past, marine scientists have started to use such boundary spanning activities (BSA) to improve the communication between them and policy makers (Mc Conney et al., 2016).

However, while the concept of boundary spanning gains increased attention in the sector of marine conservation in general (Cvitanovic et al., 2015), it remains a lack of research on the role of boundary spanners in the field of marine protected areas (MPAs) (Posner et al., 2020).

Therefore, the present master thesis investigates the science-policy interface, the use of boundary spanners in the planning process of MPAs, based on the development process of management plans, and possible barriers and enablers impacting their work.
This research will help to understand the science-policy interface and the role of boundary spanners within. It will create lessons learned to overcome a science-policy interface, to improve the development process of management plans for further German MPAs and to overall contribute to sustainable and science-based planning practices in marine conservation and spatial planning. The overall societal relevance is the contribution to a better ecological status of the oceans, strengthening their ecosystem services and thus, improving several life aspects for humans.

The conducted research is limited to the management plan development process of three designated MPAs in the German Exclusive Economic Zone (EEZ) of the North Sea and elaborates on the following **research question:**

How does the science-policy interface look like and what role do boundary spanning activities play in this?

Using the following **sub-questions**:

- What are the requirements for the inclusion of scientific findings in management plans?
- Is scientific information been used in the MPA management plans of the German EEZ?
- Are boundary spanning activities conducted in line with theory to create science-based management plans?
- What are barriers and enablers for boundary spanning activities?

2.3 Reading guide

In the following chapter, the theoretical background of the thesis is elaborated upon. It is divided into general information about marine protected areas (chapter **3.1**), an explanation of the contradicting frame (chapter **3.2**) of the necessity to work science based and an existing science-policy interface hindering the incorporation of science, the concept of boundary spanning (chapter **3.3**) and the conceptual model of this thesis (chapter Error! Reference s ource not found.).

Afterwards the methodology used within the present research and its limitations are described (chapter **4**).

Chapter **5** represent the data analysis. Starting with an overview of marine conservation in German offshore waters and the case study itself and followed by the research results based on a qualitative document analysis and conducted interviews.

Chapter **6, 7** and **8** are used to discuss the research findings, make concluding remarks and reflect the research as a whole.

3 Theory

3.1 Marine protected areas

Many human activities in the ocean such as the extraction of resources, introduction of indigenous species, damage and loss of habitats and pollution are creating pressures on the whole ecosystem, affecting its health and biodiversity (Reker, 2015). In addition, consequences of climate change are already present. Single MPAs and networks of MPAs are in place to counter such impacts, to safeguard biodiversity and to increase the resilience[1] of the whole ecosystem (Reker, 2015). The first global definition of MPAs was given by the World Conservation Union (IUCN) and defines MPAs as

"any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Kelleher, 1999, p. xviii).

In 2008, the definition of MPAs has been updated by the IUCN. The new version stresses the aspect of long-term nature conservation as it describes an MPA as

"a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Dudley, 2008, p. 60).

MPAs can include parts of the open sea as well as shoreland habitats (Salm et al., 2000). Both are important habitats for generating and maintaining a healthy ocean (Reker, 2015). The reason to establish an MPA in a certain area can differ, amongst others: the area is a best example of a well-functioning ecosystem, it has a great biodiversity of species, it has important cultural values, it provides certain coastal protection features and/or the possibility of fish recovery (Salm et al., 2000).

Even though the IUCN provided a categorization for MPAs, there are different management forms and names existing which cannot directly be connected to the provided categories (Trouillet and Jay, 2021). MPAs can be completely closed or allow selective uses in different

[1] Resilience: defined as "the capacity of an ecosystem to absorb disturbance without shifting to an alternative state and losing function and services" (Côté and Darling (2010).

zones (zoning) (Charles, 1998). Common names are for example: marine reserves or parks (Pomeroy et al., 2004), special areas of conservation (SAC), special protection areas (SPA) (Reker, 2015) or nature conservation MPA (NatureScot, n.d.). The only clear terminology in the context of MPAs is the 'no-take zone' which completely ban activities from specific areas. However, the nonexistence of global consistent terminology poses a problem because the main objective of the MPA is not clearly transferred in the first place (Hockey and Branch, 1997); even though there are international overall targets introducing the establishment of MPAs in order to increase conservation. This problem is based on the application of objectives on different scales (e.g., global, regional or local) and the variation from broad (e.g. reduction of biodiversity decline) to more specific measures (e.g. protection of a specific species to maintain their abundance) (Jennings, 2009). Hence, MPAs are often established for different purposes (goals) (Jentoft et al., 2011).

The two main purposes are protection and resource management, being applied solo or in combination (Jentoft et al., 2011). The first includes the preservation of ecosystem components and certain habitats as well as the restoring of earlier conditions. The latter focuses on the reduction of human impacts while exercising activities and creating structures for sustainable use (Jennings, 2009; Salm et al., 2000). Nevertheless, even if the focus is not on protection, the development of sustainable use structures still provides advantages for the specific ecosystem.

Based on the different (societal or political) desired status of the marine environment, management objectives can be defined clearly (Jennings, 2009) to address the complex pressures to marine ecosystems (Reker, 2015). As a result, in recent decades MPAs have evolved into powerful management tools (Dehens and Fanning, 2018) to control human pressures and their spatial distribution, improve fisheries management, and achieve specific conservation objectives (Jennings, 2009). According to Reker (2015), no other management tool has the same potential "to deliver this sort of biodiversity 'vault' from which we might be able to restore ecosystem structure and functions" (p. 9).

However, MPAs also have some downsides. First, even though MPAs have strict (legal) boundaries, the crossing point cannot be controlled due to the fluid and interactive (three-dimensional) nature of the ocean (Santo, 2013); currents do not stop at a theoretical boundary. Therefore, MPAs cannot be used to control diffuse impacts such as eutrophication

or chemical pollution (Jennings, 2009). Second, in contradiction to the ecological benefits, economic benefits are rarely visible directly but rather on the long term as they are indirect in nature. The indirect economic benefits often lead to protests against MPAs from economic actors. A highly discussed issue is the displacement of fishing activities (Jennings, 2009). The prohibition of fishing in a certain area might be followed by several problems, juristically, economically, ecologically (in alternative fishing grounds) and privately. But not only fisher(wo)men are affected by restrictions due to MPAs, also several other stakeholders such as the shipping or resource extraction sector (e.g., oil, gas, sand).

3.1.1 Management plans

In general conservation, the use of management plans has been a key element for success for ages (Pullin and Knight, 2003). Therefore it is not surprising that management plans also for MPAs are "of critical importance for achieving desirable environmental outcomes, for ensuring local support, and for the long-term viability of livelihoods" (Bennett and Dearden, 2014, p. 102). This is due to the fact that management plans help to visualize the main objectives of the MPA and provide steps to achieve them as they shall include: 1) the conservation objectives, 2) identification of threats and pressures to the ecosystem, 3) presentation of the site's spatial information (distribution of the protected features) and 4) list of measures and actions to address the pressures (OSPAR Commission, 2019).

Accordingly, points like the reduction of extraction or the prohibition of destructive fishing gear can be listed (Bennett and Dearden, 2014) to strengthen the conservation targets of the MPA. Further, management plans can be used to set the zoning of the marine area to manage multiple uses (e.g. 'no-take' zones or restricted fishing zones), which is also recommended in the IUCN best practice guidelines on MPAs (Dudley, 2008). Because the marine environment is fluid and biological productivity changes with seasons, it often occurs that zoning and hence, different management approaches, varies with different depths, parts of the MPA or are related to certain times of the year (Dudley, 2008). Consequently, identifying the different zones should be based on recent scientific information (Dudley, 2008).

3.1.2 Contextual setting: Marine protected areas in European ocean governance

Marine protected areas need to be embedded into the broader spatial planning and ocean governance of the region (van Cleve et al., 2009) as the management and protection of natural resources is mainly about reacting to "broader changes in the human and natural environment" (Bennett and Dearden, 2014, p. 102). The demand for ocean space is continuously increasing due to multiple activities (i.e., fishing, shipping, resource extraction, cables and offshore energy) which are often not compatible and rather create adverse effects on each other (user-user conflicts) (Douvere, 2008) than enable a sustainable development. The competition of ocean space further intensifies due to today's biggest concern; conflicts between human activities and marine conservation (user-environment conflict) (Douvere, 2008). In the ongoing debate about ocean space, due to the requirement of the European Union to develop marine spatial plans (Directive 2014/89/EU), it is necessary to claim space for nature conservation and to implement effective marine protected areas soon (Posner et al., 2020) in order to reduce biodiversity loss and improve the ecological status of the oceans.

The marine spatial planning (MSP) approach is "a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives" (UNESCO, n.d.) and became widely distributed in Europe in the past 20 years (Douvere, 2008). In line with the ecosystem-based management approach and the adoption of an EU law (DIRECTIVE 2014/89/EU), requiring the preparation of marine spatial plans for each European exclusive economic zone (EEZ), the designation of MPAs is conceptually and legally embedded.

Originally, MSP was seen to support marine conservation, however the recent development rather stives towards the multi-use planning of marine space and to enhance 'blue growth' (Trouillet and Jay, 2021). As result, MPAs and the MSP approach do not strive for the same result in practice anymore, however there is a potential for co-evolution or convergence to further enhance the development of both (Trouillet and Jay, 2021).

A common characteristic of both approaches is the needed strong interaction and collaboration of all relevant stakeholders in the planning process to find a balance between human uses and conservation objectives. The wide range of stakeholders includes representatives of (inter-)national regulations (i.e., international maritime organization) and

national governments, specific sectors (fishing, shipping, resource extraction, protection agencies, telecommunication, recreation, etc.), local actors, conservation agencies and non-governmental organizations (NGOs). Furthermore, the interests of adjacent states have to be included in marine spatial planning and locating MPAs as neighboring activities might reduce the effectiveness of MPAs.

Consequently, the planning process of marine protected areas includes a high potential for conflicts and both, benefits and consequences of establishing an MPA, must be considered in detail (Jennings, 2009).

3.2 A contradicting frame

The need to move towards science-based approaches is hindered by an interface between scientists and policy makers, resulting in a contradicting frame. The following chapters provide a more detailed elaboration.

3.2.1 Ongoing paradigm shift to science-based approaches

In terms of achieving goals, especially in a rapidly changing world, it is more than necessary to include science as a basis for decision making and to know what might work and what might not (Pullin and Knight, 2003). However, although the amount of science produced has strongly increased within the 20th century, the uptake of science in decision making processes was still lacking in many fields in the beginning of the last decade (Pullin and Knight, 2003). Meanwhile, a paradigm shift, a change of "views of reality that encapsulate current knowledge of a subject" (Allmendinger, 2017, p. 10) is going on. Such a change is introduced when problems that emerge "cannot be explained by the paradigm and cannot be resolved until a new paradigm emerges and the old one is abandoned" (Allmendinger, 2017, p. 10). Or with other words, if the status quo is seen as inadequate (Goodrick, 2002).

The paradigm shift towards using science instead of following (mostly) the traditional way happened already in different time periods for different fields. For example, in the field of health care, the shift from humourism to science-based medicine happened in the latter half

of the 19th century (Mount, 2013) and in the field of general management education in the 1960s (Goodrick, 2002).

The start of a paradigm shift in the realm of environmental policy (Santo, 2017) and in general conservation practices happened in the late 90s / beginning on 2000 (Pullin and Knight, 2003). According to Santo (2017), this shift was driven by the fear that "decisions not based on solid science will be skewed by politics rather than facts" (p. 42).

The latter argument is based on the point that scientific information can be used as basis for negotiation and decision making, not easily being attacked. In general, the incorporation of scientific information provides advantages for the private sake as well as for economic values and is useful to improve the communication of findings to public (Kirchhoff et al., 2013). Overall, according to Kirchhoff et al. (2013), science is expected to be useful to solve problems and meet public value functions.

3.2.1.1 Need for science incorporation in MPA planning and their management plans

According to Agardy et al. (2003), many MPAs are implemented without a comprehensive understanding and incorporation of science. Especially due the 'legal push' by international conservation targets and the adaption of laws (cf. chapter **1** and **3.1.2**), functioning as driver for MPA designations, concerns are growing that several governments designate MPAs in a rapid and not scientifically based way, focusing more on the political result than on the ecological importance (Santo, 2013). A general increase in the designation of large MPAs can be observed after the failed Convention on Biological Diversity (CBD) deadline in 2012 (Santo, 2013). This development creates a higher percent coverage of MPAs of the ocean (contributing to achieve the conservation targets), despite acknowledging their effectiveness being questioned.

However, complex and uncertain conditions as given in the marine context call for an appropriate use of science in decision making, especially for marine conservation measures like MPAs (Grorud-Colvert et al., 2010). Already in 1998, Mace et al. stated, that conservation management is a continuous process which needs to adapt to challenges and new conditions.

To inform conservation practice, a framework "that supports decision-making by delivering information in an integrated and accessible way" is needed (Pullin and Knight, 2003, p. 89). Hence, a standardized methodology is vital (Pullin and Knight, 2003) to embed the required early (Gleason et al., 2010; Ruiz-Frau et al., 2015) and ongoing (Mc Conney et al., 2016; Santo, 2017) provision of policy-relevant science along the designation cycle of marine protected areas. Especially the integration of primary science is seen as critical for the understanding of probability and potential effects of natural and anthropogenic disturbances as well as to evolve strategies to protect ecosystems and their services (Cvitanovic et al., 2014; Sutherland et al., 2004). More advantages are given if science is incorporated into MPA designation and management:

Firstly, science is used to create an overview of the representative habitats, ecosystem structures and oceanographic conditions as well as to decide on the needed size of the MPA and the protection level (Fox et al., 2012). Secondly, science-based maps can be used as basis for dialogues with stakeholders (Ruiz-Frau et al., 2015); as starting point for negotiations and to select as well as prioritize areas and thus, guide the design process of MPAs (Jennings, 2009). They are also helpful to determine the basis for appropriate resource use rights and possible conflict resolution mechanisms as well as enable the execution of monitoring and enforcement systems (Fox et al., 2012). Thirdly, planning tools, scientific guidelines and spatial data are helpful to refine alternative proposals and compare the tradeoffs among them (Gleason et al., 2010). This ensures rather proactive than reactive management actions (Hockings et al., 2004). Fourthly, science is needed to assess if management objectives are measurable and achievable (Jennings, 2009). And finally, scientifically assessing and evaluating the development of a MPA provides a foundation for a more effective marine conservation management (Cook et al., 2013; Fox et al., 2012; Sutherland et al., 2004).

The latter point refers to the use of management plans. As already mentioned shortly in chapter **3.1.1,** these need to be science-based as they are only sufficient if they are "strongly guided by and influenced by […] science guidelines, best available data and input from scientists" (Gleason et al., 2010, p. 65). In the past, such plans have been rather experience-based, attempting to keep traditional management practices (Pullin and Knight, 2003) but in strong collaboration with scientific experts, a stepwise and detailed plan enables the manager to regularly control the development and, if necessary, to adapt the plan (Angulo-Valdés and

Hatcher, 2010). A feedback cycle with active exchange of scientific information, fed by continuous assessments and gap analysis, can provide recommendations for further action (van Cleve et al., 2009) and support the long term viability of MPAs (Bennett and Dearden, 2014). **Figure 1** shows how science-based management plans can be developed.

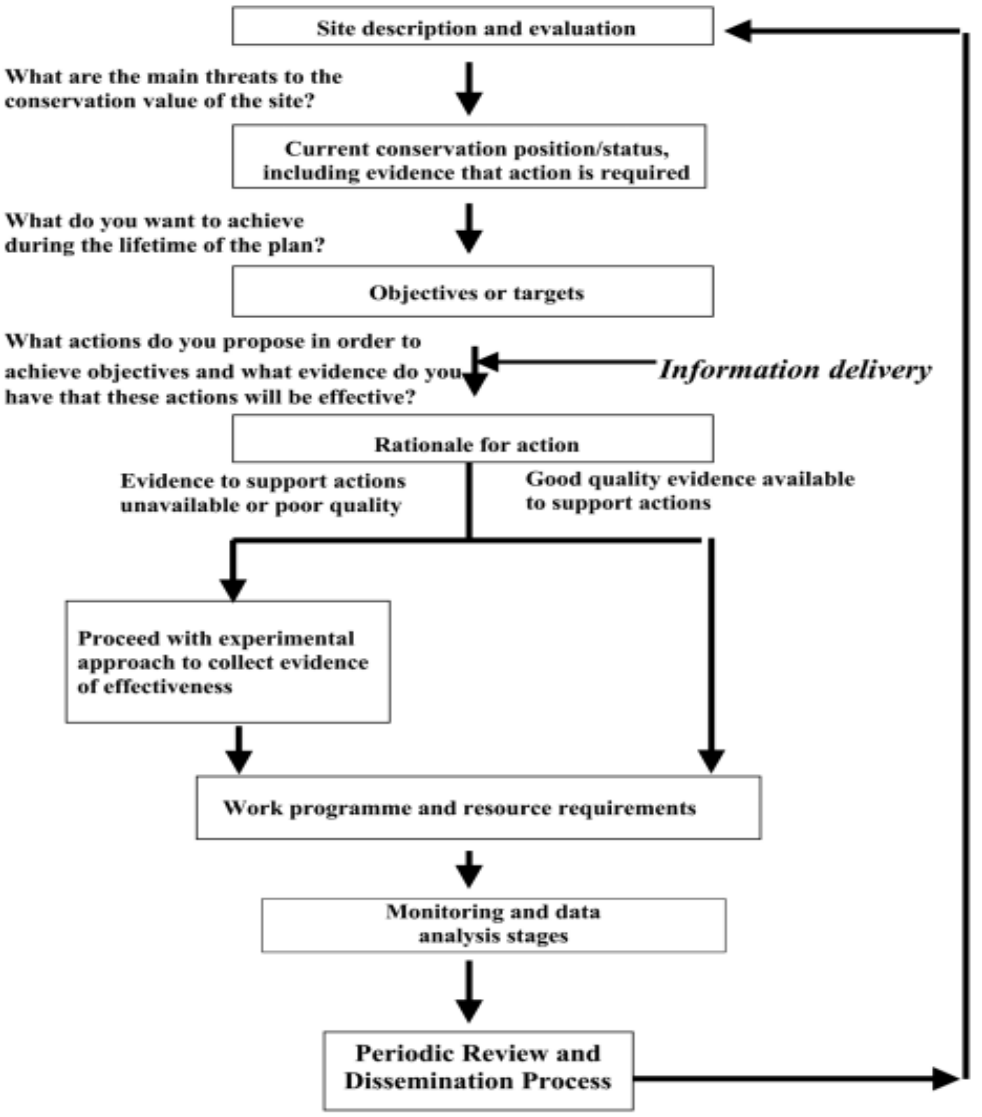

Figure 1: Flow chart of possible steps for the development of a science-based management plan (Pullin and Knight, 2003)

Obviously, the incorporation of science in the planning process of MPA and in the development of management plans has several advantages. But beside this, what downsides do exist if MPA designations and their management measures are not scientifically based?

First, without research and scientific information no ecosystem structures, key species and habitats can be identified. Hence, no evaluation of the present situation of the marine area can be done. Secondly, without an overview of the present conditions, no localization of

productive parts of the marine area is possible. An MPA in an ecological non-productive area does not provide advantages for the marine ecosystem as the protection of a productive area would do. Therefore, it is necessary to know where productive parts of the ecosystem lay to decide on location and size of the MPA (Wolff, 2015). Thirdly, not using such scientific information in management plans makes the MPA ineffective and an achievement of a certain status of conservation impossible as key species and habitats can then only be "randomly" protected, and no specific treatments are developed. Fourthly, without scientific information being used, MPA designations are only politically motivated and end in ineffective decisions (Santo, 2017). In addition, not only natural science but also social science should be included as challenges associated with the development of MPAs and their management plans are of interdisciplinary nature (Fox et al., 2012). This means that research results for example about connected human dimensions, value connection and stakeholder interaction should be included to avoid mistrust and legitimacy problems (Christie et al., 2017; Dietz, 2013). This is also strengthened by Cvitanovic et al. (2015) who state that the use of scientific information is considered to increase the success of policy decisions.

Overall, the uptake of science and a frequent communication between policy makers, scientist and stakeholders in the whole planning process fosters the long-term effectiveness of an MPA (Fox et al., 2012; Santo, 2017) and provides the best starting point to improve ecosystem health while not science-based MPAs miss the opportunity for improvement. Several cases already showed advantages and improved efficiency in the general planning process of MPAs due to the incorporation of science (Gleason et al., 2010; Zupan et al., 2018).

Even though there is no blueprint solution for effective MPAs, research of the last decades made clear that social and ecological factors determining the effectiveness are context dependent (Fox et al., 2012). Hence, the wide variation of factors possibly impacting an MPA's effectiveness further strengthens the need for compilation of local scientific information (Santo, 2017) before effective management plans can be developed.

3.2.2 The challenge: A science-policy interface

As the previous chapter showed, a general incorporation of science in decision making is of great importance. However, while policy makers decide on regulations and measures which influence future developments, they face permanent tensions between knowledge

production and its application (Nursey-Bray et al., 2014). The tensions are a result of a science-policy interface, or with other words a 'boundary', which separates scientific research and policy outcomes/management decisions from another (Jasanoff, 1987; Stojanovic et al., 2009). The foundation of this boundary lays within general incompatibilities of organizational structure, culture or functions (Nursey-Bray et al., 2014) and exist across nations and multiple levels (Hastings, 2011). Boundaries can be subjective, objective, real, imagined or socially constructed (Buick et al., 2019).

According to Buick et al. (2019), different types of boundaries can be combined and hence, a science-policy interface can firstly, be connected to a sectoral and/or organizational boundary including different structures, norms and values of the organizations involved and secondly, to a knowledge boundary based on different educational (background) disciplines.

In addition to the differences of organizational cultures, each counterpart's behavior is influenced by external aspects. For scientists, their willingness or perception of necessity to help policy makers with scientific information and advice may vary (Rudd, 2015). On the other side, policy makers' decisions are often affected by external (sectoral) pressures and interests or limited by their own policy agenda (Gleason et al., 2010). This may lead to intellectual boundaries created by scientists and policy makers themselves, protecting their "claims of authority and legitimacy" (Hastings, 2011, p. 318).

Furthermore, there is an increasing distrust against scientists (Mc Conney et al., 2016) and a general contestation of the science "to create a visage of scientific uncertainty" by policy makers (Nursey-Bray et al., 2014, p. 108). As a result, people who decide which science is 'effective' (Jasanoff, 1987) and policy makers themselves, often act as gatekeepers, restricting or excluding scientists and scientific information from decision making processes (Nursey-Bray et al., 2014). However, on the other hand, pressure put on scientists to gain new knowledge is increasing as policy makers in general strive for qualified studies backed up with publications and citations for policy actions (Nursey-Bray et al., 2014) as already mentioned in chapter **3.2.1.1**. This desire is based on the legitimacy for the final decision which depends on plausible scientific reasons for a proposed measure or action (Jasanoff, 1987).

The tensions elaborated upon create a boundary of communication between the two counterparts, limiting the quality and level of interaction between them. According to Mc Conney et al. (2016) this is seen as the main problem in the science-policy interface. It further

influences the coordination of research conducted and research needed for policy making; scientists alone do not have the resources and expertise for the identification of policy relevant research topics (Bednarek et al., 2016). As a result, there remains a gap between the reason science is developed for and its inclusion in management and policy frameworks (Nursey-Bray et al., 2014; Weichselgartner and Kasperson, 2010). Consequently, research is repeatedly conducted without consideration of policy needs while policy makers base their decisions on political premises (Diedrich et al., 2010). Tensions due to the mismanagement of research and its political necessity can further increase due to the changing political discourse. New designated policy maker or political parties may have a different strategy planned. Thereby, new obtained knowledge can fall in oblivion or be useless and increase the demand on existing scientific information (Rice and Garcia, 2011).

Another problem which often occurs within the science-policy interface is the inaccessibility of science for policy makers (Cvitanovic et al., 2014). The traditional line of scientific research starts with the creation of a research agenda and ends with a presentation of the results to potential users (usually colleagues/scientists for further research) via publication in a journal (Hastings, 2011). Consequently, the language used is often not accessible for non-scientists and influences the way how science is understood and used in decision making processes (Nursey-Bray et al., 2014). While scientific results are then disseminated through the community of practice, each discourse transposes the results into a different form and interpretation since knowledge is socially constructed (Nursey-Bray et al., 2014). On top, actors use boundary-defining language to distinguish even more between science and policy, to be able to use the own perception, related to their interests, for the interpretation of scientific information (Jasanoff, 1987). Hence, policy makers and participating representatives can interpret and use policy relevant science in the way they want.

This development limits the potential for application of science in policy decisions (Nursey-Bray et al., 2014), creates a time delay in exchanging scientific information (Cvitanovic et al., 2014) and influences its overall legitimacy (Gilson and Di McIntyre, 2008) while policy makers need scientific information from different organizations in time and the most accurately translated (Tushman and Scanlan, 1981).

3.2.2.1 The science-policy interface in ocean governance and ocean conservation

In relation to ocean governance, the science-policy interface produces a barrier for coordination, cooperation and integration of the various organizations and agencies (Prasertcharoensuk and Shott, 2010), leading to "at best, inefficient and incoherent, and, at worst, conflicting and counterproductive implementation at the local level" of marine/maritime activities and conservation goals (Bennett and Dearden, 2014, p. 100). Therefore, the science-policy interface in ocean governance is as important as in any other area of natural resource governance but may even be more challenging due to the transboundary nature of the oceans (Mc Conney et al., 2016). Especially the latter stresses the importance of a connection between science and policy to provide a basis for sustainable ocean development (Mc Conney et al., 2016). Many governments already identify the important role of scientific research as a source for evidence based marine planning, to better understand human pressures and to predict consequences of management actions (Jennings, 2009).

Nevertheless, tensions in the science-policy interface as just discussed in the previous chapter, exist in the marine context as well. Especially leading to a problem of communication, inaccessibility of scientific information and the lacking perception of scientific information needed are present (Mc Conney et al., 2016). In addition to the general problems, policy makers need different formats (type and frequency) of science for meetings with various relevant actors (Mc Conney et al., 2016), as ocean governance and marine conservation needs to be integrative, inclusive and collaborative to go in hand with the overarching MSP approach (Bennett et al., 2016).

Furthermore, it is striking that policy maker at the international level value the importance of scientific findings more than regional policy maker (Mc Conney et al., 2016). This is also mirrored in the comparable high experience of science application in policy making by international policy maker compared to regional policy makers, and in a better quality of regional marine science presented at international meetings than in regional debates (Mc Conney et al., 2016). Consequently, there is a difference between the marine science-policy interface on international and regional level.

Following, complex settings and various tensions exist in the marine science-policy interface, hindering the establishment of an "in-depth understanding of ecosystem structures, mechanism and processes" (Haase et al., 2016, p. 1) for policy makers. As a result, many MPAs are implemented without a comprehensive understanding and incorporation of conservation science due to the science-policy interface (Agardy et al., 2003). Choquet et al. (2018) even describe the marine science-policy interface as a prism, making a feedback loop impossible. Thus, a solving of the longstanding tensions between scientists and policy makers is needed to improve marine conservation measures (Cook et al., 2013). This is further strengthened by Santo (2017) who states, "effective science-based policy-making relies on information that is credible, relevant, timely, and accessible to policy makers and affected stakeholders" (p.45).

The contradiction between the need for science-based decision making and the fact that the science-policy interface hinders the development is difficult to solve. However, there are various approaches to overcome the boundary of the science-policy interface. In this thesis, the focus is set on the concept of boundary spanning, which is explained in more detail in the next chapter.

3.3 Boundary Spanning

As discussed in the previous chapter successful MPAs require the continuous incorporation of science. This is based on the interdisciplinary nature of conservation practice which requires both, understanding of different disciplines and the collaboration between them (Bennett et al., 2016). Even if negotiations across the different disciplines and within the science-policy interface can be challenging, it is necessary to work across such boundaries (Buick et al., 2019). Especially in dynamic and heterogeneous environments like the marine environment and in the field of marine conservation issues, which are shaped by high level interdependence and uncertainty (Buick et al., 2019). Seeing uncertainty as information, Bradshaw and Borchers (2000) proposed to overcome the science-policy boundary. By including scientific uncertainty in the planning process "as information for hypothesis building, experimentation, and decision making", scientific information is best represented and increase the flexibility of science-based policy (Bradshaw and Borchers, 2000, p. 7). Their idea is visualized in **Figure 2**.

However, overcoming the boundaries of the science-policy interface includes several different aspects; it is necessary to improve communication, coordination, cooperation and integration (Gustavsson, 2015). The result then allows to find alternative solutions; balancing efficiency, effectiveness and feasibility (Bennett et al., 2016). Further, a short-term collaboration for the planning process can be developed to long-term relationships, social networks or powerful partnerships (Posner et al., 2020) which lead to better coordination of policy-relevant research conduction and its application in decision making (Posner et al., 2020).

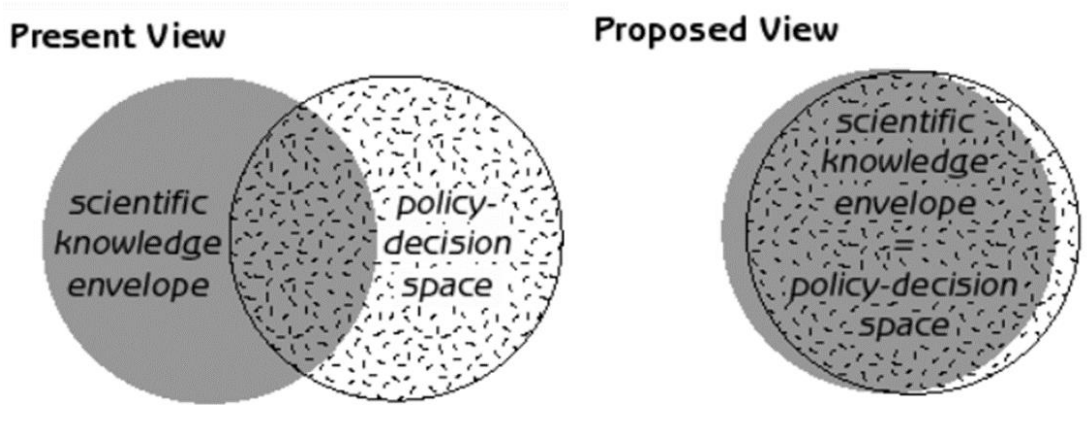

Figure 2: Closing the science-policy interface proposed by Bradshaw and Borchers (2000)

Followed by a higher potential of a sustainable development of the oceans and more effective marine protected areas (Cvitanovic et al., 2015). Consequently, there is an urgent need to span the boundaries of the marine science-policy interface (Cvitanovic et al., 2015). And as Mc Conney et al. (2016) state: "taking no action […] is not a viable option" (p. 14).

To do so, different perspectives on improving the science-policy interface exist. While some researchers suggest that changes on policy making side such as the limitation of external factors influencing the decision making process (e.g. lobbyism, agenda setting) is needed (Mc Conney et al., 2016), others stress the importance of scientists being better communicators (Bednarek et al., 2016). Following the idea of Bradshaw and Borchers (2000), different approaches have been developed in the past to overcome the (marine) science-policy interface (see Error! Reference source not found.) (Cvitanovic et al., 2015).

The four approaches presented can be seen as different types of boundary spanning activities (BSA) which can be executed by individuals, groups or whole organizations (Cvitanovic et al., 2015) and aim to improve interorganizational relationships, coordination and the exchange of

information between them (van Meerkerk, 2014). Hence, BSAs can create an arena for bilateral commitment (Wenger, 1998). The tasks being carried out can vary according to the nature of the specific boundary and can involve both, formal and informal work (Buick et al., 2019). However, two main functions are the processing/translation of information and their external representations (Aldrich and Herker, 1977). For this it is important that BSAs are done by individuals or groups who have a comprehensive understanding of the schemes and languages used on both sides to be able to select "relevant information on one side and disseminate it on the other" (Tushman and Scanlan, 1981, p. 291–292). In addition, Buick et al. (2019) associates the role of entrepreneurship with boundary spanners, developing new solutions for complex problems.

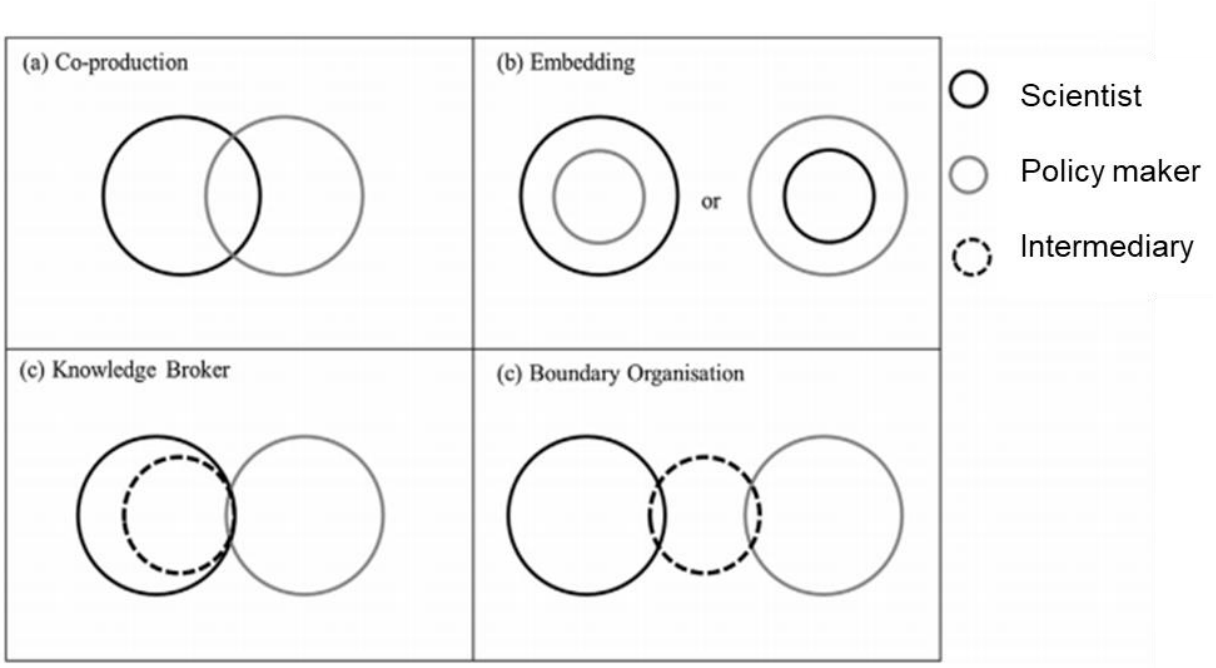

Figure 3: Four approaches to improve the science-policy interface (Cvitanovic et al., 2015)

In the first approach, knowledge co-production (a), the main aim is an active collaboration between scientists and policy makers which enables the development of a better understanding of the research content (Cvitanovic et al., 2015). Due to the ongoing communication and exchange about planned research and policy needs, valuable research can be conducted. Several examples already exist in the marine context and provide evidence of the increased awareness among scientists of the importance to include policy makers in research settings (Cvitanovic et al., 2015).

The second approach, embedding (b), contains a continues participation of scientists in the policy organization (or the other way around). Due to this, the distribution of information and

knowledge gets faster which increases the possibility to close knowledge gaps on both sides (Cook et al., 2013). Examples are the National Oceanic and Atmospheric Administration (NOAA) in the US or the Western Australian Department of Parks and Wildlife in Australia (Simpson, 2007).

The third approach, a knowledge broker (c), provides the opportunity to include an external person in institutions or research teams. Such a person then develops or improves the relationship between science producer and users due to acting as intermediary and translating facts into a common language (Michaels, 2009). Due to this, the knowledge broker enhances the knowledge exchange between them (Meyer, 2010). The exact function of knowledge brokers can differ according to the contextual setting (Cvitanovic et al., 2015) but if implemented well, it is assumed that they can remove the barrier, create change in the organizations and emphasize the value of science for policy making (Dobbins et al., 2009).

The last approach, boundary organizations (BO) (d), is seen as a novel approach to overcome the science-policy interface (Cook et al., 2013). The term used describes an environmental organization which spans the boundary between science and practice (Hastings, 2011). BOs are not embedded in another organization and work independently (Guston, 2001). Therefore, they can represent both sides (scientists and policy makers) effectively and hence, have a higher credibility than other approaches (Guston, 2001). With help of formal and informal processes on different scales, boundary organizations can develop and use linkages which connect scientists and policy makers (Hastings, 2011). Their balanced participation in the decision-making structure (Guston, 2001) and the creation of an arena for communication and exchange (Hastings, 2011) often lead to the development of standardized packages and boundary objects (Guston, 2001). Boundary organizations also draw stability through their characteristic to be “accountable and responsive to opposing, external authorities” (Guston, 2001, p. 402). The concept of BOs is not new and there is evidence of success in environmental assets (Crona and Parker, 2012).

However, boundary spanning activities itself can of course be influenced; they can be limited if certain barriers exist or be supported via enabling factors. According to O’Flynn (2011), it is also possible that factors are barrier and enabler simultaneously. Exemplary factors are formal structures, leadership and commonality/complexity (O'Flynn, 2011). To understand how the concept works and which outcomes are possible within the marine science policy interface,

this study investigates into possible barriers and enablers of boundary spanning in the planning process of MPAs based on the development process of their management plans.

3.4 Conceptual Model

A conceptual model is a visualization of the conceptual elements, research components and their interaction (Parush, 2015). Therefore, it is the foundation of the present thesis and can be used to enhance the understanding of the research topic.

The conceptual model of this research is based on the theories discussed in chapter **3.2**; the necessity of science-based approaches and the science-policy interface. The concept of boundary spanning (cf. chapter **3.3**) is seen as solution for the science-policy interface and hence as approach to deal with the contradicting frame.

The model (shown in Error! Reference source not found.) is used to investigate into boundary s panning activities within MPA planning, more particularly in the development of MPA management plans, helping to understand what role boundary spanners play and how these are affected by barriers and enablers. Within this model the science-policy interface is the dependent variable and barriers and enablers of boundary spanning activities the independent variable.

The hypothesis of this research is, that barriers and enablers for boundary spanning activities in line with theory, exist and influence the incorporation of scientific information in MPA management plans.

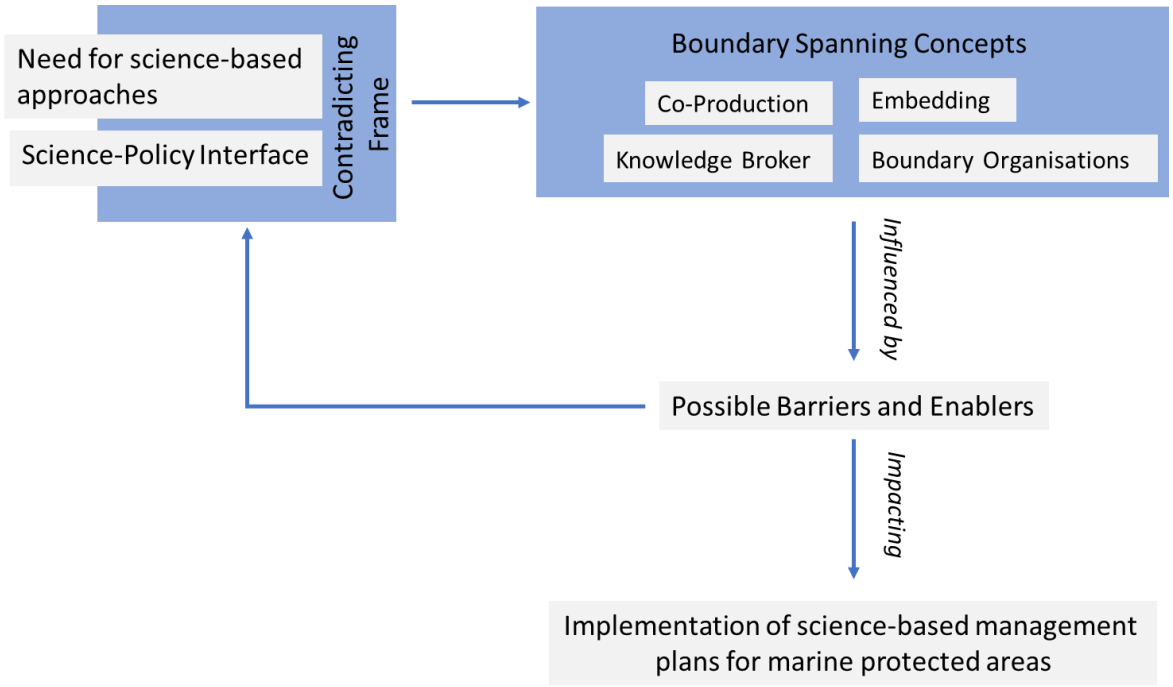

Figure 4: Conceptual Model (created by Author, 2021)

4 Methodology

After the theoretical background of this thesis has been outlined in the previous chapter, the following elaborates on the methods conducted to answer the research questions of the study.

4.1 Research design

The research design of this study adopts a *qualitative research* approach to understand the marine science-policy interface in the planning process of marine protected areas (based on the development process of the management plans), the work of boundary spanners and to identify possible barriers and enablers of boundary spanning activities within this field.

Simply described, the difference between qualitative and quantitative research is deemed by the type of data. While quantitative research focuses on descriptive details such as the who, what and where questions, which are often conducted by numbers, a qualitative approach focuses on the why questions, words and the underlying intensions (Ewing and Park, 2020; Given, 2016). Qualitative research aims to "delve deeply into people's experiences, perceptions, behaviors and beliefs", "explores the process at play" and hence, "provides a window into understanding why people" act and think how they do (Given, 2016, p. 2). The latter is important in this case, as boundary spanning activities are possibly affected by (external) barriers and enablers. A common belief of qualitative research is "that it provides insights which are difficult to produce with quantitative measures" (Azungah, 2018, p. 384). In line with this, a qualitative study is an appropriate approach to issues where either much or little is known beforehand (Strauss and Corbin, 1990). As elaborated upon in the theoretical background chapter, the latter is the case in relation to boundary spanning activities in the planning process of MPAs. Therefore, a quantitative study is chosen as not appropriate for the complex phenomenon under study.

However, as qualitative studies often use multiple methods to gain information (Yin, 2014), also a few quantitative methods can be found within this thesis. This is due to the need to understand and present the current situation of the science-policy interface within the planning process of MPAs first, before factors influencing boundary spanning activities can be

found. A mixed study like this can be “very powerful” as quantitative and qualitative data “complement each other” and lead to broad as well as deep data (Given, 2016, p. 45).

Another aspect of the undertaken study needs to be elaborated upon; the inclusion of both, the deductive and the inductive approach. As inductive research designs are related to qualitative approaches and deductive research designs to quantitative approaches, both types need to be considered within this study. A visualization of the difference is provided in **Figure 5**. In general, it can be said that a deductive approach is needed to create an organizing framework of the study, using certain key concepts (cf. chapter **3**) (Azungah, 2018). This starting point is then be used for an appropriate structure of the study (Azungah, 2018). A following more inductive approach allows to set a research question for the phenomenon of interest (Given, 2016) and to be able to go through the data carefully and assign codes for paragraphs and phrases of texts and interview transcripts (Azungah, 2018). As result, important themes derived from data can be identified (Azungah, 2018). The use of a combination of both approaches is commonly accepted beyond authors to “achieve rich interpretive data analysis” (Azungah, 2018, p. 394). Parkhe (1993) even states that there is “an essential continuity and inseparability” between both approaches (p. 237).

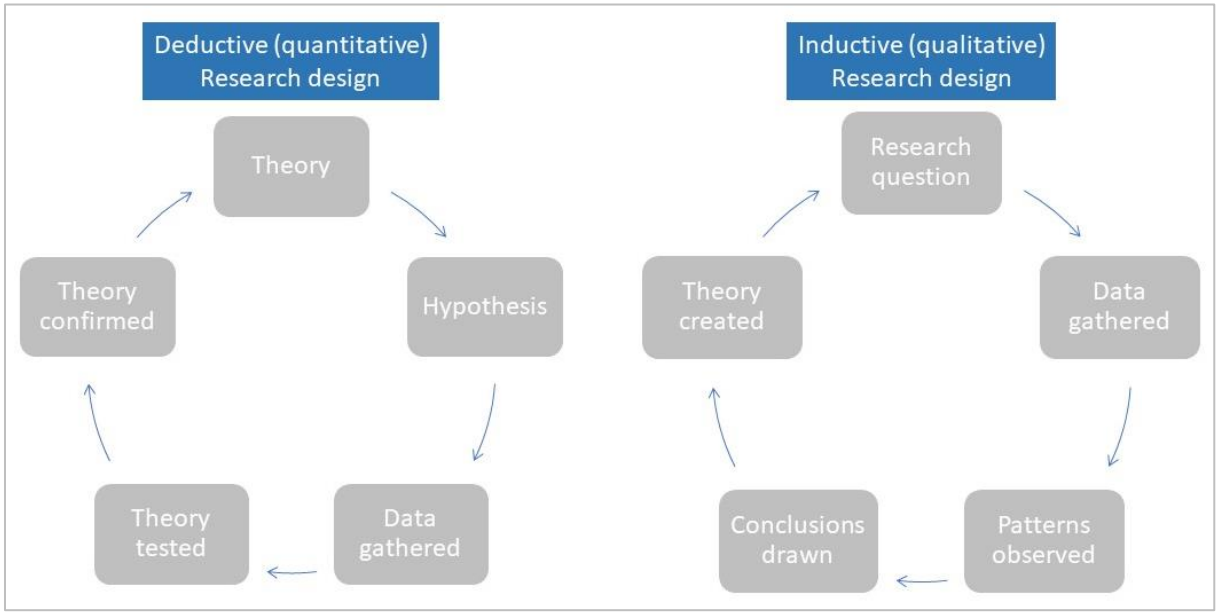

Figure 5: Overview deductive and inductive research designs based on Given (2016)

4.2 Case study research

The main research approach of this study is conducting a case study. As a common tool in several research fields (i.e., social work, education, political science), case study research helps to understand complex social phenomena (Yin, 2014). A common and comprehensive definition is provided by Yin (2014, p. 18):

"A case study is an empirical inquiry that investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when the boundaries between phenomenon and context may not be clearly evident."

Thus, a case study is done if the assumptions exist that a real-world case and its understanding is important for specific contextual conditions. The understanding of all variables und their interacting relationship (Dooley, 2002) lead to an extensive and in-depth description of a social phenomenon, retaining a holistic perspective (Yin, 2014). It further can strengthen what is known due to previous research or contest the findings (Dooley, 2002). Moreover, it is possible to include both quantitative and qualitative data (Dooley, 2002), which allows for both testing and developing new theories (Yin, 1994), thus utilizing the desirable combination of deductive and inductive approaches.

Within this thesis, case study research is chosen as the contextual conditions, provided by the marine science-policy interface within the development process of management plans and the social phenomenon of boundary spanning and its possible barriers and enablers, call for an in-depth understanding. For this investigation, a single case study is especially applicable as the designation of MPAs is steadily increasing to conserve marine nature. Because Germany is seen as front runner in designating MPAs, insights are valuable.

The present case, the development process of management plans for MPAs in Germany, which contains the contradiction of the need for science-based planning and a science-policy interface, presents a common problem within (marine) nature conservation. Lessons learned about BSA may be identified in the case study and can, as discussed by Flyvbjerg (2006) and Yin (2014), be generalized. Barriers and enablers for boundary spanning activities can subsequently be used to adopt the development process of management plans for further MPAs within Germany and cross-borders. Overall, a holistic perspective, which according to

Yin (2014) can be retained, may be important for the general overcoming of the science-policy interface in marine conservation issues.

For this study, three designated marine protected areas of Germany are selected and seen as one *single case study*. This decision was made due to the similar procedure of developing management plans within German bureaucratic boundaries. Moreover, the involvement of the same stakeholders, the same responsible agency, and the simultaneous creation of all three management plans, lead to a combination of the three cases into one single case study. Presenting a common case in Germany, conditions and circumstances of a contemporary but repeating situation can be captured (Yin, 2014).

4.2.1 Data collection methods

As qualitative data collection can be based on talking, observing, analyzing materials and the like (Flick, 2018), a mix out of different quantitative and qualitative data collection methods is used. An overview of the methods, their documentation and outcome can be found in **Table 1**.

The inclusion of multiple methods and sources allows for data triangulation. This means data that was found can be checked and the validation of the results can be enhanced (Ewing and Park, 2020), determining the “consistency of a finding” (Yin, 2014, p. 241). This is especially important for case study research, as using multiple sources allows to “address a broader range of […] behavioral issues”, developing a “converging line of inquiry” (Yin, 2014, p. 120).

The validity and reliability of the study are provided due to an explanation of the research design, the data collection methods and a general transparence in the research process (Dooley, 2002).

Table 1: Overview of the data collection methods used

Topic	Question	Main method	Documentation method	Outcome
Science-policy interface	Are there requirements for the inclusion of scientific findings in management plans?	Document analysis	Table	Yes, requirements exist
	Is scientific information being used in the management plans?	Document analysis and semi-structured interviews	Table	Yes, there is a proper use of scientific information in the management plans
Boundary Spanning	Are boundary spanning activities conducted in line with theory to create science-based management plans?	Semi-structured interviews	Transcription and analysis via MAXQDA	Yes, all four different approaches in line with theory were conducted within this interface
	What are barriers and enablers for boundary spanning activities?	Semi-structured interviews	Transcription and analysis via MAXQDA	Only enabling factors were present in the interface, well knowing that those can also be barriers in the future

4.2.1.1 Qualitative document analysis

Aiming to get an insight into the marine science-policy interface within MPA designation, based on the generation process of management plans in Germany, the research starts with a qualitative document analysis. According to Bowen (2009) and Yin (1994), this method is particularly well-suited for case study research. Such a systematic literature review helps to develop empirical knowledge and to consolidate or adjust the research context (Bowen, 2009) as a basis for further research.

In this case, only documents are included which are originated by official international authorities (conventions), from the responsible German authority for nature conservation

(Federal Agency for Nature Conservation (BfN)) and from the German federal gazette. This includes official texts of conventions, German legislative decisions, national guidelines for MPA designations, announcement documents of MPA designations, protected area ordinances and lastly, the management plans for the three protected areas. A list of all used documents is provided in **Table 2**, a list with the original (German) titles of the documents can be found in Appendix A, Table 1.

Table 2: List of documents used within the case study

YEAR	ENGLISH TITLE	REFERENCE
1982	United Nations Convention on the Law of the Sea (UNCLOS)	UNCLOS, 1982
1992	Convention for the protection of the marine environment of the North-East Atlantic	OSPAR Convention, 1992
1992	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora	FFH-Directive, 1992
2009	Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds	Birds-Directive, 2009
2009	Federal nature conservation act	BNatSschG, 2009
2017	Ordinance on the designation of the nature protection area "Borkum Reef Ground" (NSGBRgV)	BMJV, 2017a
2017	Ordinance on the designation of the nature protection area “Doggerbank” (NSGDgbV)	BMJV, 2017b
2017	Ordinance on the designation of the nature protection area “Sylt Outer Reef” (NSGSylV)	BMJV, 2017c
2017	Methodology of management planning for the protected areas in the German exclusive economic zone of the North Sea and Baltic Sea	BfN, 2017b
2020	Management plan for the nature protection area "Borkum Reef Ground”	BfN, 2020a
2020	Management plan for the nature protection area "Doggerbank”	BfN, 2020b
2020	Management plan for the nature protection area "Sylt Outer Reef”	BfN, 2020c

Necessarily to mention is, that the documents are used for two different purposes. First, the identification of the legal background for science incorporation in management plans

(research sub question 1) and second, to review if the requirements are implemented (research sub question 2).

Following the research of Cvitanovic et al. (2014), the identified management plans are read and analyzed to understand the extent management actions are based on scientific information. For this, the number of scientific articles, locally produced primary data and local status reports by the respective authorities are examined.

4.2.1.2 Semi-structured interviews

To complete the data collection for this study, semi-structured interviews are conducted. Interviews count as one of the most common approaches in qualitative research, providing rich and valuable data that "cannot be gathered in any other way" (Given, 2016, p. 88). Semi-structured interviews, compared to fully structured interviews, provide the opportunity to gather systematic information about the key topics while also new topics can emerge and be discovered (Wilson, 2014). This is especially important for the present case study as human interpretations of a social phenomenon are socially constructed and context dependent (Mathison, 2005). Thus, the German marine science-policy interface as well as possible barriers and enablers of boundary spanning activities within the development process of management plans for MPAs can be explored in more detail.

To represent both sides of the science-policy interface within the development process of management plans for German MPAs, interviewees are chosen out of a bundle of scientists and relevant authorities who were involved. As the main responsibility for design and execution of the management plans lies not in the hands of policy maker directly but within the Federal Agency for Nature Conservation (BfN), the federal agency is seen as an additional layer between scientists and policy maker within this thesis.

The number of possible interviewees is limited as persons who were directly involved in the development process are preferred. Additionally, individual persons or organizations that are mentioned in the interviews as interesting contacts are contacted and, if possible, interviewed. A list of directly involved stakeholders in the development process of the management plans and others which were relevant in the discussion afterwards can be found in chapter **5.2.3**. Potential interviewees have been contacted via e-mail, either through a

formal contact form or informal after disclosure of contact data by others. All interviews are conducted in German and through an online video-call software. This is mainly due to the ongoing COVID-19 pandemic which limits the allowed face-to-face contact. Error! Reference s ource not found. shows the list of conducted interviews. The interviewees consented to the use and publication of their names.

Table 3: Overview of conducted interviews

	ORGANIZATION / COMPANY	NAME	DATE AND DURATION
RESPONSIBLE AUTRHORITY	BSH	[redacted]	17.01.2022, 00:45
SCIENTIST	Gavia EcoResearch	[redacted]	27.01.2022, 00:45
RESPONSIBLE AUTHORITY	BfN	[redacted]	31.01.2022, 00:25
PRIVATE ENVIRONMENTAL CONSULTANCY FIRM	BioConsult Schuchardt & Scholle GbR	[redacted]	07.02.2022, 00:27
NATURE CONSERVATION ASSOCIATION (NGO)	NABU	[redacted]	07.02.2022, 00:37
SCIENTIST	IOW	[redacted]	14.02.2022, 00:15
SCIENTIST	Thünen Institut	[redacted]	21.02.2022, 00:17

As semi-structured interviews entail open questions, transcriptions of the interviews are needed to collect the information in written form and be able to reflect the interviews afterwards. Due to transcribing the interviews, key issues made in the interviews can be analyzed based on important themes (Given, 2016). Following Dresing and Pehl (2018), a semantic-content transcription system is used. This enables a consistent transcription which makes a "smoothing" of the speech easier as well as sets the focus on the content of the interviews (Kuckartz et al., 2008). Furthermore, parts of the interviews which are more of private nature instead of being relevant for the thesis are led out completely within the transcription.

The development of codes is the “initial step in analyzing interview data” as they can be connected to data, sentences or specific contexts (DeCuir-Gunby et al., 2011, p. 137). The

development of a codebook can be based on existing theories or concepts (DeCuir-Gunby et al., 2011). Therefore, codes in this research are set in line with the theoretical background presented in chapter **3,** i.e., in a deductive manner. Additionally, the codes are consistently updated during the coding process in an inductive manner, as suggested by Saldaña (2016).

The transcription and coding process is done in German, used phrases or information are translated to English after approval of use by the interviewees. The coding according to the codebook (cf. Appendix A, Table 3 and 4) is done with the software "MAXQDA". The complete interview guide in English and German can be found in Appendix B.

4.2.2 Limitations of the research

Qualitative research, including case studies, document analysis and conducting interviews, also entails some limitations. Generally, results need to be handled carefully as data "have been gathered only within specific contexts" and in small sample sizes (Given, 2016, p. 25). Especially case studies, which only investigate into a few locations and aspects, cannot provide a comprehensive overview of the social phenomenon but give an in-depth, case specific insight. Likewise, the contextual setting is decisive. For example, research results of the science-policy interface in the field of marine conservation cannot be transferred to a science-policy interface within the health or education sector. Also, for cross-border transfers it is crucial to ensure a comparable structure of the political and bureaucratic setting. Therefore, strong generalizations of the outcome should be prevented.

However, if target groups for a subsequent transfer are identified, similar institutional structures are given and all groups effected by the social phenomenon are included in the research, the outcome can be loosely generalized and used for further investigations or guidelines for improvement in other cases (Flyvbjerg, 2006; Given, 2016).

5 Data analysis

5.1 Marine conservation in German offshore waters

The thesis focuses on marine protected areas which are located in the German exclusive economic zone (EEZ) of the North Sea. As part of the North-East-Atlantic, the North Sea is included in the regional Convention for the Protection of the Marine Environment of the North-East Atlantic of 1992 (OSPAR-Convention) which entails protocols for marine conservation and stimuli for the establishment of MPA networks. The protocols of the convention are also in line with the goals of the Convention on Biological Diversity (1993) and the Aichi Biodiversity Targets (2011).

Furthermore, as Germany is an EU-member state, clear framework conditions for marine nature conservation are given to implement the convention protocols into legal instruments. Important Directives in context of marine nature conservation are the Water Framework Directive (2000/60/EC), the Marine Strategy Framework Directive (MSFD) (2008/56/EC), the Framework for Maritime Spatial Planning (2014/89/EU) and the Common Fisheries Policy (Regulation 508/2014). However, in case of marine protected areas the Directive on the conservation of natural habitats and of wild fauna and flora (Directive 92/43) is the determining one. The Directive, also called the FFH-Directive, is in place since 1992 and aims at the establishment of a coherent European ecological network of protected areas to ensure biodiversity. The result is the "Natura 2000 network" which also includes Directive 2009/147/EG (for the conservation of wild birds).

By now, the Natura 2000 network covers over 8 % of the marine territory and over 18 % of the EU's land masses; it is the world's largest network of protected areas (European Commission, 2021b). Even though the network includes some strictly managed areas, the general focus is much wider and does not exclude different uses directly. Aiming at working with nature instead of working against it, member states need to ensure a sustainable development of the areas, ecologically and economically (European Commission, 2021b). The network includes three different types of protected areas, related to the different Directives the network entails. Firstly, "special protection areas" (SPA) are designated for the conservation of wild birds (Directive 2009/147/EG). Secondly, "sites of community interest"

(SCI) are designated for the conservation of natural habitats and of wild fauna and flora (Directive 92/43). In addition, “special areas of conservation” (SAC) can be designated in line with the habitat directive. The designation of SAC, however, is mainly the implementation of European accepted MPAs into national law, so it is the same area as the SCIs, but it is also legally manifested with national instruments (European Commission, 2021a).

In Germany, 15,5 % of the land masses and 45 % of the marine territory are under protection, (BfN, 2021b). The responsibility for the designation of Natura 2000 areas is divided between the federal states and the state. While the federal states need to designate and manage protected areas in the territorial waters (within the 12 nautical mile zone), the state is responsible for protected areas in the EEZ (BMU, 2021). In 2004, Germany designated ten Natura 2000 marine areas, of which eight areas belong to Directive 92/43 and two areas to Directive 2009/147/EG (Nordheim et al., 2006). Since 2017, these areas are designated as six “special areas of conservation” (SAC), which are partly located in the Baltic Sea and in the North Sea. In German, these areas are called “Naturschutzgebiete” (NSG) (BMJV, 2017a, 2017b, 2017c).

5.2 Case study

The case study entails the three marine protected areas “Borkum Reef Ground”, “Doggerbank” and “Sylt Outer Reef – Eastern German Bight”. While the *Borkum Reef Ground* (in the west of the EEZ) and the *Sylt Outer Reef – Eastern German Bight* (in the east of the EEZ) are located at the border to German’s territorial coastal water, the *Doggerbank* is far more outside in the open sea (see **Figure 6**). Together they create a total protected size of 7.920 km² in the German North Sea EEZ (BfN, 2021a).

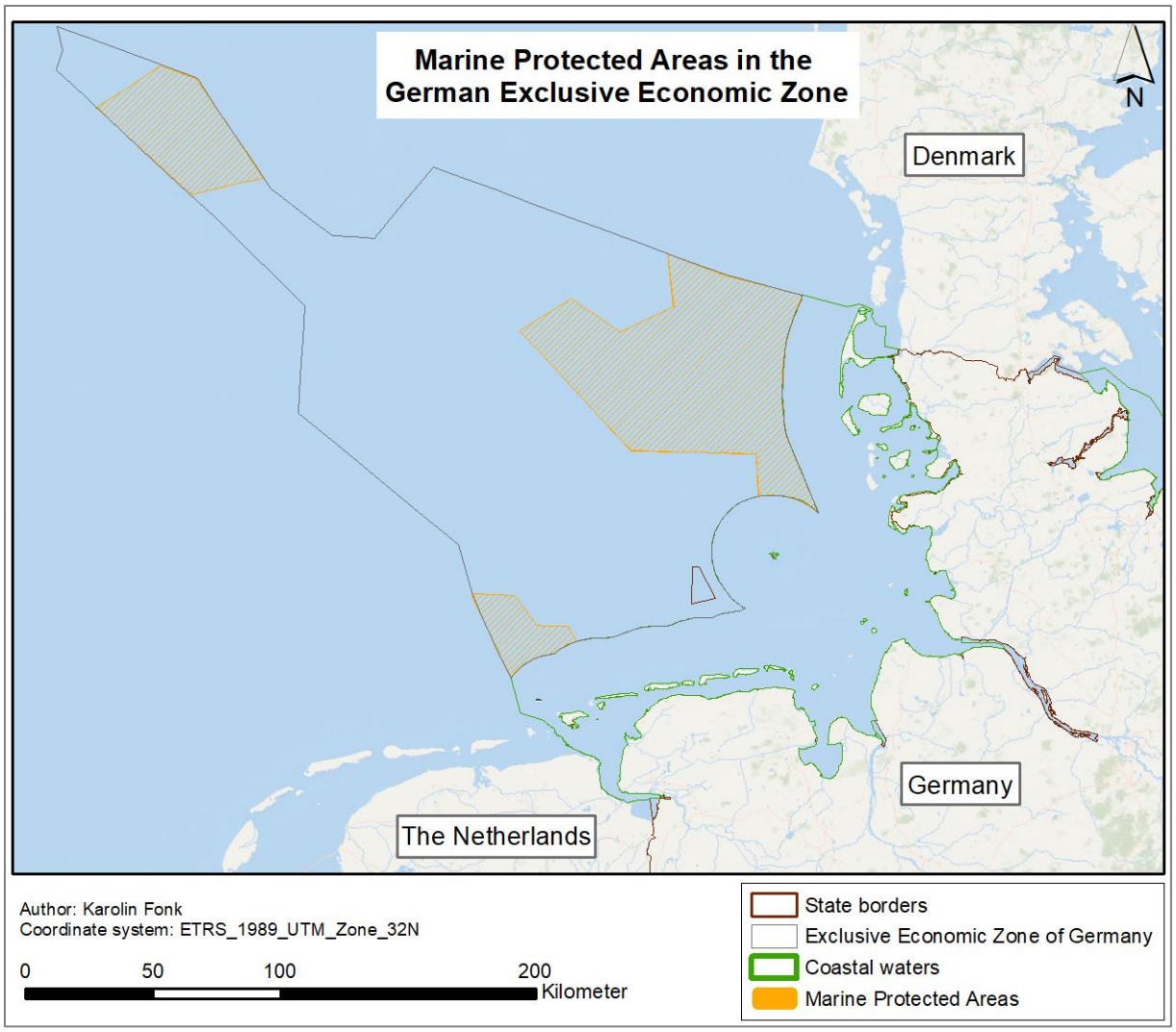

Figure 6: Overview of the three German marine protected areas in the Exclusive Economic Zone (North Sea)

Table 4: Overview of the three marine protected areas (BfN, 2021a)

NAME	SIZE	PROTECTED GOODS	STATUS*
BORKUM REEF GROUND	625 km²	Gravel, coarse sand and shingle beds, reefs, sandbars, harbor porpoises, grey seals, harbor seals, finches	SAC
DOGGERBANK	1.692 km²	Sandbanks, harbor porpoises, seals	SAC
SYLT OUTER REEF – EASTERN GERMAN BIGHT	Total size: 5.603 km² Area I: SAC Sylter Outer Reef: 5.321 km² Area II: SPA Eastern German Bight: 3140 km²	Gravel, coarse sand and shingle beds, reefs, sandbars, harbor porpoises, gray seals, harbor seals, seabird species, river lampreys and finches	SAC, SPA

* SAC = Special Areas of Conservation, SPA = Special Protection Areas

5.2.1 Ecological relevance

The three protected areas have been selected and designated based on the presence of specific habitat types, different red list species and benthic communities which are listed in Annex I of the Habitat Directive (Directive 92/43) and only occur in these areas in the German EEZ. The sediment characteristics serve as base for the MPAs, creating the two important habit types “sandbanks” and “reefs”. In connection with a (rather) shallow water column, both types enable the life cycles of many different benthic communities which, in the end, lead to a productive food web. (Nordheim et al., 2006)

At the *Borkum Reef Ground*, the sandbank is positionally stable even if winds and tides distribute sand masses, which allows the community of worms, mussels and manyborsters to settle. Furthermore, reef structures of huge stones build an area for the characteristic epifauna including sea conks, moss, sea squirts and sponges. The species rich benthic fauna forms a rich food basis for fishes and marine mammals such as harbor porpoises, grey seals and harbor seals. Therefore, the area is of high importance as breeding and feeding area and as resting area for migrating seals. (BfN, 2021c)

The *Doggerbank* is special as the sandbank lies in the center of the North Sea and presents the geographic location where the exclusive economic zones of the Netherlands, the United Kingdom, Germany and Denmark meet. Hence, the sandbank is divided into four parts and different approaches for nature conservation (between the states) exist. Independent of the legal instruments and requirements, the sandbank is characterized by a low water depth (in the German part between 29 m and 48 m) and merging water masses with different temperatures, which creates a highly productive area. The benthic fauna represents a rich biodiversity, including several red list species, and is a valuable food resource for fish fauna. As result, also marine mammals and seabirds are common visitors at the sandbank. While grey seals and harbor seals use the sandbank as feeding habitat on their way to the UK, Helgoland or the Wadden Sea, harbor porpoises use it as an important part of their breeding and reproduction areas in the North Sea. Even minke whales and white-beaked dolphins are sighted from time to time. (BfN, 2021d)

The *Sylt Outer Reef – Eastern German Bight*, combines a habitat area (Directive 92/43) and a bird protection area (Directive 2009/147/EG) which partly spatially overlap. The 5.306 km² big

areal includes nutrient rich sandbanks and colorful reefs which serve as nursing and feeding habitat for fishes and marine mammals. Furthermore, the area is determining for seabirds which use it as feeding, wintering, moulting, migrating and resting area. (BfN, 2021e)

Overall, in line with the MFSD, the three marine protected areas are necessary to restore and maintain a 'good environmental status' of the North Sea. Their spatial distribution enables them to "function as steppingstones and refuges for migrating, fluctuating and endangered species" (Nordheim et al., 2006).

5.2.2 Management practice(s)

5.2.2.1 Current human activities and their impacts on the protected goods

Despite the designation as marine protected areas, the *Borkum Reef Ground*, the *Doggerbank* and the *Sylt Outer Reef* are still areas in which several human activities take place. An overview of human activities is provided in Error! Reference source not found..

Table 5: Overview of human activities taking place within the three MPAs and in their surrounding (BfN, 2020a, 2020b, 2020c)

MPA Name	Human activities	
Borkum Reef Ground	Traffic	Commercial / Container Shipping
		Leisure shipping
		Air traffic
	Use of resources	Commercial fishing
		Recreational fishing
		Seismic survey in the context of hydrocarbon exploration
	Infrastructure and energy production	Offshore wind parks
		Cables
		Helicopter flights for wind farm maintenance
	Other uses	Military flight maneuvers and air combat exercises
		Flying and mine hunting training area (under Dutch sovereignty)
		Ammunition blasting (2013-2015)
		Research expeditions and flights
Doggerbank	Traffic	Commercial / Container Shipping

	Use of resources	Commercial fishing
		Hydrocarbon exploration
		Gas production platform
		Seismic survey in the context of gas production
	Infrastructure and energy production	Gas pipelines
	Other uses	No military areas but activities are generally allowed
		Research expeditions and flights
Sylt Outer Reef	Traffic	Commercial / Container Shipping
		Recreational shipping
		Air traffic
	Use of resources	Commercial fishing
		Sand and Gravel extraction
	Infrastructure and energy production	Cables
		Gas pipelines
		Offshore wind parks
		Helicopter flights for wind farm maintenance
	Other uses	Shooting areas of the navy
		Military training areas (shooting areas)
		Flight maneuvers and air combat exercises
		Research expeditions and flights

As a result, each activity influences the protected goods negatively and can cause deficits and threats. For the *Borkum Reef Ground* this is visible in strong deficits for the sandbank(s) and medium deficits for the reef (structure). By now, there are no deficits identifiable for harbor porpoises, grey seals and harbor seals but current human activities poses a high risk of future deficits. The *Doggerbank* shows medium deficits for the sandbank(s) and harbor porpoises. Harbor seals do not yet show deficits, but current human activities poses a high risk of future deficits as well. The *Sylter Outer Reef* shows strong deficits for the reef (structure) and the sea bird populations as well as medium deficits for sandbanks habitats, harbor porpoises and seals. (BfN, 2017a)

In the end, impact factors related to human activities can lead to a change in the species inventory as well as to long-term changes or destruction of the habitats.

For a more detailed overview of the activities, their impacts on protected goods/assets and the deficit calculation, the description and status assessment by BfN (2017a) can be studied.

5.2.2.2 The new management plans

As mentioned in the previous chapter, the conservation level of several protected goods/assets and habitat types show medium or strong deficits, which means there is a recognizable difference between the current status of the protected assets and the desired 'should-be-status' (BfN, 2017a).

In 2020, the German Federal Gazette announced the completion of comprehensive management plans. After a public participation process in 2018 and the provision of statements of relevant stakeholders in 2019, the plans now entail key data about the protected areas, describe protection goals, the need for action as well as provide the reader with several measures to avoid deterioration or to make necessary improvements of the protected assets.

The measures listed in the plans are in line with seven overall measuring groups (MG) which are presented in **Table 6**. Aiming at the improvement of the protected assets ecological status' written down as protection goals in the ordinances (BMJV, 2017a, 2017b), the measures do not consider a general improvement of the surrounding marine region. Further, not each plan includes measures of all MGs but only selected ones.

Table 6: Measuring groups included in the management plans

Measuring Group	Description
1	Measures to support the implementation of MG 2-5
2	Reduction of negative impacts by fishing
3	Reduction of negative impacts by commercial shipping and exploration of resources
4	Reduction of impairments and threats arising from unexplored ordnance and inputs of contaminants
5	Restoration of damaged reefs and reintroduction of relevant species
6	Intensification of the cooperation between the respective agencies
7	Monitoring and observation of activities and the enforcement of regulations

Table 2 in Appendix A shows the detailed list of measures for each MPA. A difference is noticeably between the marine protected areas *Sylter Outer Reef* and *Borkum Reef Ground* which are closer to the shoreline and the third protected area *Doggerbank*, located far more

offshore. The various locations, ecosystem structures and external influences require different management approaches.

Generally, it can be said that some of the measures are build up on each other. This means some of the measures need to be conducted earlier in time than others. For example, measures to support the implementation of MG 2-5 in marine spatial plans need to be clarified from the outset so that future measures are already consistent with the relevant requirements and can be implemented in a meaningful way. On the other hand, several measures can be conducted next to each other. The monitoring as well as an intensification of cooperation between the respective agencies can run simultaneously to the development of new approaches and technologies for the reduction impacts due to human activities.

Due to a categorization of the measures into 'directly necessary' and measures which are 'not directly necessary', the management plans clearly show the preferences which measures need to be done in a timely manner. These measures shall be established and implemented within six years while not directly necessary measures only need a conceptual idea within in the first six years. However, the majority is set as directly necessary so that many results should be visible in 2026.

In total, many measures include or aim to start new research projects for a better understanding of the effects of human activities (i.e., commercial fishing) on conservation. Furthermore, the list of measures include, among others, the elaboration on new rules for exploring new resource uses (M 2.4 and M 3.4), general goals like the reduction of waste and noise pollution (MG 3), the improvement of cooperation and communication between relevant agencies (MG 6) as well as the development of a concept to monitor and control the activities and the ecosystem status of the MPAs (MG 7). However, the measures listed in the management plans are rather broad than directly addressing problems with specific solutions and all activities mentioned in Error! Reference source not found. are still allowed.

5.2.3 Stakeholder involvement

In line with the MSP approach, a high interaction and communication between the relevant stakeholder is needed to ensure effective management of marine protected areas, resolve conflicts and enhance the legitimacy as well as the compliance with the measures of MPAs (cf.

chapter **3.1.2**). According to the official statement of the Federal Agency for Nature Conservation (BfN) in 2020, this was done. Therefore, the following Table provides an overview of relevant authorities and alliances of scientists which are mentioned in the management plans of the three German MPAs as well as federally recognized environmental and nature conservation associations.

Table 7: Overview of involved stakeholder in the development process of the three management plans (BfN, 2020a, 2020b, 2020c). Underlined stakeholders were directly involved within the process and were preferred as interview partner

	ORGANIZATION
MAIN RESPONSIBLE AUTHORITY	BfN - Federal Agency for Nature Conservation
FEDERAL AUTHORTIES WHICH WERE RELEVANT IN THE DISCUSSION AFTERWARDS	BSH - Federal Maritime and Hydrographic Agency
	UBA - Federal Environmental Agency
	BMU - Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
	BMEL - Federal Ministry of Food and Agriculture
	BLE - Federal Agency for Agriculture and Food
	BGR - Federal Institute for Geosciences and Natural Resources
	GDWS - Federal Waterways and Shipping Administration
	BMVI - Federal Ministry of Transport and Digital Infrastructure
	German Armed Forces
AUTHORITIES AT STATE LEVEL WHICH WERE RELEVANT IN THE DISCUSSION AFTERWARDS	Ministry for the Environment, Energy, Building and Climate Protection of Lower Saxony
	LBEG - State Office for Mining, Energy and Geology
	NLWKN - Lower Saxony State Agency for Water Management, Coastal and Nature Conservation
	MELUND - Ministry for Energy Transition, Agriculture, Environment, Nature and Digitalization of the State of Schleswig-Holstein
	WiMi - Ministry of Economics, Transport, Labor, Technology and Tourism of the State of Schleswig-Holstein
	LLUR - State Office for Agriculture, Environment and Rural Areas
	LKN.SH - Schleswig-Holstein State Agency for Coastal Protection, National Park and Marine Conservation
	Lower Saxony and Schleswig-Holstein Wadden Sea National Park Administration
RESEARCH INSTITUTES AND ALLIANCES OF SCIENTISTS	Gavia EcoResearch
	BioConsult Schuchardt & Scholle GbR
	Kieler Institut für Landschaftsökologie
	Meereszoologie
	IOW – Institute for Baltic Sea Research
	Federal Research Institute for Rural Areas, Forestry and Fisheries
	University of Veterinary Medicine Hannover
	BUND - Friends of the Earth Germany
	NABU - Naturschutzbund Deutschland e. V.

FEDERALLY RECOGNIZED ENVIRONMENTAL AND NATURE CONSERVATION ASSOCIATIONS	Deutsche Umwelthilfe
	DNR - Deutscher Naturschutzring
OTHER NON-GOVERNMENTAL ORGANIZATIONS (NGO)*	DEEPWAVE - Die Meeresschutzorganisation
	Naturschutzgesellschaft Schutzsstation Wattenmeer
	WDC - Whale and Dolphin Conservation
	WWF - World Wildlife Foundation
	Greenpeace

* Were part of the jointly submitted statements but are not federally recognized as environmental or nature conservation association (Umweltbundesamt, 2022)

5.3 Research results

5.3.1 The science-policy interface in German marine nature conservation

While answering the first two sub-questions of the present thesis, this chapter also provides an overview of the marine science-policy interface within the planning process of MPAs in German offshore waters in total.

5.3.1.1 Sub-question1: What are the legal requirements for the inclusion of scientific information in management plans?

As marine protected areas are embedded in different international as well as national conventions and regulations, as elaborated upon in chapter **5.1**, the call for science-based management exist from all sides. The most common narrative to include scientific information in management practices is the use of the "ecosystem approach", which is a strategy for the integrated management of all types of resources including the crucial role of scientific information (Vito de, 2019).

A first hint is given by the United Nations Convention on the Law of the Sea (UNCLOS) (Czybulka and Francesconi, 2017). Even though the Convention has been made before the ecosystem approach has been established, the concept is rooted within at least in an "implicit and precursory way" (Vito de, 2019, p. 12). The OSPAR Convention, which the German EEZ is part of, clearly stated in its North-East Atlantic Environment Strategy[2] and in the following strategy until 2030 [3], the implementation of the ecosystem approach and the belonging use of the best available scientific information for decision making (OSPAR Commission, 2010). Further, also the designation of protected areas within the Natura 2000 network requires the use and expansion of scientific information. Therefore, the need for science-based decision making is set in the European Directives 92/43/EEC and 2009/147/EC.

Nevertheless, or perhaps because of this, no specific reference to the use of current scientific information is made in the protected area ordinances for the three German MPAs. However,

[2] Strategy of the OSPAR Commission (2010) for the Protection of the Marine Environment of the North-East Atlantic 2010–2020

[3] Strategy of the OSPAR Commission (2021) for the Protection of the Marine Environment of the North-East Atlantic 2030

in the methodology of the management plans themselves (BfN, 2017b), the use of current findings and furthermore, the application of procedural descriptions if the data basis is insufficient, is set. Therefore, the use of knowledge-based findings serving as a basis is a legal requirement for German MPAs. An overview of the document analysis results are provided in **Table 8**.

Table 8: Overview of the document analysis results

DOCUMENT	YEAR	CITATION	REFERENCE
UNITED NATIONS CONVENTION ON THE LAW OF THE SEA (UNCLOS)	1982	"[…] based on scientific findings. In this context, the ecosystem approach is explicitly emphasized as a management principle"	Czybulka and Francesconi, 2017, p. 596
OSPAR CONVENTION	2010	"bearing in mind that the Ecosystem Approach to the management of all human activities that have an impact on the marine environment needs to be applied as an overarching principle in OSPAR's work"	OSPAR Commission, 2010, p. 1
	2021	"We are guided by the ecosystem approach"	OSPAR Commission, 2021, p. 5
EUROPEAN DIRECTIVES 92/43/EEC	1992	"On the basis of […] and relevant scientific information"	European Council, 1992, Article 4
EUROPEAN DIRECTIVES 2009/147/EC	2009	"Member States shall take the requisite measures to maintain the population of the species referred to in Article 1 at a level which corresponds in particular to ecological, scientific and cultural requirements"	European Parliament and Council, 2009, Article 2
METHODOLOGY OF MANAGEMENT PLANNING FOR THE PROTECTED AREAS IN THE GERMAN EXCLUSIVE ECONOMIC ZONE OF THE NORTH SEA AND BALTIC SEA	2017	"on the basis of current knowledge" "taking into account the latest findings or area-specific conditions" Whole chapter on the "Procedure in case of non-applicability of existing evaluation schemes and insufficient data situation"	BfN, 2017b; BMJV, 2009, § 23 (1), p. 15, 19, 25-26

5.3.1.2 Sub-question 2: Is scientific information being used in the management plans?

According to the legal requirements, management plans should be based on current scientific findings. The literature review shows that all three management plans entail a list of references at the end of the plan and further references related to the specific management measures within the chapters. These references include primary data in form of data bases and mapping results, scientific articles dealing with primary science as well as reports and guidelines of different official authorities. The overall number of references used in each management plan can be seen in **Table 9**.

Table 9: Overview of the number of references used in each management plan (MP)

NUMBER OF	MP: BORKUM REEF GROUND	MP: DOGGERBANK	MP: SYLT OUTER REEF
ARTICLES/DATA WITH PRIMARY SCIENCE[1)]	25	14	27
REPORTS OF AUTHORITIES[2)]	8	7	10
ARTICLES/DATA WITH INFORMATION SPECIFIC FOR THE SIDE[3)]	24	11	23
TOTAL NUMBER OF REFERENCES USED	57	32	60

1) Including research projects, scientific articles, data basis, scientific mapping results (general)
2) Guidelines and official assessment reports
3) All kinds of scientific research results taken in the *German North Sea*

In total, the management plan for the MPA *Sylt Outer Reef* contains the most references. The majority of the references used here entail general primary science data (27), followed by articles and data collected specifically for the North Sea (23) and reports and assessments by official authorities like the OPSAR Convention or the BfN (10). The same pattern is given for the MPA *Borkum Reef Ground* (primary data: 25, location specific data: 24, official reports: 8). Only the management plan for the MPA *Doggerbank* shows less refences in total (32) and more general primary data (14) is used instead of location specific data (11). Further, only seven official reports are referenced to. The use of less references in total for the MPA *Doggerbank* can probably be explained due to the offshore location of this protected area.

Generally, there are more research projects and scientific findings for areas close to the shoreline than for the open sea.

Overall, the management plans for German MPAs are based on many scientific information and due to different measures (e.g., M 3.1, cf. Appendix A, Table 2), the renewal of scientific findings and new research projects are initiated.

5.3.1.3 The German marine science-policy interface

As the document analysis shows a high incorporation of scientific information in the management plans, it can be assumed that communication and knowledge exchange between scientists and policy makers works. However, results of the conducted interviews allow a more detailed description of the situation.

For further investigation it is necessary to divide the German marine science-policy interface into two parts. The first interface exists between scientists and the BfN. As the BfN is the official responsible authority for German MPAs, it did not only write the methodology for the management plans but also publish the management plans. The second interface exists between the BfN and the different German ministries in which the policy maker generate the final decisions. Therefore, as already mentioned in chapter **4.2.1.2**, the BfN is seen as an extra layer between scientists and policy maker.

Starting with the first interface, it can be said that there is a high interest of the authority (BfN) to work science-based (Kramer, Dierschke, Schröder). The intention is to use the most recent and best scientific information (Schröder). This is automatically done due to the tendering of research projects to research institutes and individual scientists but also by conducting own research (Kramer, Dierschke, Schröder). In addition, there is also a general endeavor by scientists to protect the oceans and to deliver scientific information (Kramer, Darr).

However, in line with the literature review (cf. chapter **3.2.2.1**), there remains a common problem: the not existing knowledge of the type of data that is needed. Scientists who were directly involved in the development process of the management plans were not confronted with this problem (Kramer). But many scientists outside of this working group are often not aware of the kind of data needed and which general conditions and legal specifications must be complied with (Darr, Dierschke). As a result, many (general/ basic) research findings are

useless for management decisions (Darr) and need to be redone under the specific conditions. To avoid this problem, there are different official committees designed to promote exchanges between the scientific community and relevant authorities (Kramer, Darr). But this opportunity is seldomly used as it needs time scientists often do not have or do not want to spend (Darr). This is because they are not paid for it (Kramer).

Another fundamental issue is given due to the general attitude of scientists to uphold further scientific questions for follow-up research projects which they need for future work and income (Kramer). Due to miscommunication, authorities then assume that certain knowledge is not available and therefore, specific measures cannot (yet) be taken (Kramer).

Further personal attitudes of scientists can be determining for the outcome. Interpretation of data can hardly be controlled on objectivity and the influence of personal interests can only be assumed. In addition, it is always a question of the starting point and if the precautionary principle is used or not (Dierschke). Moreover, there are still plenty of scientists who do not see the translation of scientific outcomes into easier language as their responsibility (Darr).

Of course, these problems do not make the exchange of scientific information easy but nevertheless, according to all interviewees, there are no tensions between scientists and the authority - only communication issues. Occasionally, scientists outside the working group were disappointed from the final measures but even this did not end within tensions (Dierschke) and is generally seen as a positive point as discussions between scientists keep science living (Schröder). As a result, a lively exchange is sustained in which opinions are said and possible measures are critically discussed (Dierschke, Schröder). The BfN does not want to implement measures which are not efficient (Schröder) and especially the scientist involved in the developing process of the management plans are not willing to ignore their research findings (Dierschke). A certain compromising spirit is given on both sides (Dierschke).

Within the second interface, the measures of the management plans are discussed, and final decisions are made (Schröder, Schulze). Therefore, its highly important that scientific information is accessible. Through the co-production in the first interface, the BfN knows the research findings well and can represent them in an understandable and easy way in front of the different national ministries participating in the negotiation process. As the ministries such as the BSH, BMU or BMEL (cf**. Table 7**) are powerful stakeholders also having veto rights (Kramer), arguments used need to be solid and science based (Schröder). If more

clarification is needed, scientists who do not regularly participate in such negotiations, can be invited for explanations in more detail (Dierschke).

The negotiations between the ministries are often long and strained (Schröder) as a fact-based discourse is taking place (Schulze). This is partly due to the BfN (and the information provided by scientists), but also due to institutes that conduct research directly for individual ministries and to individuals with scientific backgrounds working for the ministries (Schulze). For example, the Thünen Institute is part of the BMEL and conducts departmental research. As scientists pass on their results in a neutral way (Kuehl-Stenzel), no tensions between scientists and the ministries (policy makers) are observable (Schröder, Schulze). Especially the first part of the management plans, entailing the area description and the evaluation of the protected goods, for which scientists are mainly responsible, is nothing which discussions are about (Schröder). Tensions felt in the negotiations are evoked by the ministries and other stakeholders while discussing the measures and setting the responsibilities of them (Schulze, Kuehl-Stenzel, Schröder).

5.3.2 Boundary spanning in German marine nature conservation

Within this section, the last two sub-questions of the thesis are answered. While in theory, four different approaches of boundary spanning are described (cf. chapter **3.3**), in practice, setting a clear line between them is not always possible. Further, often not only one type is conducted but a mix of several ones. An overview of the situation in the context of German MPA planning is provided in the following chapter. Afterwards barriers and enablers of boundary spanning activities are identified.

5.3.2.1 Sub-question 3: Are boundary spanning activities conducted in line with theory to create science-based management plans?

Following the structure of the previous chapter, the interface is again divided into two parts. Within the first interface, a clear *knowledge co-production* between the individual scientists, research institutes and the BfN is observable. An active collaboration between them provides the opportunity for ongoing exchange of knowledge, which is according to Dierschke, Kramer and Schröder, happening. At one hand, this co-production is supported by the fact that many

employees of the BfN have a scientific educational background (Schröder) and on the other hand, scientists already summarized their research into clear results within the area and protected good descriptions of the management plans (Dierschke). As a result, a language translation activity from scientists to the BfN is not necessary (Schröder). Further, also no fact sheets or other kinds of texts are produced to distribute the information between the scientists involved and the BfN. As Arndt summarized it well, this kind of activity always depends on the target audience.

However, oral presentations are given by scientists or the BfN within committees or discussion groups of the different German federal states (Schröder, Kramer). Such presentations inform scientists and further German authorities about the ongoing research and the progress of the development of the management plans but are not a direct boundary spanning task between scientists and the relevant authority.

In addition to this knowledge co-production, also a *boundary organization* can be identified within the first interface. The development of the management plans was accompanied by an independent environmental consultancy company (BioConsult Schuchardt & Scholle GbR), which was already strongly involved in the development process of the methodology behind (Schröder, Kramer). Due to the company's involvement in many different research projects, many contacts to the scientific community and good access to scientific information exists (Kramer). Further, based on the work with German authorities, a certain degree of understanding for bureaucratic language and processes is supplied (Kramer). This is of high relevance as it makes the adaptation to each language use easier and faster (Kramer). Moreover, the company has organized meetings, put scientific information together and wrote overall assessments (Darr). Thus, formal and informal processes (cf**.** chapter **3.3**) are used.

Furthermore, in the context of developing the management plans, also an individual scientist from the Institute for Baltic Sea Research (IOW) has been identified as *knowledge broker*. Through interpretation and translation of very scientific research results (from the IOW and the Alfred Wegener Institute (AWI)) into clear statements (Darr), the knowledge broker acted as intermediary (cf. chapter **3.3**). This work was not done separately but in tight contact with scientists to not misinterpret the findings (Darr). However, as knowledge broker according to

the theory (cf. chapter **3.3**) are usually external persons, the knowledge broker in this case represents a variation of the common type.

Within the second interface, the BfN worked as an extra layer between scientists and the policy side (ministries). Representing the results of the scientists, it sees itself as a kind of intermediary between both parties (Schröder). A clear assignment to a *boundary organization* however is not possible as the BfN is not completely independent due to its federal mandate for nature conservation and thus, presents another stakeholder involved. Nonetheless, scientific information are combined and summarized and, together with possible management options, presented to the ministries (within the first drafts of the management plans) by the BfN (Schröder). Sometimes the authority is also represented by individual scientists (Dierschke) or employees of the environmental consultancy company (Kramer) in the hearings on the draft management plans to enable scientific discussions in more detail and support the final decision process.

As described in chapter **5.3.1.3**, the Thünen Institute works for the BMEL and thus, represents the boundary spanning approach *embedding*. Independently from the collaboration of the BfN with scientists, also the ministries can collaborate with scientists (Schulze). There are probably more institutes conducting departmental research for other ministries involved but within this thesis only the Thünen Institute is investigated in. The close link between the Institute and the BMEL ensures a continuous participation of scientists in policymaking, which is typical of the embedded type and enables direct advice (Schulze). While most of the research within the institute is for specific ministry interests, independent research is conducted additionally (Schulze). Along with the performance of own research also cooperation with other institutes and universities exist; through this interactive web, current research findings from scientists outside the institute complement the knowledge of the scientists within (Schulze). While the existing knowledge is then provided to the ministry as a data basis for the negotiations, the institute simultaneously takes the role of boundary spanning between external scientists and the ministry through combining and summarizing all knowledge into 'background documents', statements and management options. Furthermore, the institute strongly collaborates with the lawyers of the ministry to translate the scientific results into legal texts (Schulze).

In addition to the institute (or the different ministerial institutes), also non-governmental organizations such as the NABU or the BUND are identified as boundary spanner, more

precisely as *boundary organizations*. Such organizations are independently and can represent both sides of the interface (cf. chapter **3.3**) as the employment of scientists, jurists and politically employees unites a certain degree of knowledge for both sides. According to Kuehl-Stenzel, they often explain each side of the interface what kind of knowledge is needed, give critical statements, lead workshops and create pressure due to the use of media. The main goal here is to further stimulate exchange between ministries and to point out existing but partly unused scientific information (Kuehl-Stenzel).

Following the visualization type of Cvitanovic et al. (2015) (cf. chapter **3.3**), **Figure 7** shows the different boundary spanning approaches identified for each interface within the case study.

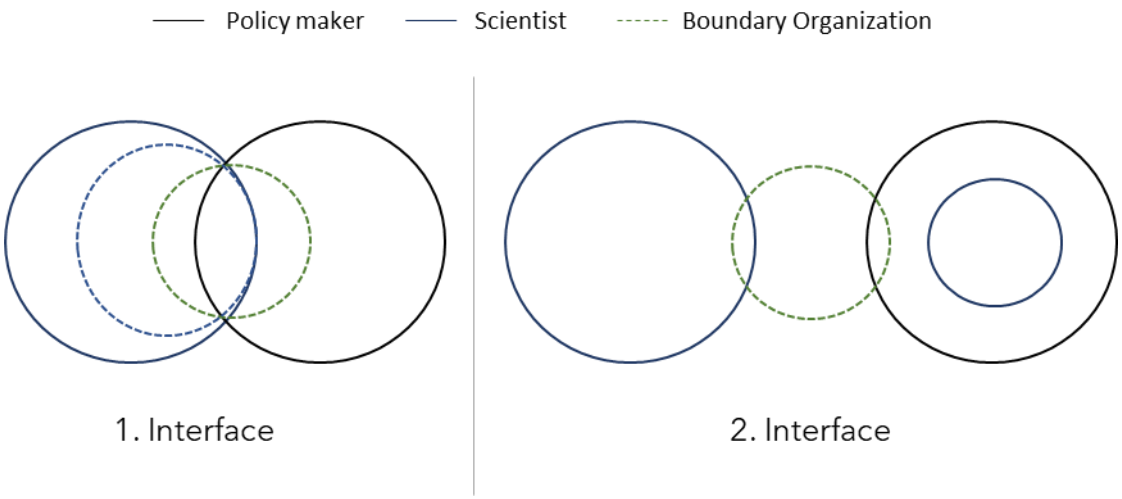

Figure 7: Visualization of the different boundary spanning approaches identified within the case study [made by author, 2022]

5.3.2.2 Sub-question 4: What are barriers and enablers for boundary spanning activities?

According to the interviewees mainly enabling factors for boundary spanning activities are present at the interface within this case. As basic requirements for boundary spanning, time, personal capacity, and budget capacity are named (Schulze, Schröder). Meetings, collaborations, making arrangements as well as connecting the different scientific research groups with each other does not only need time in general but also a good time management. Of course, also personal capacity is needed to conduct the management, organize the exchange, bring the research results together, summarize and if needed, translate them

(Schröder). In addition, this work needs to be financially honored and is not voluntarily done (Kuehl-Stenzel), therefore, a certain budget capacity should be considered as well.

Further, as doing own research is part for each boundary spanning approach within this case, spatial capacities for laboratories, third-party funds and materials are seen as requirements for doing research, extending own knowledge and being able to connect scientific research results with each other (Schulze).

Along with these basic requirements, also structures within the participating organizations and in the whole exchange process are named to be helpful (Dierschke). Structures make a clear sequence of tasks possible and contacting the right people involved way easier.

Another, important enabler for boundary spanning is a general open communication, but especially between scientists and the BfN (Schröder) or the policy makers (Schulze). This also requires a certain openness for knowledge exchange and the willingness to be advised and let scientific information influence decisions to be made (Schröder).

Naturally, as all these factors are enabling boundary spanning activities, in return this means, that the non-provision of them would reduce or limit boundary spanning activities, working as a barrier. Especially a shortage of the resources personal, time and budget capacity would lead to a stop of boundary spanning activities.

6 Discussion

To gain a better understanding of the German marine science-policy interface and the role of boundary spanning approaches within the development process of MPA management plans, research findings of the present thesis are discussed. Further, the main research question *"How does the science-policy interface look like and what role do boundary spanning activities play in this?" is answered in this chapter.*

Science-policy interface

In general, a science-policy interface is an environment in which scientists and policy maker do not collaborate and tensions between them create a boundary for communication and interaction. The research of this thesis shows that the science-policy interface in context of marine conservation in Germany, more precisely, within the development process of the management plans for three marine protected areas in the German EEZ in the North Sea, is not characterized by such a strong boundary.

In chapter **3.2.2.1**, general assumptions about science-policy interfaces have been made. In relation to the present case study research, only one general assumption, the lacking perception of scientific information needed, can be found. In line with Nursey-Bray et al. (2014)'s argumentation (cf. chapter **3.2.2**), this leads to a gap between conducted science and its inclusion in policy decisions (Darr). Even though this problem is only relatable to scientists who are not directly involved within the development of the MPA management plans, it is necessary to take a deeper look at it, as general scientific information is obtained from the scientific community and not conducted by the ones involved. According to Darr and Kramer, the problem exist mainly due to the non-participation of scientists in regional and/or national committees. The reasons for such a low participation level of scientists within (cf. chapter **5.3.1.3**) are understandable. However, with participating and hence, knowing the legal requirements, their research results would gain additional value as it would then get more attention outside of the scientific community. A higher usage of their work by the policy sector would probably also improve the mood of scientists in relation to authorities and policy makers in general. A new form of appreciation (within the scientific community) for participating in such committees like the establishment of an index for participating (Kramer),

would be a possibility to motivate scientists. Beside this, also other forms of distributing the relevant information such as monthly newsletters or a homepage which regularly updates the information, are possible alternatives. Nonetheless, it also depends on the willingness of scientists to help policy makers with advice as mentioned by Rudd (2015) (cf. chapter **3.2.2**).

Other assumptions like a problem of communication and an inaccessibility of scientific information cannot generally be connected to the *first interface* under study. This is mainly based on the non-existence of a knowledge boundary (cf. Buick et al., 2019) in chapter **3.2.2**); several relevant employees within the BfN do have a scientific background and understand scientific language (Schröder). Therefore, also no language boundary exist between the scientists involved and the authority (BfN). Rather a good communication and the preference of a strong collaboration between them was emphasized within the interviews (Darr, Dierschke, Schröder), also resulting in a good accessibility of scientific information for the BfN. This can further be underpinned with a good organizational structure within the whole development process (Kramer). Within the *second interface*, in which scientific information is provided to the ministries and policy makers, most people involved do not have a scientific background and therefore, have problems with the understanding of facts by their own (Schröder). However, as scientists were able to participate actively in the hearings of the management plans, they could distribute and explain their facts/opinion (Kramer). Further, some of the ministries have internal scientific adviser who can help with understanding the results (Schulze). Nevertheless, within the negotiation processes, which are separated from the hearings of the management plans, scientists are not participating and able to advice.

Nonetheless, sometimes a problem of miscommunication exist as some scientists (not all) want to ensure follow-up projects for themselves and therefore let final research statements vague (cf. chapter **5.3.1.3**). The result was an accumulation of new research projects within the draft management plans that are apparently needed, creating the illusion of not yet being able to decide on final (protection) measures within the ministry negotiations. Ultimately, the research projects were retained in the final management plans (cf. chapter **5.2.2.2**). Of course, ongoing research is always appreciated and needed but certain management measures can already be done, without knowing some specific parameters. And this should be clearly communicated from scientists to policy makers.

However, such a miscommunication can be produced by both sides; it is not possible to connect this problem only to scientists. Next to them, also policy makers want to follow their own aims. It can be said that policy makers act as gate keeper (following Nursey-Bray et al., 2014) within this research, as they do not let scientists participate in negotiation processes regularly, except for clarification of scientific results sometimes. Further, a certain degree of boundary defining language from policy side is observable as their use of bureaucratic language is not directly accessible for externs (Kramer). Such a demarcation can be used to interpret scientific information within own perceptions and interests as stated by Jasanoff (1987) (cf. chapter **3.2.2**). Therefore, it cannot completely be excluded, that policy makers make decisions unbiased as also discussed by Gleason et al. (2010) (cf. chapter **3.2.2**).

Generally, it must be admitted, that possibly both sides, scientists and policy makers, are not unbiased in the whole development process of the MPA management plans. While most scientists and the BfN do want to secure a high protection and conservation of the marine environment, the ministries and policy makers do want to achieve their own interests and political agenda. Therefore, research conducted and research results are often in line with the preferred outcome. Especially research by institutes which are connected to specific ministries can be assumed to lead into a certain direction to show specific needs or non-need of protection measures. It is a common strategy which can be observed here: throwing in high needs or requirements into the pot to achieve a high level of fulfillment even in the event of a compromise.

Another point to mention is that, according to the interviewees, scientists generally can have different personal attitudes in conducting research as well as can have different ways to interpret research results. At one hand, this is common within the science community and keeps science alive. But at the other hand, it often leads to confusion for people outside of the community; partly also resulting in a distrust against scientists as Mc Conney et al. (2016) state (cf. chapter **3.2.2**). However, even though a certain disagreement and/or dissatisfaction among (external) scientists have been present from time to time, a problem of distrust by policy makers against scientists was not mentioned. Also, no tensions between scientists and policy makers were present (cf. chapter **5.3.1.3**).

Instead, tensions between the different ministries and stakeholders involved were mentioned by several interviewees (cf. chapter **5.3.1.3**). As each ministry wants to fulfill its own agenda,

like the extension of offshore energy production (BSH), sand and gravel extraction (BGR) or the conservation of fish stocks (BMEL), and nature protection measures limit such activities in different ways, a certain degree of resistance is given. Further, not only own activities get limited but also new rules and (control) procedures need to be established and conducted (cf. chapter **5.2.2.2**). The negotiation of such and the assignment of responsibility of them represented another point of discussion in the negotiation processes (Schröder). While the course of negotiations are common like this in the (German) bureaucratic system, decision making for marine space also include an integrative and collaborative approach based on the MSP approach. This way, a co-evolution of 'Blue Growth' and marine conservation can be aimed. However, due to sectoral pressure, scientific information is often disregarded or ignored (Kuehl-Stenzel). This is further influenced by the ongoing debate between climate protection and nature protection (Dierschke), shifting the current priorities. In the end, a certain consensus and common values need to be found to compromise own goals. Arndt summarized this as "if everyone is unhappy at the end, then we have actually done our job well" (Arndt, 00:15:22).

Boundary spanning

Within this research all four approaches of boundary spanning (cf. chapter **3.3**) could be found. However, as already mentioned in chapter **5.3.2**, it is not always possible to clearly divide between the different approaches in practice. Especially due to the twofold interface, the transition of the BfN from co-production with the scientists involved towards a boundary organization between them and the ministries is fluent.

However, if looking at the fist interface separately, it is possible to disconnect the *knowledge broker* (acting between external scientists/research institutes and the BfN), the strong *co-production* between scientists involved and the BfN, and the *boundary organization* (bringing information from external and internal scientists together and delivering it to the BfN) from each other.

The existence of different boundary spanning approaches shows that the work done is needed, as only writing scientific paper is not sufficient to inject knowledge (Kramer); and active participation for exchange as well as willingness from (external) scientists to translate research findings to understandable language by themselves, is often missing (Darr). It also

shows that especially scientists involved in the development process are aware of the importance to include their research results into decision making.

On the other hand, different ways to resolve the problem and hence, to overcome the boundary of the science-policy interface have already been found. Conducting, analyzing, interpreting, and summarizing research results into common language within one research institute or working group makes the whole process easier, faster and reduces the risk of losing information (*knowledge broker*) (Darr). Further, with time it is known with whom cooperation works well (*co-production*) (Darr) and how to combine scientific and bureaucratic languages in the final (draft) management plans (*boundary organization*). Additionally, the identified boundary organization (BioConsult Schuchardt & Scholle GbR) as well as the BfN itself, uses the information gained for oral presentations within national and international committees (cf. chapter **5.3.2.1**), updating interested people about the process and newly gained knowledge. This further rises the understanding for the issue and needed protection management measures outwardly. Even though this cannot be seen as a direct boundary spanning activity between scientists and policy makers, it can indirectly have an influence on the negotiation processes if relevant people attended such committees.

Looking at the second interface separately, the BfN as *boundary organization* and scientists of research institutes connected to specific ministries as *embedded* adviser*,* could be identified (cf. chapter **5.3.2.1**). Hence, boundary spanning activities are conducted from both sides. Following the research results, no tensions between scientists and policy makers were present. However, as mentioned by Schröder, most employees of the ministries do not have a scientific background, ending in the need for a translation of the scientific results into common language. As final decisions on protection measures are decided upon within the ministry negotiations and to avoid the MPAs resulting in 'paper parks' as described in chapter **2.1**, it is more than necessary, that scientific information is understandable and most recent findings are used. Therefore, the BfN has the task to deliver policy relevant scientific information in an accessible way. In addition, also the embedded scientific adviser, which in this research are presented by the Thünen Institute, have the task to translate and explain research results to policy makers. Own research for their specific interests are conducted and included in the negotiation processes as well (Schulze).

While people involved in the development process of the management plans are satisfied in terms of the science-policy interface and the exchange of knowledge in retrospect, external people do not see the problem solved. According to Kuehl-Stenzel, translation of scientific facts are often still not sufficient (facts are still not really understandable) and non-governmental organizations (NGOs) are regularly asked to help in forms of workshops or presentations. Also, official advisory boards for the ministries and policy makers are not well used (Kuehl-Stenzel). Hence, an additional external and independent boundary organization seems to be needed (Kuehl-Stenzel). Of course, it is necessary to see both sides critical; people involved want to stress that everything worked out fine while people outside want to see better results in the end.

Nevertheless, in general it can be said that boundary spanning activities are conducted within the German marine science-policy interface and play an important role. According to the interviewees this is also happening without meaningful barriers for such activities. Rather, only enabling (supporting) factors that already exist are mentioned (cf. Chapter **5.3.2.2**), well-knowing that they can become barriers if they should not be possible to the same extent one day. This result confirms the hypothesis of the present thesis, that existing barriers and enablers do have an influence on the incorporation of scientific information into management plans. Even though only enabling factors were present within the development process.

The result is also totally in line with the argumentation of O'Flynn et al. (2011), who divide between seven different barriers and enablers for boundary spanning, but also acknowledge that they can also be both. The seven categories used (1. Formal structures, 2. Commonality and complexity, 3. People, 4. Understanding culture, 5. Leadership, 6. Power and politics, and 7. Performance, accountability and budgets) in their paper are generally relatable to the research outcome of this thesis (cf. chapter **5.3.2.2**). Especially formal structures, people as well as budget were mentioned by the interviewees and represent the general basis for boundary spanning activities. The category leadership can be connected to a necessary organizational management of the whole process and a leading position, represented by the BfN and BioConsult Schuchardt & Scholle GbR. The other categories have not been directly mentioned along with barriers or enablers for boundary spanning activities within this research. However, based on the general mood in the interviews, understanding culture can be seen as an existing enabling factor because due to the existing scientific background

knowledge within the BfN, a great understanding of scientists' culture is given. The category of power and politics, which is mainly about the political and administrative power relations (O'Flynn et al., 2011) between the interlocutors, was also not mentioned at all. But of course, the BfN, as the federal agency responsible for German marine protected areas, which tenders the research projects and cooperation agreements, has a powerful position. Anyhow, as co-production between the agency and scientists involved was chosen, no hard top-down approaches, hindering boundary spanning activities, could be found within the development process of the management plans.

Final thoughts

Looking at the main research question *"How does the science-policy interface look like and what role do boundary spanning activities play in this?"* of this thesis, it can be said that the science-policy interface within the context of German MPA planning and the development of their management plans, is not a boundary of communication and interaction as strong as expected based on theory and literature. The data triangulation of the conducted qualitative document analysis and the interviews show that scientific information has been incorporated into the management decisions and the final protection measures of the management plans. This can be traced back to three general points. Firstly, a general commitment of both sides, the scientists involved and the policy makers, to work together and find a best solution which is accepted by all, is present. Secondly, due to a great network of the BfN of scientists and bureaucratic employees, a good initial position is provided for a collaboration between them. And thirdly, the own development and use of different boundary spanning approaches is already a milestone compiled, improving the interaction and communication for the whole planning process.

The variation of boundary spanning activities conducted is based on the existence of different 'problem areas' within the interface. Hence, the *knowledge broker* for example helps to put scientific information from outside together to incorporate them into the management plans while the *embedded advisers* in the second interface mainly help to translate knowledge to the policy makers and ministries involved.

Despite a general satisfaction about the science-policy interface and the cooperation within the development process among the involved, the final management plans have been criticized from external parties and organizations. Especially environmental associations and non-governmental organizations, who already have provided a statement on the draft versions of the management plans in 2018, see the final versions critical – the protection measures are too weak to fulfill the MSFD goal to reach a "good environmental status" of the ocean (Kuehl-Stenzel). Not within an official statement to the final management plans but within a report of the BUND, the points of criticism become clear once again (BUND, 2021b). Also, the mood of the interviewee and the fact that, following the management plans, most of the human activities are still allowed within the MPAs, shows that the statement of the environmental associations has not been included in final decision making. Fishery management can be named as an example. Most types of fisheries are still allowed within the marine protected areas, even though it is commonly known that some of them create huge damages on the marine environment. However, as consolation prize, their effects on the protected goods/assets and habitats shall be studied in future. This leads directly to another point of criticism; the high amount of new research projects (cf. chapter **5.2.2.2**). Reading the management plans, they seem to be needed first to be able to decide on strong protection measures. However, certain basic protection measures could already be conducted without having specific scientific information. It therefore appears that ways are being sought to postpone final decisions on protection measures rather than already manifesting clear and strong measures.

Due to the rising pressure on marine space through different human uses, an influence of sectoral pressure on protection measures, can be assumed. Even though or perhaps especially because using the MSP approach, in which an integrative, collaborative and communicative line of decision making is wanted, there is a high possibility of (reduced) compromises as final results, partly fading out the known scientific information. Hereby, nature protection often loses, especially against climate protection measures such as the expansion of offshore wind energy (BUND, 2021a). This shows that a bigger problem for marine conservation is provided by the variety of targets desired for marine space, instead of a science-policy interface.

Generalization and lessons learned

A generalization of the results for international application in MPA planning as thought in the beginning of the present research, is not a possibility as the boundary spanning work conducted within this interface strongly depended on the motivation of the individual people, authorities and organization involved. Instead, it can be said - since the same people and institutions are already working on the management plans for the German MPAs in the Baltic Sea - that the working methods and spirit within the working group should be maintained to ensure this level of or further improvement of the science-policy interface.

Nonetheless, the following **lessons learned** about overcoming a science-policy interface through boundary spanning

1. The potential occurrence of multiple different tensions and problems within an interface requires appropriate use of more than one boundary spanning approach to counteract the development of or to dissolve a strong barrier within.
2. A certain degree of willingness and motivation to collaborate needs to be existing on both sides, scientists and policy makers. This allows
    a. a design of active exchange
    b. the provision of additional effort and time which is necessary for boundary spanning activities
    c. overcoming possible (bureaucratic) obstacles.
3. Many barriers and enablers of boundary spanning are dependent on institutional and organizational capacities.

can be generalized and used to improve collaboration between scientists and policy makers throughout planning practices of marine conservation and within marine spatial planning to ensure the development of sustainable use of marine space.

7 Concluding remarks

Despite the downsides of not having a physical boundary, being difficult in controlling (especially in the high seas) and only providing indirect and mostly delayed economic benefits, marine protected areas are seen as powerful management tools to control human pressure and achieve marine conservation objectives worldwide. However, 'paper parks', legally designated MPAs which are not science-based and where no measures are controlled or taken, do not provide any benefit for the ocean. Therefore, it is more than necessary that the planning process, management decisions and protection measures are based on scientific information. As elaborated upon in chapter **3.2.2.1**, based on literature, this is often hindered by a science-policy interface, creating a barrier of communication and interaction between scientists and policy makers.

Nevertheless, the present research shows, that in context of the development process of management plans for the three MPAs *Sylter Outer Reef, Doggerbank and Borkum Reef Ground* located in the German EEZ of the North Sea, such a strong barrier of communication and interaction is not existing. Instead, the science-policy interface within this context seems to be on a level in which collaboration is valued. Of course, there are always scientists who do not see the need to interact with policy makers directly, as well as policy makers who only want to focus on their targets, but the ones involved in the development process of the management plans see a strong collaboration necessary. Further, no tensions between scientists and policy makers were present, only issues of miscommunication could be identified.

Based on the high motivation of the people involved and the research projects tendered by the BfN, different boundary spanning approaches in line with theory (cf. chapter **3.3**) are conducted within this interface. As result, policy relevant scientific information is distributed to the relevant people of the policy sector, in an understandable way. Therefore, no general language barrier and problem of accessibility is given within the working group. Currently, also no real barriers for boundary spanning activities are present. Instead, only enabling factors were identified, well knowing that such can also act as barriers if they would not be existing in the same way someday.

If the three German marine protected areas in the North Sea can be seen as effective, based on their management plans, cannot be answered yet. This is due to the fact the application and control of the included measures need to be done first, to be evaluated. Furthermore, the management plans are criticized from external people and organizations, not including measures which are strong enough to counteract a deterioration of the marine environment and to comply the desired 'good environmental status' according to the MSFD. So, known scientific information are not used in the best possible way. Therefore, it is also questionable if the management plans can be seen as 'successful' if the included measures are not sufficient. This leads to the conclusion that German MPAs run the risk of being seen as 'paper parks'. A reason for this outcome can be seen in the high number of stakeholders involved, representing different sectoral interests and trading high nature protection measures into low impact compromises.

To counteract a further development of this problem, a focus on synergies of human activities and marine conservation should be set. Finding new ways to use marine space, while simultaneously implementing protective measures and compensatory offsets, would strongly promote the sustainable development of marine use. Further, next to specific management options, setting clear rules and prohibitions within MPAs which are also controlled regularly, would already provide benefits.

Despite seeing scientifically based management plans as important factor for MPA success, it is of great importance to acknowledge that the effectiveness of marine protected areas is not only dependent on the incorporation of current scientific information in management planning and execution. Rather it also depends on the power play between the different ministries involved, the socio-economic pressures and on its legitimacy and compliance beyond all stakeholders involved or effected by a marine protected area. The latter is especially important as controlling certain measures on high seas can be difficult.

Therefore, to ensure effective marine protected areas in the German exclusive economic zone of the North Sea and to fulfill the requirements of the international and national conventions, emphasis is needed on science based MPA planning, durable management and a certain degree of compliance by all stakeholders.

8 Reflection

Within this thesis, case study research was chosen to investigate into the marine science-policy interface in the development process of MPA management plans. Case study research allows to get deeper insights into the situation and to gain more information compared to a research area of a general context. However, in this case it also limits the number of possible interview partner, as they should have been involved in the specific process. Further, some contacted interview partner could not effort the time or have referred to other people involved which were already contacted. As result, the number of interviews was reduced from 10 to 7 people. An opening of the research area towards a general (possibly existing) science-policy interface in German marine conservation would have allowed for a higher number of interviewees.

Another point of criticism is the fact, that only employees of relevant federal agencies have been interviewed but no policy makers directly. This is mainly based on the missing contact details of relevant persons within the management plans and no identification of involved ones were possible. The interviewees were able to provide a general sentiment of policy makers, but it would have been interesting to hear their perceptions of the interface from themselves. If more time had been available, it might have been possible to find out the relevant contact details.

Anyway, the data triangulation of the qualitative document analysis and the conducted interviews worked very well, and the general information provided in the documents could be confirmed by the interviewees. Furthermore, extra information, especially on boundary spanning and on possible barriers and enablers of boundary spanning could be gained due to the interviews.

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Appendix A

Table 1: List of documents used for literature research within the case study (original titles)

YEAR	ORIGINAL TITLE	REFERENCE
1982	United Nations Convention on the Law of the Sea (UNCLOS)	UNCLOS, 1982
1992	Convention for the protection of the marine environment of the North-East Atlantic	OSPAR Convention, 1992
1992	RICHTLINIE 92/43/EWG DES RATES vom 21. Mai 1992 zur Erhaltung der natürlichen Lebensräume sowie der wildlebenden Tiere und Pflanzen	FFH-Directive, 1992
2009	RICHTLINIE 2009/147/EG DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 30. November 2009 über die Erhaltung der wildlebenden Vogelarten	Birds-Directive, 2009
2009	Bundesnaturschutzgesetz	BNatSschG, 2009
2017	Verordnung über die Festsetzung des Naturschutzgebietes „Borkum Riffgrund“ (NSGBRgV)	BMJV, 2017a
2017	Verordnung über die Festsetzung des Naturschutzgebietes „Doggerbank“ (NSGDgbV)	BMJV, 2017b
2017	Verordnung über die Festsetzung des Naturschutzgebietes „Sylter Außenriff – Östliche Deutsche Bucht“ (NSGSylV)	BMJV, 2017c
2017	Methodik der Managementplanung für die Schutzgebiete in der deutschen ausschließlichen Wirtschaftszone der Nord- und Ostsee	BfN, 2017b
2020	Managementplan für das Naturschutzgebiet „Borkum Riffgrund“	BfN, 2020a
2020	Managementplan für das Naturschutzgebiet "Doggerbank”	BfN, 2020b
2020	Managementplan für das Naturschutzgebiet „Sylter Außenriff – Östliche Deutsche Bucht“	BfN, 2020c

Table 2: Detailed overview of measures within the three management plans

Measurement		Suitable			Priority			Necessary		
		BRG	D	SOR	BRG	D	SOR	BRG	D	SOR
MG 1	Accompanying measures to facilitate the implementation of the groups of measures MG 2-5 and to achieve the protective purposes of the Protected Area Ordinance									
M 1.1	Consideration in the update of the spatial development plan for the EEZ	X	X	X	high	high	high	X	X	X
M 1.3	Navigation instructions for maritime navigation in the NSG according to the IHO Standard S-122	X	X	X	high	high	high	X	X	X
MG 2	Minimize the bycatch of non-target species and the negative impacts of the capture of target species and reduction of alteration and destruction of habitats									
M 2.1	Ecosystem-based fisheries management measures	X	X	X	high	high	high	X	X	X
	Investigation of the effects of commercial fishing on the conservation and development of ecosystem-appropriate fishing methods in the permitted fishery in the NSG	X	X	X	medium	high	high	X	X	X
M 2.2	Module 1: Investigation of effects	*	*	*	*	*	*	*	*	*
	Module 2: Development of devices and methods	*		*	*		*	*		
	Module 3: Conversion to alternative devices and methods	*		*	*		*	*		
	Module 4: Further development of management proposals	*	*	*	*	*	*	*	*	*
M 2.4	Elaboration of nature conservation requirements for sand and gravel extraction in the NSG and examination of possibilities to reduce the areas taken up			X			medium			X
MG 3	Reduction of barrier effects, noise inputs and collisions									
M 3.1	Investigation of the effects of commercial shipping and examination of the possibilities of making them compatible with the protection purpose in the NSG	X	X	X	medium	low	high	X		X
M 3.3	Management of protected assets to reduce noise in the NSG	X	X	X	high	high	high	X	X	X
M 3.4	Elaboration of nature conservation requirements for the exploration and and extraction of hydrocarbons in the NSG and examination of further possibilities for the reduction of noise emissions	X	X		medium	medium		X	X	

	Ensuring the interconnectedness of the NSG with functional areas of its protected assets	X	X	X	medium	low	high	X		X
M 3.5	Module 1: Consideration of networking requirements in the updating of the regional spatial development plan	*	*	*	*	*	*	*	*	*
	Module 2: Development and, if necessary, implementation of further concepts	*	*	*	*	*	*	*	*	*
MG 4	Reduction of impairments and hazards due to contaminated sites, waste and pollutants									
M 4.1	Possible dismantling of cables and pipelines no longer in use in the NSG	X		X	low		low			
M 4.2	Low-damage removal of munitions contamination in projects; review of non-project remediation requirements in NSG	X	X	X	medium	low	medium	X		X
	Module 1: Low-damage removal for projects	*	*	*	*	*	*	*	*	*
	Module 2: Examination of project-independent remediation requirements	*		*	*		*	*		*
M 4.3	Recording of waste and examination of remediation requirements in the NSG	X	X	X	low	low	low	*	*	*
	Module 1: Recording in existing monitoring programs	*	*	*	*	*	*	*	*	*
	Module 2: Recording within the scope of MSFD monitoring	*	*	*	*	*	*	*	*	*
	Module 3 : Examination of remediation requirements	*		*	*		*	*		*
M 4.4	Reduction of the input of pollutants and pathogens into the NSG	X	X	X	low	low	low	*		*
	Module 1: Pollutant discharge through scrubber wash water	*	*	*	*	*	*	*	*	*
	Module 2: Wastewater discharge	*	*	*	*	*	*	*	*	*
M 4.5	Reduction of the effects of damage from accidental discharges of pollutants for the NSG	X	X	X	medium	low	medium	X		X
MG 5	Reintroduction of species and/or restoration of habitat types in their typical forms									
M 5.1	Active restoration of habitat types / biotopes / habitats damaged by (historical) uses	X		X	medium		high	X		X B-I
M 5.2	Reintroduction or support of species missing or endangered due to (historical) use	X		X	high		medium	X		X B-I
	Module 1: Reintroduction of the European Oyster	*		*	*		*	*		*
	Module 2: Reintroduction of further species			*			*			*

MG 6	Cooperations and communication									
M 6.1	Cooperation between BfN and fisheries research institutes to improve the compatibility of fisheries with the purpose of protection	X	X	X	high	high	high	X	X	X
	Module 1: Management and research	*	*	*	*	*	*	*	*	*
	Module 2: Monitoring and controlling	*	*	*	*	*	*	*	*	*
M 6.2	Establishment of "round tables"; dialogue with fisheries and nature conservation associations to improve the compatibility of fishing with the conservation purpose	X	X	X	medium	medium	high	X	X	X
	Module 1: Commercial fishing	*	*	*	*	*	*	*	*	*
M 6.3	Establishment of an expert working group with representatives of the BfN and other authorities affected in their responsibilities to improve the compatibility of various uses with the conservation purpose	X	X	X	high	medium	high	X	X	X
	Module 1: Dialogue BfN - Federal Armed Forces	*	*	*	*	*	*	*	*	*
	Module 2: Dialogue BfN - mining authorities	*	*	*	*	*	*	*	*	*
	Module 3: Dialogue BfN - BSH	*	*	*	*	*	*	*	*	*
	Module 4: Development of requirements and agreements	*	*	*	*	*	*	*	*	*
M 6.4	Cooperation of the BfN with the protected area administrations of the marine protected areas of the coastal federal states and neighboring countries	X	X	X	medium	medium	medium	X	X	X
M 6.5	Public communication in coastal tourism	X	X	X	medium	medium	medium	X	X	X
	Module 1: Exhibition	*	*	*	*	*	*	*	*	*
	Module 2: Further protected area-related information offers	*	*	*	*	*	*	*	*	*
MG 7	Monitoring and control									
M 7.1	Development and establishment of an area-related use monitoring in the NSG and its close environment	X	X	X	high	high	high	X	X	X
	Module 1: Recording of fisheries	*	*	*	*	*	*	*	*	*
	Module 2: evaluation of satellite data	*	*	*	*	*	*	*	*	*
	Module 3: On-site use monitoring	*	*	*	*	*	*	*	*	*
M 7.2	Optimization of the monitoring of compliance with the regulations of the protected area ordinance and other restrictions on use	X	X	X	high	high	high	X	X	X

M 7.3	Presentation of uses and activities as well as of results of the marine monitoring in the NSG and its close surroundings	X	X	X	medium	medium	medium	X	X	X	

Legend:

* module included in the measurement

X B-I = only necessary for area I

Table 3: Codebook in English

KATEGORIE	CODE	DEFINITION
SCIENCE	Scientists	Statements referring to scientists
	Research projects	Statements that relate to research in general and to research projects
	Data collection and compilation	Statements that relate to data collection and compilation
	Data processing	Statements that relate to the processing of data
	Fact-based	Statements that relate to the need for science / evidence-based measures
POLICITCS AND OFFICAL AUTHORITIES	Decisions	Statements that relate to decisions to be made
	Responsibilities	Statements that refer to the various competencies and responsibilities within an authority
	Ministries	Statements die sich auf die verschiedenen involvierten Ministerien beziehen
	Authorities	Statements referring to the relevant authorities
SCIENCE-POLIYCY INTERFACE	Interest in fact-based measures	Statements referring to the fact that measures must be fact-based
	Tensions	Statements referring to tension between scientists and the authorities
	Discourse	Statements that refer to an active discourse
	Lack of exchange / interaction	Statements referring to the fact that there is too little exchange and interaction
	Limited access to scientific results	Statements referring to the fact that access to scientific results is restricted
	Incorrect interpretation of the facts	Statements that refer to facts/knowledge being misinterpreted
	Decisions that are not fact-based	Statements that refer to decisions and actions not being fact-based
	Supportive framework for the contribution of scientific results	Statements that refer to frameworks that support the incorporation of scientific facts
	Barriers to the introduction of scientific results	Statements that refer to framework conditions that hinder the introduction of scientific facts
BOUNDARY SPANNING	Co-production	Statements referring to the approach of co-production
	Embedding	Statements referring to the approach embedding
	Knowledge broker	Statements referring to the approach knowledge broker
	Boundary organization	Statements referring to the approach boundary Organization
	Communication	Statements referring to a communication between scientists and authorities
	Linguistic translation	Statements referring to a linguistic translation (e.g. easy language)
	Texts / Publications	Statements referring to written texts (publications of any kind)
	Collaboration	Statements that relate to collaboration
	Discussion groups / committees	Statements referring to committees and discussion groups (etc.)
	Enabling factors	Statements that relate to frameworks that support boundary spanning activities
	Barriers	Statements that address potential barriers that may limit boundary spanning activities

MARINE NATURE PROTECTION	Protected goods	Statements that relate to the protected goods of marine protected areas
	Protected areas	Statements that relate to marine protected areas in general
PLANNING PROCESS	Protected Area Ordinance	Statements referring to the protected area ordinance
	Management plans	Statements that relate directly to the management plans
	Criticism of the management plans / statements	Statements referring to criticism of the management plans
STAKEHOLDER	Stakeholders and their influence	Statements that refer to relevant stakeholders and their influence in the identification of measures

Table 4: Codebook in German

KATEGORIE	CODE	DEFINITION
WISSENSCHAFT	Wissenschaftler	Statements die sich auf Wissenschaftler beziehen
	Forschungsprojekte	Statements die sich auf Forschung im Allgemeinen und auf Forschungsprojekte beziehen
	Datenerhebung und -Sammlung	Statements die sich auf Datenerhebung und -Sammlung beziehen
	Datenverarbeitung	Statements die sich auf die Verarbeitung von Daten beziehen
	Faktenbasiert	Statements die sich auf die Notwendigkeit von wissenschafts- / faktenbasierten Maßnahmen beziehen
POLITIK (BZW. BEHÖRDEN)	Entscheidungen	Statements die sich auf zu treffende Entscheidungen beziehen
	Zuständigkeiten	Statements die sich auf die verschiedenen Zuständigkeiten und Verantwortlichkeiten innerhalb einer Behörde beziehen
	Ministerien	Statements die sich auf die verschiedenen involvierten Ministerien beziehen
	Behörden	Statements die sich auf die relevanten Behörden beziehen
SCIENCE-POLIYCY INTERFACE	Interesse an faktenbasierten Maßnahmen	Statements, die sich darauf beziehen, dass Maßnahmen faktenbasiert sein müssen
	Spannungen	Statements die sich auf Spannung zwischen Wissenschaftlern und die Behörden beziehen
	Diskurs	Statements die sich auf einen aktiven Diskurs beziehen
	Fehlender Austausch / Interaktion	Statements, die sich darauf beziehen, dass es zu wenig Austausch und Interaktion gibt
	Begrenzter Zugang zu wissenschaftlichen Ergebnissen	Statements, die sich darauf beziehen, dass der Zugang zu wissenschaftlichen Ergebnissen eingeschränkt ist
	Falsche Auslegung der Fakten	Statements, die sich darauf beziehen, dass Fakten/ Wissen falsch ausgelegt werden
	Entscheidungen die nicht faktenbasiert sind	Statements, die sich darauf beziehen, dass Entscheidungen und Maßnahmen nicht faktenbasiert sind
	Unterstützende Rahmenbedingungen für das Einbringen von wissenschaftlichen Ergebnissen	Statements, die sich auf Rahmenbedingungen beziehen, die das Einbringen von wissenschaftlichen Fakten unterstützen
	Barrieren für das Einbringen von wissenschaftlichen Ergebnissen	Statements, die sich auf Rahmenbedingungen beziehen, die das Einbringen von wissenschaftlichen Fakten behindern
BOUNDARY SPANNING	Co-Produktion	Statements die sich auf den Ansatz „Co-Produktion“ beziehen
	Embedding	Statements, die sich auf den Ansatz „Embedding“ beziehen
	Knowledge broker	Statements, die sich auf den Ansatz „Knowledge broker“ beziehen
	Boundary Organisation	Statements, die sich auf den Ansatz „Boundary Organisation“ beziehen
	Kommunikation	Statements, die sich auf eine(n) Kommunikation/ Austausch zwischen Wissenschaftlern und Behörden beziehen

	Sprachliche Übersetzung	Statements, die sich auf eine sprachliche Übersetzung (z.b leichtere Sprache) beziehen
	Texte / Veröffentlichungen	Statements, die sich auf geschriebene Texte beziehen (Veröffentlichungen jeglicher Art)
	Zusammenarbeit	Statements, die sich auf eine Zusammenarbeit beziehen
	Gesprächskreise / Gremien	Statements, die sich auf Gremien und Gesprächskreise (etc.) beziehen
	Unterstützende Rahmenbedingungen	Statements, die sich auf Rahmenbedingungen beziehen, die Boundary Spanning Aktivitäten unterstützen
	Barrieren	Statements, die sich auf mögliche Barrieren beziehen, die Boundary Spanning Aktivitäten einschränken können
MARINER NATURSCHUTZ	Schutzgüter	Statements, die sich auf die Schutzgüter der Meeresschutzgebiete beziehen
	Schutzgebiete	Statements, die sich generell auf die Meeresschutzgebiete beziehen
PLANUNGSPROZESS	Schutzgebiets-Verordnung	Statements, die sich auf die Schutzgebiets-Verordnung beziehen
	Managementpläne	Statements, die sich direkt auf die Managementpläne beziehen
	Kritik an den Managementplänen / Stellungnahmen	Statements, die sich auf Kritik an den Managementpläne beziehen
STAKEHOLDER	Stakeholder und ihr Einfluss	Statements, die sich auf relevante Stakeholder und ihren Einfluss bei der Maßnahmenfindung beziehen

Appendix B

Interview guide in English

INTRODUCTION (of yourself, thesis topic, explaining the right to stop the interviewee whenever he/she wants, confirmation for recording etc.)

1. What is your profession and your current job/tasks in X?
2. How is your job connected to marine conservation/ the planning process of MPAs?
3. What was your role in the development process of the management plans?

The following questions refer to the planning process of MPAs and their management plans

SCIENCE-POLICY INTERFACE

4. Is there a general commitment between scientist and politicians to communicate and include (recent) research results? [following legislation guidelines?]
5. Can you give an overview of the tensions between scientists and politicians in the planning process of MPAs?
    a. (In your opinion, what is the reason for this?)

BOUNDARY SPANNING AND THEIR BARRIERS/ENABLERS

6. Is there a type of mediator to make the interaction and communication easier between scientists and politicians? /Enhance the communication in general?

    If so,
    a. What kind of mediator is it?
    (Embedded adviser, knowledge broker, boundary organization, co-production)
    b. What kind of tasks are conducted?
    (Summary and presentation of research results, interpretations, information/fact sheets, clear list of political goals so researcher know what information helpful, easy and understandable access to scientific research results, 'easy language', etc.)
    c. What are enabling factors for a mediating role? What makes it possible to have a mediating role in the planning process?

    If not,
    a. Why is there no 'mediator'?
    b. What are the 'barriers' to have a 'mediator'? [not needed, difficult to implement, etc.]

COMING TO AN END

7. Do you know the term 'boundary spanning' for this kind of tasks?
8. Is there something else related to this topic you would like to share with me/ could be interesting for me?
9. Do you know other professionals/ experts I could interview?

THANK YOU

Interview guide in German

1. Was ist ihr Beruf und welche Aufgaben übernehmen Sie zurzeit in ihrer Behörde/Firma?
2. In welcher Verbindung steht ihre Arbeit mit dem Thema mariner Naturschutz und den Meeresschutzgebieten?
3. Was war ihre Aufgabe im Planung-/Erstellungssprozess der Management Pläne?

<u>Die folgenden Fragen beziehen sich auf den Planungsprozess von MPAs und deren Managementpläne</u>

SCIENCE-POLICY INTERFACE (generell im Planungsprozess von MPAs)

4. Gibt es ein generelles Verständnis zwischen Wissenschaftler*innen und Politiker*innen / Entscheidungsträgern*innen zu kommunizieren und Wissen auszutauschen, um dieses in die Entwicklung von Managementplänen einfließen zu lassen?
5. Treten generelle Spannungen zwischen Wissenschaftler*innen und Politiker*innen / Entscheidungsträger*innen auf? Wie ist die Stimmung zwischen den beiden Parteien?
    a. Rückfrage: Woran liegt das ihrer Meinung nach?

BOUNDARY SPANNING AND THEIR BARRIERS/ENABLERS (Im Entwicklungsprozess der Managementpläne)

6. Gibt es eine Art 'Vermittlerrolle' zwischen Wissenschaftler*innen und Politiker*innen / Entscheidungsträger*innen, die die Kommunikation und den Wissensaustausch beeinflusst/verstärkt?

    Wenn ja,
    a. Was für eine Art Vermittlerrolle liegt vor?
    (Embedded adviser, knowledge broker, boundary organization, co-production)
    b. Was für Aufgaben werden durch diese Vermittlerrolle ausgeführt? (Zusammenfassungen, Berichte, Präsentationen, Fact sheets, Fakten in einfacher Sprache, vereinfachter Zugang zu Forschungen)
    c. Was für Gegebenheiten/ Rahmenbedingungen müssen bestehen, um eine Vermittlerrolle zu ermöglichen?

    Wenn nein,

    a. Warum gibt es keine Vermittlerrolle?
    b. Was für Hindernisse bestehen, die eine Vermittlerrolle einschränken?
    (schwer einzuführen, nicht notwendig, zu komplexes Organigramm, zu viele Beteiligte, etc.)

COMING TO AN END

7. Kennen sie den Begriff 'Boundary Spanning'?
8. Gibt es noch etwas, dass sie im Bezug zu diesem Thema mit mir teilen möchten? Personen, die für mich relevant wären?

Vielen Dank für ihre Zeit und Hilfe!