NATURAL RESOURCE MANAGEMENT IN COASTAL AREAS

- A Case Study from the South Baltic Sea -

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OVERVIEW

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ABBREVIATIONS

AfROVP	Office of Spatial Planning and Regional Development Western Pomerania
AMMV	State Ministry of Labor, Construction and Spatial Planning in M-V (nowadays it is the EMMV)
BASMV	Mining authority of MV in Stralsund
BBergG	Federal Mining Law
BfN	Federal Agency of Nature Conservation
BLE	Federal Institute of Agriculture and Nutrition
BMEL	Federal Ministry of Food and Agriculture
BMJV	Bundesministerium für Justiz und Verbraucherschutz
BMU	German Ministry of Environment, Nature Conservation and Nuclear Safety
BMVI	Ministry of Transport and Digital Security
BNatSchG	Federal Nature Conservation Act
BSH	Federal Institute for shipping and hydrography
BSR	Biosphere Reserve
BLMP	German Working Group on Marine Conservation Issues of the Federal States and the Federal Government (Arbeitsgruppe Bund/Länder-Messprogramm Nord- und Ostsee)
CAP	Common Agricultural Policy
CFP	Common Fisheries Policy
DBU	Federal German Environmental Fundation (Deutsche Bundesstiftung Umwelt)
DL files	Data language files
EBM	Ecosystem-based management
EC	European Commission
EEC	European Economic Community
EEZ	Exclusive Economic Zone
ESDP	European Spatial Development Perspective
EU	European Union
EMMV	State Ministry of Energy, Infrastructure and Spatial Planning
FFH-Directive	Council Directive 1992/43/ECC on Conservation of natural habitats and of wild fauna and flora
GWB	Greifswald Bay
GFO	German Fertilizer Ordinance
ICES	International Council for the Exploration of the Sea
ICZM	Integrated coastal zone management
IfaÖ	Institute of applied ecosystem research GmbH
INSNA	International network for social network analysis
LALLF	State Office for Agriculture, Food Safety and Fishery in M-V
LAV	State Association for Angling in M-V
LdKKF	Fishery Association of the Cutter and Small Scale Fisheries in M-V
LEP	State Development Program
LMfRO	State Ministry of Energy, Infrastructure and Spatial Planning M-V (Department of Spatial Planning)
LUMV	State Ministry of Agriculture, Environment and Consumer Protection M-V
LUNG M-V	State Ministry of Agriculture, Nature Conservation and Geology M-V
LWaG	State Water Resource Law

MariLim	Aquatic Research GmbH
MS	Member States
MSC	Marine Stewardship Council
MSFD	Marine Strategy Framework Directive (2008/56/EC)
MSP	Marine Spatial Planning
MSPI	Marine Spatial Planning Initiative
MSY	Maximum sustainable yield
M-V	Mecklenburg-Western Pomerania
n.a.	no data available
ppt	parts per thousand (common way to express water salinity)
ROG	Federal Spatial Planning Act
RPV	Regional Planning Unit
RPVVP	Regional Planning Unit in Western Pomerania
RREP	Regional Spatial Development Program
SACs	Special Areas of Conservation (Habitats Directive)
Sd	Standard deviation
SNA	Social Network Analysis
SPAs	Special Protection Areas (Birds Directive)
SSTs	Sea surface temperatures
Stalu VP	Regional Agency for Agriculture and Environment in Western Pomerania
STECF	Scientific, Technical and Economic Committee for the Fisheries
TAC	Total allowable catch
TI-OF	Thünen Institute of Baltic Sea Fisheries
UNB	Lower Nature Conservation Authority
UNCED	UN-Conference on Environment and Development
VP	Western Pomerania
WaStrG	Federal Water Way Law
WBSS	Western Baltic spring spawning herring
WFD	European Water Framework Directive (2000/60/EC)
WHG	Federal Water Resource Law
WSA	Water and Shipping Office in Stralsund
WSV	Federal Water- and Shipping Administration Office
WWF	World Wide Fund for Nature

1 GENERAL INTRODUCTION

1.1 The Management of Natural Resources

The management of natural resources has been - and will continue to be - one of the most essential tasks for human societies as they depend on the long-term maintenance of natural resources to ensure survival and well-being (Saglie, 2006, p. 1). In this study, the management of natural resources is in the focus of the scientific discussion. The Greifswald Bay (in German: Greifswalder Bodden, GWB) and its coastal areas have been chosen as the case study for this research. The area covers highly vulnerable marine and terrestrial ecosystems and habitats for endemic plants and animals. The Greifswald Bay itself serves as a major spawning and nursery ground for the western Baltic spring spawning (WBSS) herring (Oeberst et al., 2009, p. 1671; Polte, Kotterba, Hammer, & Gröhsler, 2013, p. 2), which has a crucial importance for the regional coastal small scale fishery. In 2014, herring catches constituted more than 90% of the total catches landed by regional fishermen (LALLF, 2015). The area of the Greifswald Bay is distinctively shaped in its culture by a long tradition of anthropogenic uses. Land use for agriculture dominates the landscape (StaluVP, 2011, pp. 14-15). The juxtaposition of protection needs to ensure the ecological preservation of the area and, on the other hand, the diversity of divergent spatial human usage claims evinces the need for the implementation of a coherent and effective natural resource management. In the context of this thesis, natural resource management is understood as the concrete organization of tasks and processes with respect to the sustainable development of coastal areas and their natural resources. Ecological aspects of sustainability comprise the focus of the analysis. Natural resources include various components and functional characteristics of nature, e.g. surface and groundwater bodies, arable land and soils, fish stocks and spawning grounds, genetic biodiversity, and mineral resources. However, management practices to sustain these resources are often a contentious issue. On one hand, the effectiveness of management practices striving to achieve sustainability are often disputed within the natural scientific discourse. On the other hand, the design of management systems and procedures themselves may also be contested (Saglie, 2006, p. 1).

In the case study area, the efforts to sustain natural resources in a long-term perspective are documented in a plethora of environmental policies. However, several major environmental problems have not been effectively tackled as of yet, menacing marine and terrestrial ecosystems and habitats in the case study area. For instance, there are still huge amounts of nutrients discharged into the water body of the Greifswald Bay, adversely affecting biodiversity and the distribution of macrophytes (Bachor & Weber, 2008, p. 3; Munkes, 2005, p. 22), which serve as major spawning substrate for herring and other fish species in the region. This thesis seeks for reasons why environmental problems could still not effectively be addressed and therefore analyses the institutional framework as well as the policy network underlying natural resource management processes in the case study area.

Natural resource management in the case study area is suggested to be substantially fragmented, characterized by a plethora of sectoral policies and a variety of different state and non-state actors pursuing divergent interests regarding the use and the protection of the Greifswald Bay and its coastal areas. Institutional fragmentation may have serious adverse effects on the ecological conditions in (coastal) areas, if different policy sectors pursue conflicting objectives and therefore neglect holistic management approaches to natural resource management. The incoherency of

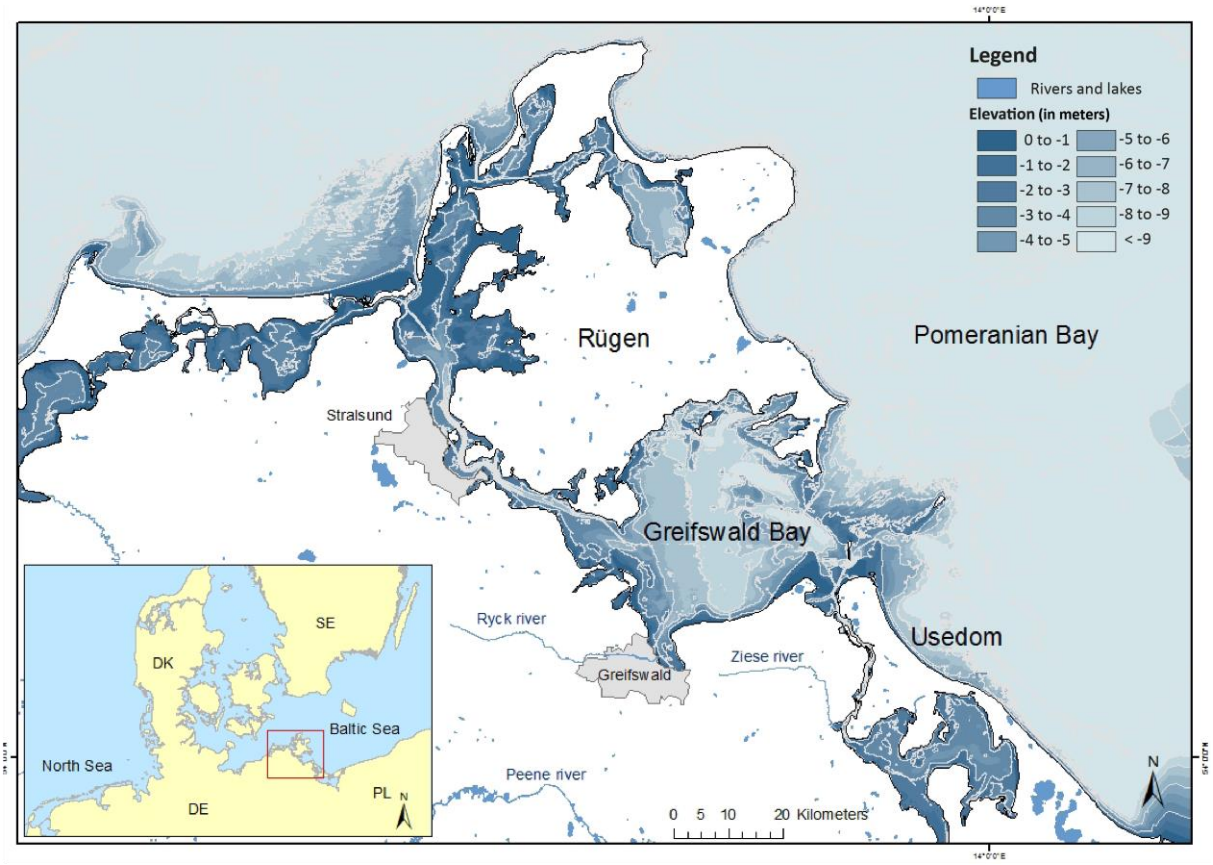
policies may impede effective strategies to support the sustainable development in an area. The prioritization of sectoral policy goals in policy making may further establish power asymmetries among the different actors, thus impeding cooperative approaches to natural resource management. An uncoordinated planning between policy sectors and the prioritization of sectoral interests have been found to be problematic with respect to the sustainable, coherent management of natural resources (Ekstrom, Young, Gaines, Gordon, & McCay, 2009, p. 532; Saglie, 2006, p. 10; Steel & Weber, 2001, p. 120). There are a few policies that try to strengthen coordination among different sectoral policy fields and actor groups in the case study, as a sustainable development in coastal areas is suggested to be particularly dependent on a cooperative approach and the inclusion of major resource users. In this context, important policies are the State Development Program for M-V (LEP) from 2005, the National Strategy for an Integrated Coastal Zone Management (ICZM) from 2006 and the Marine Strategy Framework Directive from 2008. All three policies emphasize the need for policy tools that establish coherence between sectoral policy objectives and that particularly pay attention to prevent the reinforcement of individual or partial actor groups' interests. Therefore, a holistic management approach is promoted replacing sectoral management perspectives (AMMV, 2005, p. 16 and 67; EC, 2002: Chapter 2 (f)-(h); 2008: Initial Justification: Number 9). Having this in mind, the management of natural resources can be considered a question of collective agreement and negotiation on prospective goals and strategies. In this thesis, an ecosystem-based management approach is seen as being equally important with respect to a coherent and sustainable natural resource management. Thus, the coordination of policy objectives should be complemented by considerations on ecosystem interactions and interrelations to avoid detrimental ecosystem impacts.

The coordination of a high number of state and non-state actors is a time- and resource-consuming process (Saglie, 2006, pp. 10-11). A diverse spectrum of interests and an uneven distribution of costs and benefits may further cause tensions between different actor groups. Additionally, actors in policy subsystems may have become largely autonomous with varying 'degrees of mutual commitment or dependence on others' (Heclo, 1978, p. 102). Heclo (1978) argues that power and influence is a matter of the actual 'configuration through which leading policy makers move and do business with each other' (Heclo, 1978, p. 88). For this reason, it is essential to identify who the key actors and their interests in public policy making are, how they interact and what effects their interactions have with respect to management decisions. This will be part of the analysis in this research.

Natural resource management in the case study is analyzed in the context of a fragmented management system including diverse sectoral policy subsystems and a variety of different state and non-state actors pursuing divergent interests. The central aim of this research is to answer the question how actors involved in natural resource management in the Greifswald Bay succeed in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation and whether this contributes to the improvement of the ecological conditions in this area.

1.2 The Greifswald Bay

The Greifswald Bay is a semi-enclosed, inshore basin that is shaped by the mainland coast of the Southern Baltic and the Island of Rügen, Germany. The bay covers an area of approximately 514 km^2 and is characterized by an average water depth of 5.8 m (Stigge, 1989, p. 10) with a maximum of 13.6 m (Reinke, 1989, p. 3).



Map 1: Map of the Greifswald Bay

In the east, the bay gains open access to the Baltic Sea by a shallow, fringing shoal that is interrupted by various shipping channels. To the west, the bay is connected to the coastal Baltic Sea through a tight sound, separating the mainland from the Island of Rügen. The entire water body of the Greifswald Bay is exchanged with water from the Baltic Sea around eight times a year. The process is mainly wind-driven as tidal amplitudes are marginal (<10 cm, semi-diurnal) in the inner Baltic Sea region. The salinity of the Greifswald Bay is characterized by a mesohaline water regime with lower surface water salinity values in spring and summer time (circa 6 ppt) and higher values in winter (circa 8 ppt). Those alterations are mainly dependent on seasonally varying precipitation intensity and wind drift (Polte et al., 2013, p. 2). The annual mean salinity is about 7.3 ppt (Kell, 1989). Seasonal temperature fluctuations are high in amplitude and range from regular sub-zero degree Celsius sea surface water temperatures (SSTs) with an ice cover in winter months, to more than 20˚C SSTs in summer (Polte et al., 2013, p. 2). Based on the temperatures, the inland lake characteristics of the GWB become obvious. Thus, compared to the Baltic Sea, SSTs tend to increase faster in summer, but also drop faster in winter.

Due to constant coastal wind force, there is a continual intermixture of water leading to a suitable aeration. The content of dissolved oxygen at the bottom is normally close to 100% during the major herring spawning season in spring time (Polte et al., 2013, p. 2). Submerged aquatic vegetation is abundant, especially in the littoral zone, and dominated by communities of flowing plants, such as pondweeds *(Potamogetonaceae)* and eelgrass *(Zostera marina)* as well as a diverse macroalgal community (Polte et al., 2013, p. 4). However, the ecosystem of the Greifswald Bay is largely affected by eutrophication (Munkes, 2005, p. 22). There are several inflows to the GWB that transport huge amounts of nutrients (especially nitrate and phosphorus) straight to the coastal water body (Bachor

& Weber, 2008, p. 3). During the last years, excessive nutrient discharge caused the accumulation of large quantities of phosphorus in sediments on the bottom that might easily be remobilized, especially in lower or riparian areas of the bay (Bachor & Weber, 2008, p. 4). In literature, descriptions of the density and composition of the existing macrophytobenthos vary considerably. However, it is highly likely that submerged vegetation communities substantially decreased during the last decades, and that the lower depths limit of distribution was reduced (Hammer, Zimmermann, von Dorrien, Stepputtis, & Oeberst, 2009, p. 46). In many studies, an increased eutrophication, phytoplankton blooms, and a consequentially reduced water transparency and light irradiation were identified as causes for a decline of submerged vegetation (Bachor & Weber, 2008, p. 30; Munkes, 2005, p. 22).

The Greifswald Bay was found to be one of the major spawning areas for the western Baltic spring spawning (WBSS) herring that is of crucial economic importance for the regional coastal small scale fishery. Studies showed that there is a positive correlation between the yearly herring larval production in the GWB and the abundance of one and two-year old juvenile fish in the whole western Baltic Sea (Oeberst et al., 2009, p. 1671). Until the present day, commercial fish stocks (such as the herring stocks) are exclusively managed through quotas and total allowable catches (TACs). These management mechanisms primarily manage the adult fish stock that, in the case of herring, once a year returns to its spawning areas in the coastal regions. Due to an annual quota setting the adult spawning stock biomass[1] grew slightly during the last four years. However, the reproduction of early larval stages obviously decreased (ICES, 2014, p. 9). The reasons for this decline are not well understood at this point. Most probably, they lie in the complex interaction of several different environmental parameters. But also anthropogenic impacts may play a role as they change the physical and biological environment (Polte et al., 2013, p. 2).

During the last years, human uses and spatial claims considerably increased in coastal regions (BMU, 2006, p. 6). The GWB and its coastal areas are home to many traditional and ‘new’ usage forms, such as shipping, fishery, tourism, nature conservation, energy generation, pipeline construction, and cable transfer (Fey et al., 2014, pp. 15-17). A multitude of different actors pursue various interests with respect to natural resource management in the case study area. The management is characterized by a fragmented institutional setting comprising separate organizational frameworks with their own comprehensive policies on different political levels. These include the organizational frameworks for fishery, nature conservation, and agricultural policy issues (Strehlow et al., 2014, pp. 3-4).

In this study, I do not exclusively refer to the water body of the Greifswald Bay, but rather consider the whole ensemble of all terrestrial and marine coastal areas in this region. I therefore define coastal areas as all those areas directly surrounding coastal waters, as well as all marine areas within a close distance to the coast (up to 12 nautical miles). I include all municipalities and administrative districts that border the coastline.

1.3 Aim of the Study and Research Questions

As formulated above, the central question in the focus of this thesis is how actors involved in natural resource management in the Greifswald Bay succeed in developing (policy) networks and strategies

[1] Overall weight of all adult herring that partake in spawning events and thus contribute with shed spawn (Barz & Zimmermann, 2015)

to mitigate negative effects of institutional fragmentation and whether this contributes to the improvement of the ecological conditions in this area. It is suggested that institutional fragmentation may have negative effects on the ecological conditions in (coastal) areas, if different policy sectors pursue conflicting objectives and therefore neglect holistic management approaches. The incoherency of policies and the prioritization of sectoral policy goals may impede effective strategies to support the sustainable development in an area and may further establish power asymmetries among different actor groups. A coordinated planning and a mutual approach to natural resource management are assumed to be essential with respect to ecological sustainability. In order to address the central research question, several different analysis steps are combined to add parts to the puzzle.

In a first step, different policy fields and policies that are shaping natural resource management in the case study are identified and analyzed, particularly focusing on their ambiguities and inherent conflict potentials. This policy analysis is further used to display the fragmentation of the institutional setting within that natural resource management takes place. Therewith, it becomes possible to determine weaknesses and strengths of the current management system in the case study area. This analysis step serves as the starting point for a critical discussion of existing management practices in the Greifswald Bay and its coastal areas.

Introduced by the policy analysis, a second major research step deals with the identification of all those actors that are provided with a specific responsibility or that pursue specific interests with respect to the use and the protection of the GWB and its coastal areas. This part of the analysis helps to explain fragmentation in the management of natural resources in the case study area, not focusing on policies as in the previous step, but rather on the actors that are integral part of the management system – either as resource manager or at least through being affected by management decisions and actions. To understand different behavioral rationalities, semi-structured interviews were conducted with a variety of these actors. Additionally, roundtable discussions were initiated. These approaches help to gather insights into the perceived reality of actors, their fears and their needs with respect to the implementation of various possible policy options to manage natural resources in the case study area. At the same time, conflict issues and tensions between different actor groups are revealed. Conflicts are suggested to reinforce fragmentation through impeding cooperative approaches to natural resource management. Cooperative approaches are further complicated, if certain actor groups feel less powerful (than other actors) to influence management decisions. In the context of opposing interests, the study assesses how different actor groups perceive themselves and other actors with respect to their influence in natural resource management. This approach serves to measure the *perceived* influence distribution among the assessed actor groups. The self-perceived access to resources and the perceived (dis-)advantages in decision making have been proven to considerably influence the actual capacity of a group to exert power (Fischer & Sciarini, 2013, p. 4; Johnson & Orbach, 2002, p. 308).

A third major research step strives to answer the question whether (potentially) identified negative effects of institutional fragmentation with respect to natural resource management in the case study are mitigated through cooperation among different actor groups. One way of addressing this question is the structural analysis of the existing (policy) network including all those actors that were identified in the previous step as being important natural resource managers or as being affected by respective management decisions. Policy network analysis provides a range of tools to assess how different actors or actor groups interact and cooperate with each other. It is furthermore suitable to

determine the centrality and thus the power that an actor may potentially exert to implement the own interests. This way, *perceived* power, which was analyzed in the previous step, can be compared to an actor group's power derived by quantitative network analysis. In this context, policy network analysis may further serve as a tool to identify those actors or actor groups that are rather marginalized within decision making. Patterns of institutional fragmentation are assessed through the analysis of the degree of intergroup cooperation. An effective natural resource management in the case study area is suggested to depend on the cooperation of different actor groups.

The following figure summarizes all research questions that contribute to understanding the central topic of this thesis and assigns these subordinated questions to the applicable method.

A) POLICY ANALYSIS
Q1: Which are the different policy fields and policies that are shaping natural resource management processes in the case study area?
B) SEMI-STRUCTURED INTERVIEWS AND CONFLICT ANALYSIS
Q2: Who has an interest in the use and the protection of natural resources in the Greifswald Bay and its coastal areas and what are the different actors' interests?
Q3: What are the major conflicts between the different actor groups?
Q4: How do different actor groups perceive themselves and other actors with respect to their influence in natural resource management?
C) POLICY NETWORK ANALYSIS
Q5: How does the natural resource management network in the GWB look like?
Q6: How do different actors or actor groups involved in natural resource management interact with each other?
Q7: In which way are different actors integrated into natural resource management? Are there actors or groups that are more marginalized than others?
Q8: How is power among different actor groups distributed in natural resource management?

Figure 1: Research questions

1.4 Structure of the Work and Research Design

This study is divided into eight main chapters. The first chapter consists of a general introduction to the management of natural resources in the case study area. In this context, the implementation of a coherent management approach is problematized in view of an increasingly fragmented institutional setting. Subsequently, the Greifswald Bay as the case study for this research is introduced. The first chapter ends with explaining the aim and the research questions as well as the research design.

The second main chapter comprises three major conceptualization subchapters explaining and contextualizing the key research concepts, namely: 'institutional fragmentation', 'actors', and 'policy networks.'

The third chapter of the study provides a detailed description of the methodology and the different data collection procedures.

The results of the study are presented in the subsequent three chapters, each emphasizing a different major aspect. The fourth chapter gives a detailed overview of the different relevant policy fields and policies and thereby provides a picture of the institutional fragmentation of the current management system regulating the use and the protection of natural resources in the case study area. The fifth chapter describes the identified actors, their interests and perceptions with respect to resource management in the case study. It further analyzes various management conflicts and issues among different actor groups that are likely to impede cooperative approaches and mutual management strategies. The sixth chapter focuses on the distribution of power among the different actor groups that are part of the natural resource management network – either as resource managers or by being affected by management decisions in the case study area. This chapter focuses on both the perceived influence of certain actor groups in the policy network, but also the influence determined by quantitative network analysis.

The penultimate chapter (Chapter 7) introduces the discussion of the major findings and further the methodological limitations of this research.

The final chapter (Chapter 8) summarizes the most crucial findings of the study and provides answers to the central question, how actors involved in natural resource management in the Greifswald Bay succeed in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation and whether this contributes to the improvement of the ecological conditions in this area. Concluding remarks try to elaborate ideas on how a sustainable, coherent natural resource management in the case study area could prospectively be strengthened.

The following figure provides a structural overview of the research design and the major research concepts:

Chapter 1: GENERAL INTRODUCTION

Defining the research problem

- Incoherence in natural resource management and challenging environmental conditions

Research focus

- Institutional fragmentation in natural resource management
- Different actors' interests and conflicts with respect to natural resource management
- Actor networks and distribution of power

Research area

- Greifswald Bay and its coastal areas

Research questions

Q1: Which are the different policy fields and policies that are shaping natural resource management processes in the case study area?

Q2: Who has an interest in the use and the protection of natural resources in the Greifswald Bay and its coastal areas and what are the different actors' interests?

Q3: What are the major conflicts between the different actor groups?

Q4: How do different actor groups perceive each other with respect to their influence and interest representation?

Q5: How does the natural resource management network in the GWB look like?

Q6: How do different actors or actor groups involved in natural resource management interact with each other?

Q7: In which way are different actors integrated into natural resource management? Are there actors or groups that are more marginalized than others?

Q8: How is power among different actor groups distributed in natural resource management?

Chapter 2: CONCEPTUALIZATION

Policy making in the Context of Institutional Fragmentation

- Institutional arrangements
- Policy contents
- Conflicting policy issues
- Institutionalization of conflicts
- Structural power

Actors and their Relationships

- The meaning and role of institutions
- Trust as social capital in actor relations
- Power in actor relations
- Subjective meanings, perceptions, interests, and urgency
- Conflicts among actors, fears and needs

Policy networks

- Interaction processes and actor constellations
- Centrality and positional power of individual actors and actor groups
- Integration and marginalization of actors

Chapter 3: METHODOLOGY

Methods	Questions
Document and policy analysis	Q1
Semi-structured qualitative interviews	Q2, Q3, Q4
Snowball sampling	Q2
Roundtable discussions & participatory observations	Q2, Q3, Q4
Conflict analysis	Q3
Social network analysis	Q5, Q6, Q7, Q8
Interactional approach	Q6
Positional approach	Q7, Q8
Reputational approach	Q4

Chapter 4: POLICY FIELDS AND THE INSTITUTIONAL SETTING

- Organizational framework of the fishery
- Organizational framework of nature (and water) conservation
- Organizational framework of agriculture
- Organizational framework of spatial planning
- Organizational framework of mining and resource extraction
- Organizational framework of the water and shipping administration

Chapter 5: ACTORS, INTERESTS, PERCEPTIONS AND CONFLICTS IN NATURAL RESOURCE MANAGEMENT

- Actors shaping natural resource management in the study site
- Divergent interests in natural resource management
- ICZM and EBM in the study site
- Perception of negative impacts on coastal ecosystems
- Conflicts among different actor groups in the Greifswald Bay
- Implementing a management approach towards sustainability

Chapter 6: THE DISTRIBUTION OF POWER IN NATURAL RESOURCE MANAGEMENT

- Influence and power perception from different actor groups' perspectives
- The integration and marginalization of different actor groups in the policy network
- Centrality measures on individual and subgroup level derived from quantitative network analysis

Chapter 7: DISCUSSING SUSTAINABLE MANAGEMENT PRACTICES IN THE CASE STUDY AREA

- Fragmentation in natural resource management and cooperative management approaches
- Interest antagonism, existential fears, mutual trust and mediation
- The institutionalization of management conflicts
- Power of actor groups in natural resource management
- The science-policy interface, decision making under conditions of uncertainty, and the inclusion of local knowledge
- Methodological limitations

Chapter 8: CONCLUSION

- How do actors involved in natural resource management in the Greifswald Bay succeed in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation and does this contributes to the improvement of the ecological conditions in this area?
- Strengthening sustainable, coherent natural resource management in the case study area

Figure 2: Design of the study

2 KEY RESEARCH CONCEPTS

2.1 Policy Making in the Context of Institutional Fragmentation

Many societal and environmental problems have become progressively complex and, as a result, no longer fit the problem-solving structure of traditional government (Sandström, 2008, p. 1). While the boundaries between different levels of governmental entities, as well as different policy sectors, are administratively defined, societal and environmental problems, which are interdependent and cross-scale in nature, transcend these boundaries (Berkes, 2002, pp. 293-294; Hanf & Scharpf, 1978, p. 1; Koppenjan & Klijn, 2004, p. 1; Sandström, 2008, p. 1). Hence, 'governments are more and more confronted with tasks where both the problems and their solutions tend to cut across the boundaries of separate authorities and functional jurisdiction' (Hanf & Scharpf, 1978, p. 1). This situation has resulted in the development of separate policy subsystems that follow their own separate laws and 'make their own separate strategies and plans covering the same geographical territory' (Saglie, 2006, p. 10). Hence, policy making takes place within sectoral policy subsystems each comprising a group of actors that are bound together by a 'combination of material interests and policy ideas' (Hessing, Howlett, & Summerville, 2005, p. 113). The development of a rather fragmented (or decentralized) process of policy making in natural resource management, as it is described above, is the starting point for the empirical and theoretical research presented in this thesis.

The opening chapter introduced the idea that the natural resource management in the case study area is institutionally fragmented. This fragmentation becomes obvious by a plethora of sectoral policies and a variety of state and non-state actors that pursue divergent interests regarding the use and the protection of the Greifswald Bay and its coastal areas. Several empirical studies have disclosed various difficulties in managing coastal areas and their natural resources across different political levels and spatial scales. These studies showed that the successful implementation of sustainable environmental policies in coastal areas considerably depend upon an improved understanding of the existing management structures, including gaps and overlaps resulting from institutional fragmentation (Ekstrom et al., 2009, p. 532).

The policy analysis in a first part of this thesis shall help to analytically examine the different organizational frameworks and their specific policies that characterize natural resource management in the case study. In general, policy analysis focuses on the essential meaning of a certain policy. Policies can be legal regulations, agreements, directives, measure programs or guidelines (Knill & Tosun, 2015, p. 11). Policies are intentionally created by political actors that pursue some kind of interests or goals. In modern democracies, there are a lot of different actors from executive, legislative or administrative bodies involved in political decision making. But also non-state actors, such as interest associations, pressure groups, the media or even leading scientists are temporarily included in policy consultation and policy making. Within this multitude of different interests, values and responsibilities, all these actors have to define their own (organizational) positions and strategies in order to achieve their goals. Under such conditions of complexity, none of these actors are able to unilaterally or autonomously achieve their own goals. Even actors in high political positions are usually dependent on other actors and may realize their objectives solely in cooperation or in conflict with others (Schubert & Bandelow, 2014, p. 1). Hence, the ideal-typical policy process itself is not a simple reflection of implementing ex ante formulated goals, but rather characterized by an interaction process that encourages actors to exchange information about problems, preferences

and means. It thus supports consensus building on conflicting rationalities, interests and strategies (Kickert, Klijn, & Koppenjan, 1997, p. 9).

For actors, it becomes increasingly difficult to oversee and understand the complexity of different policies and regulatory instruments. Thus, from a policy-analytical perspective, the chance to successfully deal with political problems and to achieve the desired objectives is increasing by a constant involvement of these actors in objective information and communication flows, and by having a sound knowledge basis or an adequate professional support (Schubert & Bandelow, 2014, p. 3). In this thesis, network analysis will serve as a methodological tool to assess the degree of inclusion of actors in natural resource management in the case study (cf. Chapter 2.3.3).

Environmental problems became increasingly visible in local, national, and global arenas. In recent and past decades, human activities considerably affected complex ecosystem conditions and resource availability (Loomis & Helfand, 2001, p. ix). Governments are challenged to find cooperative approaches including a variety of different state and non-state actors in order to mitigate environmental degradation. Cooperative approaches are however apparently impeded by the fact that policy making in natural resource management usually takes place in highly fragmented institutional settings where relatively independent actors are provided with different competencies, access different (power) resources, and further 'pursue separate, potentially conflicting courses of action' (Hanf & Scharpf, 1978, p. 1).

Policy making can be understood as a continual process that does not end in unique and final decisions, but rather consists of a set of subsequent decisions that always and continually influence each other. Policies are not independent from each other. For instance, national policies are embedded in the transnational and international context of decision making. Many political systems are further based on the principle of *subsidiarity* meaning that socio-political issues 'should be dealt with at the most immediate (or local) level consistent with their solution' (Oxford English Dictionary, 2015). Thus, central authority is supposed to only perform those tasks that cannot be performed effectively at a more immediate or local level (Oxford English Dictionary, 2015).

Especially when trying to ensure coherent management practices to enhance environmental sustainability, the immense need for cross-sectoral coordination of policies and responsible actors becomes apparent. The failure to properly consider the interlinkage between the different political levels, their actors and policies has led to unsustainable policy outcomes in many exemplary cases (Cash et al., 2006). Challenges in natural resource management arise especially in those situations, in which policies adversely constrain each other and necessary cooperation among responsible actors is lacking. The increasing complexity of management systems and organizational arrangements aggravates the policy-making process as decision makers must 'consciously trade-off multiple goals' (Norton & Pardey, 1987, p. 4).

A broad literature review has been conducted in this study to identify all those policy fields and policies that are shaping natural resource management processes in the case study area. This step is complemented by an analysis of concrete policies and their substantive meaning regarding either resource protection objectives or resource usage claims. In the analysis of the various policy documents one focus was set on revealing potential contradictions and ambiguities between sectoral policy fields. It was further investigated whether there is a tendency in policy making to prioritize sectoral policy interests. The analysis is supposed to provide a detailed picture of the institutional

fragmentation of the current management system that regulates the use and the protection of natural resources in the case study area.

2.2 Actors and their Relationships

While the first conceptual section focused on policy making in the context of institutional fragmentation, this section concentrates on the actors that are an integral 'part' of the management system due to their official responsibilities or due to their own interests as resource users. By 'actor,' I refer to any individual, group, or organization that can affect or is affected – either positively (beneficiaries) or negatively by certain decisions and actions (Gass, Biggs, & Kelly, 1997, p. 122). In the context of this thesis and with respect to the empirical approach, I specify that actors are natural resource users and 'managers' (Röling & Wagemakers, 1998) that pursue some kind of interest with respect to the use or the protection of natural resources in the case study area. Thus, my definition includes all actors actively involved in policy negotiation processes regarding certain management issues, as well as those that are not directly involved or excluded, but are obviously concerned by management and policy decisions.

In which way people act, vastly depends on their position, their interests and their specific perception of the situation in which they have to operate (Mollinga, Meinzen-Dick, & Merrey, 2007, p. 705). Human behavior and action is further facilitated or constraint by the institutional setting. Usually, actors differ in their perceptions and further pursue different interests. Differences in interests, goals and values may result in conflicts in which essential needs are defended and fears are disclosed. Most actor relationships tend to be characterized by specific power constellations that shape the interactions and negotiations between different actors or parties.

There are many different concepts that are essential in order to understand actors, their behaviour, and their interactions in environmental management. The following figure summarizes those concepts that are going to be explained in the next subchapters.

Conceptualizing Actors and their Relations

- The meaning and role of institutions
- Trust as social capital in actor relations
- Power in actor relations
- Subjective meanings, perceptions, interests and urgency
- Conflicts among actors, fears and needs

Figure 3: Major concepts used to conceptualize actors and their relations

2.2.1 The Meaning and Role of Institutions

This thesis follows the assumption that actors are always embedded in an institutional structure that supports or constraints their behavior. There is a huge variety of scientific literature that emphasizes the important role of institutions with regard to problems related to human-environment relations (Gibbs & Bromely, 1989; Jentoft, McCay, & Wilson, 1998; Leach, Mearns, & Scoones, 1997; Ostrom, 1990; Pido, Pomeroy, Garces, & Carlos, 1997; Rydin & Falleth, 2006). However, there is still some vagueness in the definition of an institution or organization, in the context of natural resource management and development (King, 2000, p. 10). In general, many scholars refer to the Parsonian (Parson, 1937, 1951) view of institutions as a complex set of established norms, rules, and practices

guiding and constraining human behavior and action (Bandaragoda, 2000, p. 4; Mayntz & Scharpf, 1995, p. 43; North, 1990b, p. 3; Ostrom, 1990, p. 27; Scharpf, 1997, p. 77). In a narrow sense, institutions may be defined as 'an organized, established, procedure' (Jepperson, 1991, p. 143) or a 'system of rules that structures the course of actions that a set of actors may choose' (Scharpf, 1997, p. 38). However, Scott (1995) emphasizes that institutions are more than a system of rules as they additionally provide 'cognitive, normative, and regulative structures and activities' establishing stability and meaning to social behavior (F. Scott, 1995, p. 33). The regular use of rules and the general acceptance of and the repetitive compliance with social norms result in the emergence of identifiable institutions (Mearns, 1995 in: King 2000 p. 11; Schimank, 2010, p. 22). Institutions can be either formal or informal (Casson, Guista, & Kambhampati, 2010; Narayan, 1999, p. 19; North, 1990b, p. 137; Rydin, 2006, p. 17). Formal institutions are legally binding rules, policies, written contracts, or other codified artefacts that can be enforced by an official court system. Informal institutions encompass conventional practices, habits, beliefs, and social norms that actors in general respect and whose infringement is penalized by loss of reputation, social disapproval, withdrawal of cooperation, or even ostracism (Ostrom, 1990, p. 68; Scharpf, 1997, p. 38; 2000, p. 77). In this way, the core of formalized law is complemented, challenged, or modified by a variety of informal rules, norms, conventions, and expectations. In the context of natural resource management, formal and informal institutions shape the regulative framework for the protection and use of natural resources. These institutions further determine the access of certain actor groups to natural resources and may earmark specific sanctions in cases of infringements. In this work the role of formal institutions is assessed in the form of the analysis of policy documents that officially regulate different aspects of natural resource management in the case study area.

Institutions are said to have a decisive influence on actors, actor constellations, and modes of interaction (Mayntz & Scharpf, 1995, p. 76). Institutions force actors to adjust and align their actions by regulatory and penalizing mechanisms. These mechanisms foster reciprocal predictability and therefore enable social interaction beyond the borders of personal relations. However, it has been proven that an actor's behavior is also considerably determined by the non-institutional context. Thus, already the *perceived* access to valuable (action) resources can drive an actor's behavior (Mayntz & Scharpf, 1995, p. 59). Once established, institutions are hard to reform or abolish, even if the purpose of their original justification does not exist any longer (Scharpf, 1997, p. 41; 2000, p. 82).

In some cases the terms 'institution' and 'organizations' are applied in an interchangeable way; however, a distinction between the two concepts is useful (Polski & Ostrom, 1999, pp. 3-4). Organizations can be defined as a collective of individuals whose activities and interactions are deliberately coordinated in a way that allows and facilitates the pursuit of specifically defined collective objectives (R. W. Scott, 1981, p. 23). Therefore, organizations exhibit a relatively high degree of formalization with a predefined structure of relations and a set of rules governing the behavior of participants. Roles and role relations are determined 'independently of the personal attributes of individuals occupying positions in the structure' (R. W. Scott, 1981, p. 23). With this definition in mind, organizations can be seen as groups of individuals that have predefined roles and that are bound by a common purpose, some common rules, and procedures to achieve their objectives (Bandaragoda, 2000, p. 5). Following the conceptualization of North (1990), institutions are the 'rules of the game,' while organizations are the 'players' – meaning groups of individuals engaged in purposive activities. Furthermore, institutions create a certain opportunity structure determining the emergence of organizations (North, 1990a, p. 3). Therefore, organizations can be understood as a set of 'institutional arrangements' (Polski & Ostrom, 1999, p. 4) constraining or facilitating individual

actions and behavior (Rydin, 2006, p. 18). Organizations become 'institutionalized' at the moment they satisfy people's needs by meeting their normative expectations over time (Uphoff, 1986 in King, 2000, p. 11). In the same way as institutions, organizations can be categorized as formal or informal (Polski & Ostrom, 1999, p. 4). Formal organizations are deliberately organized collectivities (Coleman, 1993, p. 2), assigning prescribed roles to their individuals and further binding them together by a common set of objectives (R. W. Scott, 1981, p. 23). In this thesis, formal organizations include government and non-government agencies, fishery and nature conservation associations, research institutions, or business enterprises. Formal roles include those of conservationist, fishery representative, farmer, manager or scientist. These roles are largely defined by the organizational context (a conservationist engaged in a nature conservation association or a fishery representative working for the state fishery department). Informal organizations include e.g., clans or families.

As mentioned above, institutions establish reciprocal predictability and common knowledge about 'rules' in social relationships. In general, they are a good source of reliable information about choices and purposes that can be expected to be taken by others. The set of feasible options for action and strategies is diminished to an institutionally defined subset (Baumgartner, 2010, p. 82; Scharpf, 1997, p. 39; 2000, p. 81). Thus, institutions may play an important role in establishing trust among actors. Trust is considered to be one of the most important assets facilitating interaction and cooperation (Beratan, 2008; Berkes & Seixas, 2005, p. 971; Folke, Hahn, Olsson, & Norberg, 2005, p. 444; Ostrom, 1990, p. 183). Actors learn about other actors' views and behavior through conversations and by comparing what they say (verbally and non-verbally) to their actions. In actor relations, the degree of trust might be modified by repeated experiences of interaction. Trust within relations reduces uncertainty and increases predictability of reciprocal interactions (Beratan, 2008; Krackhardt, 1992, p. 219). While the development of trust is a process that becomes consolidated over time, it might by spontaneously and abruptly interrupted by the perceived abuse of trust in situations of conflict or suspicion.

Trust is highlighted as a crucial indicator for social capital that facilitates the achievement of collective goals that cannot be achieved in its absence or only at higher costs (Ostrom, 2005, p. 98). Social capital is distinctly established when relations among actors change in ways that encourage interactions (Coleman, 1990, p. 304). Thus, social capital is embodied in *relations* of actors and strengthens their capacity to benefit from interactions with others (Putnam, 1995, p. 664). In this study, the existence of trust among the different actors involved in natural resource management is considered to be crucial important as trustful relationships may help to develop (policy) networks and strategies to mitigate negative effects of institutional fragmentation (e.g. policy incoherency, conflicting management goals).

2.2.2 Power in Actor Relations

Institutions may not only establish predictability among actors, but may at the same time shape power constellations in policy making. Thus, power is an essential feature that may determine the success of management negotiations.

The concept of power is often associated with the widely known definition of Weber (1972), who defines power as the ability - whatever this ability is based on - to impose one individual's will on somebody else, breaking reluctance and opposition (Weber, 1972, p. 28). Thus, power may be recognized as 'the ability of those who possess power to bring about the outcomes they desire'

(Salancik & Pfeffer, 1974, p. 3). Likewise, Dahl (1975) defines power as the capacity of a social actor to determine the actions of another actor (Dahl, 1957, pp. 202-203). Crozier and Friedberg (1993) expand these concepts and argue that power is equally the capacity of actors to access different resources (e.g. expert knowledge, important contacts, information and communication flows), and to mobilize these to enforce the actors' own interests (Crozier & Friedberg, 1993, p. 43). In this context, power may be further defined as the *ability* to have an effect (Kadushin, 1968, p. 687) on important decisions, 'regardless on whether such potential is actually translated into action' (Kadushin, 1968, p. 689). An essential work on distinguishing different dimensions of power was published by French and Raven (1959) who identified five sources of power that can be grouped into two categories: organizational power (legitimate, reward, coercive) and personal power (expert and referent) (French & Raven, 1959, pp. 155-165). Thus, *legitimate power* is defined as a person's ability to influence other persons' behavior due to the person's formal position of authority inside the organization. This power is often referred to as 'formal authority' (French & Raven, 1959, p. 158f; Lunenburg, 2012, p. 2). *Reward power* is interpreted as a person's ability to influence other's behavior by providing valuable resources that those others want to receive (French & Raven, 1959, pp. 156-157). *Coercive power* is the ability of someone to influence another person's behavior by applying punishments or threats (French & Raven, 1959, pp. 157-158). *Expert power* is a person's ability to influence somebody else's behavior because of recognized knowledge, skills, and abilities (French & Raven, 1959, pp. 163-164). *Referent power* is seen as a person's ability to influence other persons' behavior, because they like, admire, or respect this individual (French & Raven, 1959, pp. 161-163).

Legitimate power or formal authority, as defined above, renders power an intrinsic characteristic of official positions within the political system. Therefore, power is considered the exercise of legitimate authority (Etzioni, 1964, p. 59; French & Raven, 1959; Parson, 1966, p. 158) which in most political regimes is shaped by various institutional, organizational, or moral constraints. The right to issue commands is enacted by legitimized procedures that are accepted by both superiors as well as subordinates (Astley & Sachdeva, 1984, p. 106). Thus, subordinates have to accept the exertion of legitimate power and have to comply with respective procedures (Lunenburg, 2012, p. 2). Therewith, the structural dimension of power reveals. Thus, power is not exclusively a function of human agency (every person's inherent ability to influence the world around him), but also a function of social structure (in the form of the structures of domination that determine the degree of a person's ability to influence the world) (Sadan, 2004, p. 69). Structural power is defined as a form of power that is determined through societal conditions and the established socio-political status quo (Abels, 2009, p. 249). In this thesis, structural power has been assessed by analyzing socio-political inequalities asking questions like: 'Are there obvious priorities in political decision-making and in which way are ecological, social and economic interests negotiated?', 'Are there real or perceived disadvantages of certain actor groups in natural resource management?', 'Who is involved in policy negotiations?'

2.2.3 Subjective Meanings, Perceptions, Interests and Urgency

In this thesis, subjective meanings and perceptions play a crucial role in understanding the relationships of all actors involved in natural resource management in the case study area. Different perceptions on certain management issues may provoke conflicts that, as a consequence, impede collective approaches.

Constructivist positions assume that individuals try to understand the world in which they live and work by giving subjective meanings to certain objects or phenomena. Meanings are constructed from personal experiences and perceived reality and are usually forged in discussions or interactions with other persons. Thus, meanings are not deterministically imprinted on individuals, but are modifiable in the course of personal interactions or the development of societal values and norms (Creswell, 2003, p. 8). These meanings form an actor's perception with respect to other actors, their behavior, or with respect to substantive characteristics of policy issues (Bots, van Twist, & van Duin, 2000, p. 2). In a metaphorical sense, a perception may be defined as an image that actors have of the world around them (Enserink et al., 2010, p. 81).

'People act not on the basis of objective reality but on the basis of *perceived reality* and of assumed cause-and-effect relationships operating in the world they perceive' (Scharpf, 1997, p. 19). Hence, human behavior cannot always be reasoned to immediate cognitive perception of real world data and causal law, but is rather influenced by culturally shaped and socially constructed beliefs about the real world. Actors tend to perceive what they are 'ready' to perceive (DeWitt & Simon, 1958, p. 140), dependent on individual socialization or experiences. It must be further considered that human knowledge is limited in its scope and rationality is bounded (Scharpf, 1997, p. 21). Thus, humans are prone to behavioral decisions under conditions of incomplete information about alternatives, uncertainty, situational complexity and permanent risk (Simon, 1972, pp. 163-164). In very complex or ambiguous situations, actors' perceptions seem to be vastly determined by previous patterns of action and decisions (DeWitt & Simon, 1958, p. 140).

Interests are a further essential component to explain and understand actor behavior in natural resource management. Interests are defined as the total of values (Enserink et al., 2010, p. 54) that direct social actors towards specific ends and hence describe the internal motivations of actors (Hermans & Thissen, 2009, p. 809). Structuralist perspectives suggest that interests are fixed, while constructivist positions argue that interests are social constructs that might be modified and renegotiated in the course of interactions (Kickert & Koppenjan, 1997, p. 56). Interests may subsequently push an actor to seek means towards their attainment. Social actors may also be guided by negative interests strategically preventing everything that would downsize the probability of attaining specific goals (Knoke, Pappi, Broadbent, Tsujinaka, & Kaufman, 1996, p. 78).

When dealing with collective or corporate actors, such as formal organizations, it is important to analytically distinguish between individual and organizational interests. While an individual is a unitary actor in decision making, organizations represent a plurality of actors whose specific interests are negotiated in social processes comprising a lot of different individuals with different capacities to affect binding decisions (Knoke et al., 1996, p. 80). It is the dominant subset of organizational members in leading authority positions that typically try to enforce their preferences on the whole collectivity, ignoring the resistance or indifference of other members (Pennings & Goodman, 1977, p. 152). In this thesis, all of the interview respondents are affiliated with an organization or association and therefore represent the organization's or association's perception or interest with respect to the management of the Greifswald Bay and its coastal areas. This puts the focus of the empirical evaluation on the organizations' agency rather than on individual actors' agency.

Social or political events generate a certain amount of consternation that at the same time stimulates actions (or non-actions) and defines the course of actions (Mayntz & Scharpf, 1995, p. 59). Actors tend to put a stronger emphasis on policy issues which affect them personally (Mayntz &

Scharpf, 1995, p. 55). The more existentially threatening an issue and the more limited the access to resources, the higher is the urgency for actors to influence policy outcomes. In general, risk aversion and the continual threat of personal disadvantages are more urgently motivating actions than possible profits (Kahneman & Tversky, 1984, p. 142). Urgency describes the degree to which actor claims call for immediate attention. Thus, it is the capacity of each actor or actor group to get attention in decision making and to get their own interests ranked high on the (political) agenda (Mitchell, Agle, & Wood, 1997, p. 864).

2.2.4 Conflicts among Actors, Fears and Needs

Actor relations, especially in the context of policy and decision making, are usually characterized by some kinds of conflicts. Conflicts may impede collective approaches to natural resource management. That is one reason for putting a special focus on the analysis of conflicts among different actor groups in the case study area. The concept of 'conflict' may refer to many different situations and issues. There are considerable differences regarding potential conflict objectives, the intensity of a conflict, and the way of conflict resolving (Schneckener, 2014, p. 23). From an analytical perspective, conflicts may be assessed and explained from various different theoretical perspectives. Some of them are relevant for the understanding of this work. A short introduction to theoretical conflict considerations is provided in the following segment.

In very general terms, social conflicts are characterized by 'differences in positions about interests, goals and values' in social contexts (Brzoska, 2014, p. 32; Czempiel, 1981, p. 199). A conflict develops, if goals and interests of two or more conflict parties are mutually exclusive or, at least, are perceived as being incompatible with each other (Esser, 1993, p. 90; Galtung, 1972, p. 113; Schneckener, 2014, p. 15). Fisher (1990) conceptualizes conflict 'as a social situation involving perceived incompatibilities in goals or values between two or more parties, attempts by the parties to control each other, and antagonistic feelings by the parties towards each other' (Fisher, 1990, p. 6). Rendering a conflict a matter of perceptions, conflicts are likely to be found in almost all social relations or organizational settings. Assuming a plurality of interdependent state and non-state actors, it is unlikely that there will be a spontaneous, consistent perception on a certain prevailing policy issue among them. The same applies to actors' choices with respect to behavioral strategies. What is true for one actor might not be true for somebody else. Most often, people differ in their cognitive capabilities including their perception, attentiveness, memory, creativeness, orientation, and intentions. All of these aspects are determining a person's interpretation of an event. Perceptual and cognitive processes are important drivers with respect to the escalation and perpetuation of a conflict. Conflict parties tend to construct their own reality – their own parallel image of self and other; their own perception of the conflict and the opponents' behavior. These images and perceptions are often based in a good-bad dimension. Each side sees itself as good, whereas, the other side is seen as evil or hostile (Kelman, 2007, p. 92). The clash of conflicting selective perceptions may lead to the evocation of conflicts among actors if there is no mediating mechanism.

Several authors interpret conflicts as a process that is driven by collective needs and fears. Human needs theories suggest that all human beings have certain essential needs and that their nonfulfillment or threats to the fulfillment will evoke the occurrence of social conflicts (Danesh, 2011, p. 510). These needs do not only encompass material requirements, such as food, shelter, physical safety, and physical well-being, but also psychological needs, such as distributive justice, recognition, belongingness, self-esteem, personal fulfillment, identity, and freedom (Burton, 1991, p.

64; 1990). In most cases, protracted and deep-rooted conflicts are developing around the deprivation of non-negotiable human needs (Burton, 1993, p. 7 and 14). The fulfillment of needs is considerably bound to the context of groups. Usually, groups (such as social groups, professional groups, ethnic groups etc.) differ in their needs, or in the prioritization of these needs. Intergroup conflicts are often characterized by strong fears about the denial of such needs. In protracted conflicts over issues that are perceived as non-negotiable, fears often become existential in nature, 'turning the conflict into a struggle over group survival' (Kelman, 2007, p. 64) and increasing the risk of the conflict's escalation or perpetuation. Strong feelings of needs and fears may cause situations where conflict parties are not able to make any concessions in order to mitigate or resolve the conflict, even if they know that it would be in their interest to end the conflict and to avoid further escalation. Joint conflict resolutions are complicated by the fact that conflict parties are afraid of making concessions that potentially constrain or compromise their existential needs or interests (Kelman, 2007, pp. 65-66). In this context, White (1984) introduces the concept of 'realistic empathy' that takes place at the individual level, but is seen as crucial with respect to conflict resolution (R. K. White, 1984). Realistic empathy is defined as the (individual) capacity to perceive another person's motives and perceptions through that person's eyes and thereupon appreciating that person's emotional reactions (Schwebel, 2006, pp. 195-196). Thus, the concept promotes the idea of trying to gain an understanding of the behavior of opponent parties without demonizing them. It further emphasizes that it is rather crucial to learn about and to question own attitudes and perceptions in order to potentially find the reasons for the opponents' distrust, fear, or anger (R. K. White, 1984, pp. 160-161).

While social conflicts may divide people, they may, at the same time, have socializing effects by creating cooperation among all those actors that are like-minded with respect to their interests and goals (Müller, 1993, pp. 4-5). Simmel (1992) writes that conflicts can contribute to the creation and stabilization of a corporate identity among members of a group. The deliberate distinction of one group from other groups may considerably revive and strengthen the feeling of togetherness within this group. The negation of the other groups' interests may substantially shape the group identity and further support cohesion within this group. He emphasizes the social construction of differences between groups. The differences are produced in and through the conflict itself, and in some cases are assumed to be deliberately induced and even opportune, particular with respect to the stability and coherence of the group (Simmel, 1992, p. 289). The higher the intensity of a conflict the more groups tend to a radicalization of their internal positions and the more they exclude deviating opinions both from the external and the internal social environment. Reversely, the unity of the group tends to decrease in the moment where commonly defined stereotypes vanish (Simmel, 1992, pp. 355, 358-360). Coser (1965) follows this argumentation and stresses that conflicts ensure a certain societal stability and reliability as group identities become established and are strengthened temporarily (Coser, 1965, p. 44). Conflicts are seen as a mechanism to compensate or balance divergent interests within a group or between groups. This fact, however, requires the presence of a certain (political) willingness to accept the permanent dispute of these divergent interests within the social system (Coser, 1965, p. 102). In this sense, conflicts establish space for the revision and adjustment of social norms and legal provisions (Weber, 1967, p. 175). Conflicts are an indicator for an insufficient legal coverage of social reality (Nollmann, 1997, p. 46). Referring to Georg Simpson (Simpson, 1937, p. 4), Coser distinguishes between collective and non-collective conflicts. A non-collective conflict evolves if there are no common objectives among the conflict parties, or if there is no common ground for conflict resolution. This type of conflict appears dividing and disintegrating. Collective conflicts do have a higher integrating effect and allow the elaboration of conflict

resolutions on the basis of unity. In this case, conflicts have a positive integrating effect with respect to the common values, objectives and norms beyond the divergent interests. Thus, collective conflicts do not threaten the basic societal consensus, but rather strengthen it (Nollmann, 1997, p. 46).

The appearance, the function and the potential effect of conflicts among different actor groups will be subject in this thesis (cf. Chapter 5.5).

2.3 Policy Networks

The natural resource management process in the area of the Greifswald Bay is illustratively assessed in the form of a policy network including all actors that have been defined earlier in this thesis as either natural resource users or 'managers' (compare chapter 2.2). It is assessed, how the policy network that governs the protection and the use of natural resources in the case study area looks like and how different actor groups interact with each other. At the same time, the research further puts a focus on assessing the integration of actors in the management practice and, in this context, analytically examines the distribution of power among different actor groups involved in natural resource management.

In scientific literature, there is a real 'Babylonian' variety (Börzel, 1998, p. 253) of network concepts and applications (Kickert et al., 1997, p. 6). There is neither a mutual understanding about what policy networks actually are, nor is there an agreement on whether policy networks represent a mere metaphor, a method, an analytical tool, or a proper theory (Börzel, 1998, p. 253). With this in mind, I introduce different theoretical definitions of policy networks in a first step. Then, I go on to applied approaches and definitions that constitute the empirical access to network analysis in this thesis. In a last subchapter, the network approach is put into the context of this study.

2.3.1 Theoretical Definitions of Policy Networks

Kickert et al. (1997) define policy networks 'as (more or less) stable patterns of social relations between interdependent actors, which take shape around policy problems and/or policy programmes' (Kickert et al., 1997, p. 6). According to this understanding, policy networks typically arise, covering a specific domain of public policy 'in which relevant actors engage in processes of decision making and resource mobilization [that, F.L.] are oriented towards solving economic or social problems gaining political relevance' (Schneider & Werle, 1991, p. 98). Within these subsystems, policies are (re-)formulated and advocated, while specific strategy options with respect to the essential problem in questions are determined (Knoke & Laumann, 1982, p. 256).

A similar definition is given by Rhodes (1992). He defines policy networks 'as a cluster or complex of organizations connected to each other by resource dependencies […]' (Rhodes & Marsh, 1992, p. 182). Complex organizations are characteristically based on a partitioning of discrete positions that are further differentiated both vertically by hierarchical levels, and horizontally by a division of labor or departments (Astley & Sachdeva, 1984, p. 106). In this context, organizations are actors that are related to each other through hierarchical and functional interdependency (Geser, 1990, pp. 402-403). These actors have to coordinate their actions, while they possess different sources of legitimacy, access different information, and pursue different interests, sometimes conflicting with other actors' objectives and ideas. Additionally, organizations have to progressively deal with

problems that tend to exceed boundaries of separate jurisdiction and specification (Hanf & O'Toole, 1992, p. 166). Increasing dependencies that are further promoted by an increasing socio-political differentiation support the development of policy networks (Rhodes & Marsh, 1992, p. 182).

Expanding the latter conception, other authors understand policy networks as a reflection of the fact that the relationship between the state government and the public has profoundly changed (Börzel, 1998, p. 260). Accordingly, the policy process is no longer determined completely and solely by formal governmental organizations, but is rather open to inclusive approaches, particularly integrating non-governmental actors' interests. Thus, governments have become progressively dependent on the effective cooperation of actors outside the conventional hierarchical control favoring the development of policy networks as a new form of governance (Börzel, 1998, p. 260). Public policies are developed within multiple actor-settings in which different actors (governmental or non-governmental) are interrelated to each other in a more or less systematic order (Kenis & Schneider, 1991, p. 32). Thus, executive and legislative actors do not monopolize policy making any longer and instead operate in a broader political arena including state, public, and private actors (Brans, 1997, p. 391; Stoker, 1998, p. 17).

Furthermore, it is common to distinguish between *heterogeneous* and *homogeneous* policy networks. Empirical studies on policy networks are primarily looking at heterogeneous networks, in which actors dispose *different* interests and resources. Thus, heterogeneity may provoke diverse dependencies and (power) asymmetries among the actors. With this in mind, policy networks may be interpreted as constituent entities, establishing links between interdependent actors, in order to adjust their interests and to further exchange resources. In contrast, homogeneous networks consist of actors with similar interests and resources (e.g. professional or epistemic networks) (Börzel, 1998, p. 258). Many authors assume that a high number of diverse actors renders a constructive cooperation and an agreement among actors in a policy network very difficult. Kickert & Koppenjan (1997) do not consider this factor to be crucial, especially when taking into account that a higher variety and number of actors may enhance the number of ideas and policy options to mutually solve a problem (Kickert & Koppenjan, 1997, pp. 53-54). The capacity to mediate conflicts within a policy network and to stimulate constructive joint actions strongly depends on the conflict's intensity and sharpness.

Tichy and Fombrun (1979) further distinguish between *prescribed* and *emergent* (policy) networks (Tichy & Fombrun, 1979, p. 929). They assume that prescribed networks are primarily the result of the formalized organizational setting that frames political life and emerges from organization charts and the hierarchical and functional differentiation within and between organizations (Astley & Sachdeva, 1984, p. 108; Tichy & Fombrun, 1979, p. 929). Thus, in a literal sense, the organizational setting prescribes the policy network structure and predefines theoretical interactions that are envisaged by the organizational design. In contrast, emergent networks are the result of sociometric data inquiry that reflect 'real' interaction processes within the network. The authors stress the interdependent character of prescribed and emergent networks. Thus, changes and variations within the formalized prescribed network (= the organizational setting) will alter the form of the emergent network (Tichy & Fombrun, 1979, p. 929).

2.3.2 Applied Definition of Networks and Basic Concepts

There is a broad discussion on what the actual essence of policy networks is and how they should be understood in an empirical context (Sandström, 2008, p. 17). In very general terms, networks can be visualized as nodes (or vertices), which are connected by ties (or edges). These nodes represent e.g. individual actors, organizations, or groups. There can be specific attributes ascribed to the actor nodes such as age, organizational affiliation, interest, or power which may provide further information for the analysis. Ties among different actors may be established through e.g. personal contact, resource flows, dependencies, or conflicts. Thus, the network approach describes structures systematically as a system of properties that is formed by ties between nodes (Hauck, 2010, p. 18). Network analysis provides a whole range of related concepts that support the measurement and interpretation of patterns in the structures (Hanneman & Riddle, 2005; Wasserman & Faust, 1994).

In the following subchapters, I will introduce the most important concepts that were applied in this thesis. A particular emphasis was put on different concepts of centrality and network cohesiveness (centralization, density, and homophily) to explain patterns of power distribution and cooperation in natural resource management processes in the case study area.

2.3.2.1 Centrality in Networks as a Reflection of Power

Taking a positional approach in social network analysis, power is inherent in an actor's individual position in the network (Cook, 1977, p. 72; J. Scott, 2013, p. 45). Power may further be directly influenced by an actor's ties to other actors, the quality of these ties, and the formation of groups and clusters in the network (Beritelli & Laesser, 2011, p. 1299). By occupying a central position in the network, actors may be superiorly empowered to exert influence over others in the network and may, at the same time, have better access to important resources or information which can put them at an advantage compared to actors that are more peripheral in the network (Brass, 1984, p. 520; Burt, 1976, p. 93; 1992, p. 57; Degenne & Forsé, 1999, p. 29; Ibarra & Andrews, 1993). Being tightly connected to others in the network, the power of an actor rises through the actor's integration in multiple interdependencies that renders the actor functionally indispensable (Astley & Sachdeva, 1984, p. 106; Dubin, 1963, p. 21; Hinings, Hickson, Pennings, & Schneck, 1974, p. 216). Thus, actors that hold a central position in the network are most favorably able to integrate the divided functional contributions of other actors in the network that lack a direct connectivity (E. R. Freeman, Roeder, & Mulholland, 1980, pp. 136-137; L. C. Freeman, 1979, p. 223). Favorable network positions (but also personal characteristics) are crucial means for actors to expand meaningful leadership and to push, or to hinder societal change (Bodin & Crona, 2011, p. 76).

Social network analysis provides a variety of different centrality measures that allow the specific determination of the centrality of an actor in the network. Several of these measures are briefly described here. *Degree centrality* is defined as the total number of ties attached to an actor; this number is positively correlated with that actor's visibility and influence in the network (Borgatti, Everett, & Johnson, 2013; Degenne & Forsé, 1999, p. 133). *Betweenness centrality* is another measure that indicates the degree to which an actor connects other actors who would otherwise not be linked (Burt, 1992, p. 74). This actor occupies an intermediary position (Prell, 2013, p. 104) and bridges different set of actors. Thereby, the actor is granted the ability to influence the flow of resources between others (Bodin & Crona, 2009, p. 370). These actors may fill the role of '*bottlenecks'* or *'brokers;'* disrupting or facilitating resource flows within the network (Burt, 1992, p. 78; Wasserman & Faust, 1994, p. 3). Two further important measures are *closeness* and *eigenvector*

centrality. Closeness centrality reflects the 'reachability' of an actor in the network. Taking communication within a social network as an example, empirical studies show that information flow through various intermediaries increases the risk of erosion and distortion of the original message's contents, while shorter communication exchange paths (and thereby a better reachability) are less vulnerable to information loss (Borgatti et al., 2013, p. 173). Actors that are located in far communication distance to others in the network are more vulnerable to become marginalized in decision making and therefore have less possibilities to interact with others or to influence the other actors' perceptions to their own benefit (Knoke, 1998, p. 516). However, a good integration of an actor in e.g. communication structures is not solely reflected by the sheer number of ties that this actor maintains to other actors in the network, but also by the quality of the contacts. Eigenvector centrality refines the concept of degree centrality; it counts the ties of a focal actor, but weighs these connections according to the other actors' degree of centrality. Thereby, eigenvector centrality acknowledges that not all ties are equal and that the power of an actor is not necessarily dependent on the number of ties, but rather depends on the question *with whom* this focal actor maintains contact (Bonacich & Lloyd, 2001, p. 192) and in which way a contact provides benefits (or disadvantages) to realize an actor's goals and interests.

Mizruchi and Potts (1998) found that the link between centrality and power is highly contingent on the structure of the overall network (Mizruchi & Potts, 1998, p. 353). In networks with only a few central actors but a high number of subgroups, central actors may fail to dominate, when peripheral actors are able to directly influence one another, rendering the central actors the least powerful in the network. In contrast, networks consisting of an even number of central actors and subgroups leave central actors in a dominant and powerful network position (Mizruchi & Potts, 1998, pp. 353, 379). Furthermore, it has been proven that being highly central within a group of peers (so-called bonding or strong ties) may put an actor in a position to influence those that are close. However, a lack of links to other groups (so-called bridging or weak ties) increases the threat of marginalization within the network (Granovetter, 1973, p. 1366). Both examples show that other structural network characteristics (such as actor group formation, density, centralization etc.) also play an important role when analyzing centrality and power distribution between actors or actor groups in a network. Different network structures are supportive or critical for a coordinated effort to attain conjoint policy goals within a collectivity of actors (Kenis & Schneider, 1991, p. 30).

2.3.2.2 Network Centralization, Density and Patterns of 'Homophily' in Networks

There are several measures of *cohesiveness* that characterize a network as a whole, providing information about whether a network tends to 'stay together' or whether it is breaking apart in sub-structures (Prell, 2013, p. 167). *Network centralization* is one of these measures, describing the degree of variability or the dispersion of centrality amongst the network members (L. C. Freeman, 1979, p. 227; Wasserman & Faust, 1994, p. 6). *Density* is another important measure of cohesiveness. The average network density is defined as the relation of the number of ties per node to the number of possible ties (Borgatti et al., 2013, pp. 151-152; Jansen, 2006, p. 94; Prell, 2013, pp. 166-167; J. Scott, 2000, p. 69). A higher or lower density is said to be a characteristic sign of a higher or lower level of interaction, communication, or resource flows within a network. A high density in the network may strengthen trust that is crucial to the maintenance of actor relations (Granovetter, 1985, p. 489). A high density further encourages collective action (Bodin & Crona, 2009, p. 368) and

facilitates the spread of information through an enhanced accessibility to information and a better exchange of ideas.

A huge body of scientific work has proved that people's personal networks are homogenous regarding many sociodemographic, behavioral, and intrapersonal characteristics. Thus, in tendency, people are more likely to interact with people that are perceived as being similar (McPherson, Smith-Lovin, & Cook, 2001, p. 415). Empirical studies in social psychology has provided evidence that perceived similarities among actors concerning their attributes, affiliations, and relationships raise attraction for each other (Huston & Levinger, 1978, p. 145; Montoya, Horton, & Kirchner, 2008, p. 889). Individuals are more likely to be attracted to similar others (Byrne, 1971, cited in Goodreau et al. 2009, p. 105) and to rather interact with those they have much in common with, as information exchange may be more efficient and easier between similar individuals due to e.g. a common language, common competences and a common knowledge base, or a similar system of values, creating more opportunities for interaction (Carley, 1991, p. 334). In literature on social network analysis, the fact that similarities among actors support their interactions is referred to as *homophily effect* (Goodreau, Kitts, & Morris, 2009, p. 105; Krackhardt, 1992, p. 219; Rogers & Bhowmik, 1970). In networks that show several different types of actor groups, the density of ties within each group is more distinctive than between different groups (Hanneman & Riddle, 2005: Chapter 18). Homophily limits people's social worlds in a way that is significantly affecting their personal embeddedness in information flows, their attitudes, and their interactions (McPherson et al., 2001, p. 415). Homogeneity within a group of actors is likely to diminish their collective ability to perceive and digest new information and knowledge, thereby reducing the group's capacity to adjust to new circumstances or to respond to changes and disturbances (Bodin & Crona, 2008, p. 2776). A high density within a network's subgroup that mainly contains a very homogenous set of actors may lead to a further adjustment of perceptions among members potentially sealing off the subgroup from the rest of the network.

2.3.3 The Use of Social Network Analysis in this Study

The natural resource management network in the case study area is highly heterogeneous, comprising a variety of different state and non-state actors having various responsibilities, pursuing varying interests, and referring to different sources of power and resources.

Visually, actors are represented as nodes; contacts among actors are represented as ties. Sociometric network data were gathered during the qualitative interviews. Actors were asked to name all actors with whom they stayed in regular professional contact to discuss issues related to the management of the GWB and its coastal areas. Thus, the personal network of an individual actor served to complement the overall network. Therefore, the basic analytical units in the network are individual actors, whose behavior was assumed to largely be determined by the organizational setting, the actor's own affiliation, and the respective organizational interest. Interview respondents were asked to answer the questions exclusively on behalf of the organization or association they were affiliated with. Within the network, actors are represented by the label of their organization.

Following Tichy and Fombrun (1979), I assume that policy networks reflect the structure of the organizational setting, which prescribes a hierarchical and functional differentiation, which in turn induces formalized (and obligatory) forms of cooperation and coordination among the respective organizations (Tichy & Fombrun, 1979, p. 929). Therefore, there are complex vertical and horizontal

coordination and interaction processes among different actors that all have to coordinate their tasks and that are more or less dependent on each other. Nevertheless, besides the formally prescribed interaction, policy networks reveal patterns of informal interaction among both state and non-state actors. Assessing the density of ties between state and non-state actors may, for instance, disclose the degree of involvement of non-state actors in the policy-making process. In the context of this research, contact among network actors may display regular patterns of *help, advice, information or money flow, conflict* or the *formal involvement in decision making* with respect to management issues in the Greifswald Bay. Only 'regular' contacts were included in the network data set, while 'unique' or 'irrelevant' contacts were not considered. The relevance or irrelevance of a contact was determined by the interview respondents themselves.

The distribution of power in policy networks is operationalized by a 'positional approach' to social network analysis. Therein, power is inherent in an actor's individual position in the network. The emphasis in this analysis step was put on the identification of specific network characteristics such as the identification of powerful actors, the integration or marginalization of actor groups in natural resource management, or the cooperation of groups in the case study area. Network analysis offers various different quantitative measures, such as degree centrality, betweenness centrality, closeness centrality and eigenvector centrality, that all serve to give an impression of an actor's position in the network. These measures have been applied to the individual actors (being defined as an organization or association in this thesis) and to actor groups (comprising different organizations, or different associations pursuing the same interests). The calculation of centrality values on the individual and subgroup level was performed with UCINET 6, a software for social network analysis. Thereby, it became possible to identify individual actors and actor groups with the highest (or lowest) centrality scores indicating a good (or bad) integration with respect to the overall network structures. By applying different statistical procedures implemented in UCINET, it was possible to (quantitatively) determine how well different actor groups succeeded in developing (policy) networks to mitigate negative effects of institutional fragmentation through cooperative management approaches. Cooperation and coordination between different actor groups is suggested to support coherency and sustainability in natural resource management (e.g. Ostrom, 1990, p. 67).

2.4 Analytical Framework

In order to answer the question how actors involved in natural resource management in the Greifswald Bay succeed in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation, three key concepts that frame the major empirical analysis steps have been defined; namely the concept of institutional fragmentation, the concept of actors, and the concept of policy networks. These concepts are mutually interrelated and placed in the context of this thesis in the previous sections.

Natural resource management in the case study area was suggested to be substantially fragmented, characterized by a plethora of sectoral policies and a variety of different state and non-state actors pursuing divergent interests regarding the use and the protection of the Greifswald Bay and its coastal areas. Institutional fragmentation may have serious negative effects on the ecological conditions in (coastal) areas, in the case that different policy sectors pursue conflicting objectives and therefore neglect holistic management approaches to natural resource management. The incoherency of policies may impede effective strategies to support the sustainable development in

an area. The prioritization of sectoral policy goals in policy making may further establish power asymmetries among the different actors, thus impeding cooperative approaches to natural resource management. To assess institutional fragmentation and its potential (negative) effects in natural resource management, all the different policies that are regulating the use or the protection of natural resources in the case study were identified and analyzed, particularly focusing on their ambiguities and inherent conflict potentials. This research step was intended to reveal both advantageous and (potentially) disadvantageous environmental impacts of certain policies and their interplay. The analysis also tried to identify patterns of *structural power* inherent in policy making and determining policy outcomes. Aim was to disclose interests that are more politically powerful in policy making than others and that way are able to direct policy outcomes to their own specific benefit. This step was based on the detailed analysis of policies and served as the starting point for a critical discussion of current management practices in the case study area.

Introduced by the policy analysis, the subsequent research step identified all actors that are provided with a specific responsibility or that pursue specific interests related to the management of natural resources in the Greifswald Bay and its coastal areas. Semi-structured interviews were conducted with all actors in order to gain information on their perceptions regarding current management practices in the GWB, their fears and their needs, their interests, and preferences related to prospective developments in the region. Roundtable discussions helped to understand and to reveal conflicts and power asymmetries characterizing different actor groups' relationships.

Subsequently, different approaches of social network analysis were applied to assess interaction processes, actor constellations, centrality, and power within the policy network framing the natural resource management in the case study area. By applying different tools of social network analysis, it was possible to assess whether actors involved in natural resource management in the case study area succeeded in mitigating institutional fragmentation through cooperative approaches and coordination. Furthermore, it became feasible to analyze the degree of integration and marginalization of actor groups within the policy network.

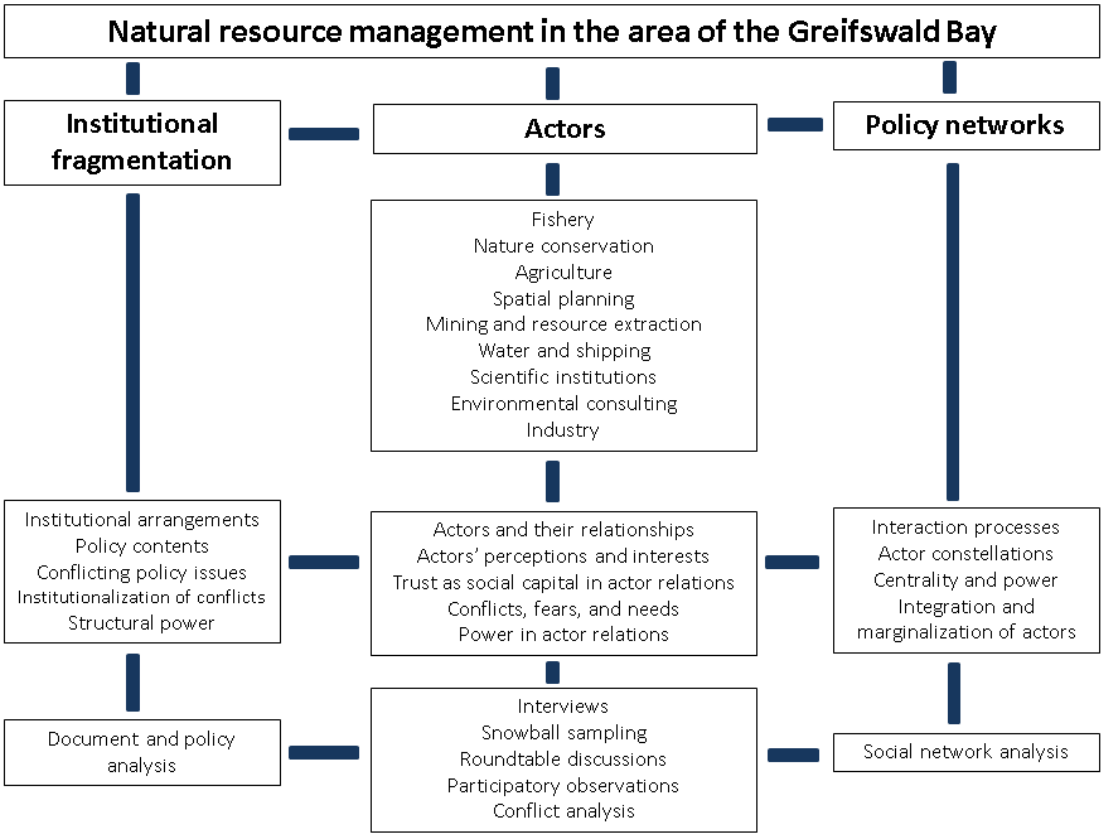


Figure 4: Overview of the analytical framework

3 METHODOLOGY

3.1 Mixed Method Research Design

In this study, a pluralistic mixture of different methods has been applied, combining both qualitative and quantitative paradigms. A holistic data collection approach was required as the research objectives are rich and interesting in their facets. The following figure provides a summary of the most essential issues focused in the assessment.

1. **Institutional arrangements and policy contents** shaping natural resource management processes in the case study area
2. **Actors**, their **interests**, and **perceptions** regarding natural resource management in the Greifswald Bay and its coastal areas
3. **Conflicts** between different actor groups in regard to natural resource management issues
4. The distribution of power in natural resource management ▪ **perceived power asymmetries** in actor relations ▪ **power deriving from network positions**
5. **Policy network structures** and **interactions/cooperation** between different actors/actor groups
6**. Integration and marginalization** of actors/actor groups within the policy network

Figure 5: Summary of the most essential research issues focused in this thesis

Referring to these research issues, the following table summarizes the applied methods and their methodological potential for this study.

Table 1: Applied methods and their methodological potential

Methodological approach	Method	Methodological potential for this study
	Document and policy analysis (literature review, online documents, press articles etc.)	▪ Analysis of the institutional setting and the different organizational frameworks shaping natural resource management in the case study area ▪ Identification of the different policy fields relevant for the use and the protection of natural resources in the case study area ▪ Textual analysis of policies, their gaps and overlaps ▪ Identification of actors with formal responsibility or interests with respect to the use or the protection of natural resources in the case study area ▪ Analysis of actors'/actor groups' interests, public behavior, perceptions, needs, and fears ▪ Analysis of the public perception of different actors/ actor groups in public media ▪ Analysis of the societal/political opinion regarding the management in the case study area
	Semi-structured qualitative interviews	▪ Identification of the relevant actors regarding the management of natural resources in the GWB ▪ Identification of different actors'/actor groups' interests, preferences and perceptions regarding the use and the protection of natural resources ▪ Focus on personal narratives and experiences ▪ Knowledge of causes and effects of actors' behavior ▪ Knowledge of network development and dynamics ▪ Analysis of actors' relationships (formal and informal communication structures, trust and mistrust, etc.)

Methodological approach	Snowball sampling	▪ Identification of potential respondents for the interviews
	Roundtable discussions and participatory observation	▪ Focus on actors' interactions and behavior, on mutual discussions and conflict issues ▪ Discourse analytical evaluation
	Conflict analysis	▪ Identification of conflict issues ▪ Analysis of fears and needs concerning an actor's/actor group's interest regarding the use and the protection of natural resources in the case study area ▪ Analysis of the conflict's intensity and possible solutions
	Social network analysis	▪ Visualization of the natural resource management network ▪ Comparative analysis of the 'prescribed' and the 'emergent' policy network ▪ Inferential and descriptive statistics ▪ Compilation of quantitative socio-metric/relational data
	Interactional approach	▪ Focus on interaction and cooperation processes within and between different actor groups ▪ Operationalization through questions, e.g.: 'With whom do you regularly have professional contact?', 'Who do you contact to get, for example, help/advice/money?' ▪ Comparative analysis of intragroup and intergroup cooperation ▪ Observational methods (e.g. roundtable discussions) ▪ Discourse analysis ('Who speaks to whom?', 'Who interrupts whom?', 'Which wording is used by whom, why, and what are the consequences resulting from that?')
	Positional approach	▪ Focus on structural characteristics of networks, e.g. centrality measures, network cohesion and density, centralization and group formation ▪ Distribution of power within the natural resource management network ▪ Structural integration or marginalization of actors/ actor groups
	Reputational approach	▪ Analysis of the perceived power distribution among different actors/actor groups within the network: 'Who are, according to your perception, the top influential actors regarding the use and the protection of the GWB and its coastal areas?' ▪ Analysis of potential leadership, elites, prestige, and trust within the network ▪ Assessment of mutual relevance

A combination and integration of different methods to gather and subsequently analyze research data 'can permit investigators to address more complicated research questions and collect a richer and stronger array of evidence than can be accomplished by any single method alone' (Yin, 2009, p. 63). Combining qualitative and quantitative research techniques, methods, approaches, concepts, and languages facilitates examining and understanding the research issue from multiple perspectives. The integration of a range of different methods to understand the same phenomena essentially contributes to construct validity (Kelle & Erzberger, 2001, p. 127). However, it must be acknowledged that scientists are not able to establish absolute truth of knowledge, especially when studying the behavior and actions of human beings (Creswell, 2003, p. 7).

A critical reflection of methodological approaches recognizes specific strengths and weaknesses that are inevitably inherent in all methods, both quantitative and qualitative. In this study the methodological research design was conceived to integrate different methods – benefiting from the strengths of one method and compensating its faults with another. Interview data were complemented with roundtable discussions and participatory observations during events in which different actor groups' representatives were present. This way, it became possible to compare the observed behavior and the given answers in the face-to-face interviews with the behavior and argumentations in multi-actor settings. The analysis of documents and press articles accompanied the whole research process and gave details on the public media discourse. This discourse covered issues about certain actors' strategies and interests, their needs and fears, and potential conflicts between different actors or actor groups. In social network analysis, three different methodological approaches were used, emphasizing different aspects of social networks and building on one another. The interactional approach was primarily applied to gather relational data as a basis for network visualization. The positional approach was concentrated on the analysis of network structures and deriving power constellations from these data. In this context, power is assumed to be an intrinsic characteristic feature of an actor's position in the network. The subsequently applied reputational approach focused on the *perceived power* of actors within an actor network. During this analysis step, the quantitative network data derived from the positional approach were compared to the qualitative data on collective influence reputation within the network. This way it was possible to identify discrepancies between the perceived power and the power derived from the network analysis. Explanations regarding the question why actors perceived themselves or others in the network to possess or be deprived of influence were given in the interviews. With respect to the study's purpose, qualitative data were of crucial importance in order to validate the interpretations made on the basis of the quantitative network data. The visualized network maps were constantly discussed with the former interview respondents when meeting them occasionally during events or discussion forums. The methodological approach was steadily expanded and adopted right during the research process in order to broaden the breadth and scope of the inquiry. For the realization of this research, particularly the interviews and the roundtable discussions, I relied on the respondents' genuine cooperation and their willingness to provide information on their personal perceptions and views with respect to management issues in the case study area.

In science there is still an emotional discussion among those scientists that are basically committed to quantitative approaches in research and those that are primarily adopting qualitative methods. Thorne (2000) explains this distinction and ascertains that the distinguishing determinant between quantitatively and qualitatively designed studies becomes obvious through 'a set of [distinctive, F.L.] assumptions, principles, and even values about truth and reality' (Thorne, 2000, p. 68) that underlie the research process. Quantitative researchers suggest that the objectives of science are best described as the exploratory investigation of the truths that exist in the world by using scientific methods in order to produce a more complete image and understanding of reality. On the other hand, qualitative researchers assume that (social) reality is a construct of different subjective experiences, social contexts, and historical developments that can best be explained by taking into account and generating knowledge on how people think and feel with respect to the circumstances in which they find themselves (Thorne, 2000, p. 68), how they perceive and how they are affected by social or environmental changes, and in which way they interact with other human beings. According to Holloway (1997), qualitative research is a manner of social inquiry that emphasizes gaining deep

insights in 'the way people interpret and make sense of their experiences and the world in which they live' (Holloway, 1997, p. 2).

The different methods applied here, their theoretical foundation and practical application within the context of this thesis are explained within the following subchapters.

3.1.1 Document and Policy Analysis

The management of natural resources in the case study has been suggested to be considerably fragmented. There is a plethora of policies on different political levels determining usage aspects on the one hand, and protection needs and objectives on the other hand. Additionally, there is a variety of state and non-state actors pursuing different interests with regard to the protection and use in the area of the Greifswald Bay (Strehlow et al., 2014, p. 3).

This first methodological step focused on the detailed elaboration and analysis of all those policies that regulate natural resource management in the case study area. Therefore, relevant policy fields and policies were identified by applying a comprehensive literature review. This step was facilitated by systematically screening the various existing political authorities on different political levels and by analyzing their specific responsibilities and organizational interests. These results were complemented and verified in the interviews by asking the respondents to name all actors they believed to be important with respect to the management of the Greifswald Bay and its coastal areas. Often, these mentioned actors were political organizations themselves and therefore they could be assigned to a specific policy field. A total of six policy fields were identified, covering all those management issues playing a major role in the research area: fishery, nature and water conservation, agriculture, spatial planning, mining and resource extraction, and shipping. The policy analysis provided in this thesis serves as a comprehensive overview of the different organizational frameworks covering the single policy fields, their constituent organizations, and policies on different political levels. It needs to be kept in mind that, in general, policy making on national or subordinated political levels is strongly influenced by international and European regulations.

The different policies were analyzed on the basis of an intensive textual analysis, highlighting those regulatory aspects that directly or indirectly determine the management of natural resources in the area of the GWB. The analysis was however focused on conflicting policy provisions, especially with respect to the achievement of environmental goals and the maintenance of ecological sustainability in the case study area. This way it became possible to assess how far environmental problems were already institutionalized within the existing organizational frameworks of sectoral policy goals. The comprehensive analysis of the institutional setting helped to depict fragmentation of the management of natural resources in the case study area.

The identification of conflictual policy issues was strongly supported by a detailed document review of online sources (such as newspaper articles, governmental websites and statements) and the analysis of original policy documents. The policies considered in this thesis include legal regulations, formal or voluntary agreements, directives, measure programs, and guidelines, each implying another legal obligation.

3.1.2 Semi-structured Qualitative Interviews

During the research, a total of 37 actors were interviewed. The identification of potential respondents was realized via snowball sampling. An interview guideline led through each interview but was adjusted to each interview respondent. The interviews were divided into six parts, each concentrating on a different aspect with respect to the management in the case study area. The following subchapters will provide more detailed methodological insights into the interview part of this thesis.

3.1.2.1 Snowball Sampling

In this research, snowball sampling primarily served to identify potential respondents for the interviews. The principal idea of the snowball sampling technique follows the attempt to define a population (and, furthermore, its boundaries) inductively, by letting the respondents designate one another (Miles & Huberman, 1994, p. 28). Each actor is asked to nominate another actor who then is interviewed as well (J. Scott, 2000, p. 46). The process is continued until no new actors are designated, or identified (Hanneman & Riddle, 2005: Chapter 1: Social Network Data). The policy analysis served to define an initial circle of respondents, most of them coming from political organizations on different political levels. These respondents were asked to name all actors they believed to be important - maybe due to their formal position in policy making, or their respective interests concerning the use and the protection of the GWB. These actors were then also interviewed. Moreover, I tried to make interview appointments with all actors who were thought to have a negative or positive impact of some form in the research area.

3.1.2.2 The Interview Guideline

I designed a semi-structured interview guideline, but carefully matched this guideline to every single respondent. The different parts of the interview guideline corresponded to the research questions presented in chapter 1.3. These questions were refined and operationalized. The major parts of the interview guideline and the respective questions are summarized in the following list:

Part 1: Personal data

- Questions on personal data and (authoritative) competencies

Part 2: Interests and perceptions

- What are your interests with respect to the use and the protection of natural resources in the GWB and its coastal areas?
- Who else do you think has an interest or a formal responsibility with respect to the use or the protection of natural resources in the area of the GWB?
- What is your personal understanding of an integrated coastal zone management (ICZM) or an ecosystem-based management (EBM) approach in the study region?
- Which difficulties do you personally perceive with respect to the realization of an ICZM or an EBM approach?
- Please list all issues you think have negative impacts on coastal ecosystems!
- Please define your understanding of ‘sustainability’ in the GWB! What are, according to your opinion, factors supporting or threatening sustainability and what strengths and weaknesses do you see in the area under consideration?

Part 3: Conflicts between different actor groups

- What are your major problems with respect to the realization of your interests?
- What are your fears and needs with respect to your interests and with respect to the revealed conflict issues?

Part 4: Perceived importance of actors and power distribution among different actor groups

- Who do you think is an important actor with respect to the use and the protection of the GWB?
- How do you perceive your own personal influence and your actor group's influence? How do you perceive the influence of other actor groups involved in natural resource management in the case study area?
- Why, do you think, do some actors/actor groups have a low and others a high degree of influence in natural resource management in the case study area?

Part 5: Interaction of different actors/ actor groups

- Please name all actors you have regularly professional contact with, regarding issues related to the management of the GWB and/ or its coastal areas.
- How often do you contact this particular actor?
- Why do you contact this particular actor?
- How do you evaluate the contact with this particular actor? (positive/negative/neutral)
- Is the contact with this particular actor one-sided?

Part 6: Outlook on further developments and policy options

- What would you improve in natural resource management in the case study area?
- How do you envision the development in this area?

The questionnaire was divided into six parts. In the first part, interviewees were briefly questioned about their personal data and (authoritative) competencies. The second part particularly dealt with the different actors' interests and perceptions regarding natural resource management in the Greifswald Bay and its coastal areas. In a first question, respondents should specify their interests (or political responsibilities) with respect to the area under study. In a further question, the interview respondents were asked to list all those issues that they thought negatively impact the coastal ecosystems. Subsequently, the actors were asked to explain their understanding of an integrated coastal zone management (ICZM) and an ecosystem-based management (EBM) approach in the study region. Furthermore, they should specify which impacts they personally perceived to be problematic with respect to the realization of an ICZM or an EBM approach. In a following question, I asked the interviewees to define 'sustainability' in the area of the Greifswald Bay. In this context, the respondents were required to list all factors that support or threaten sustainability according to their opinion. They should then list the strengths and weaknesses they esteemed to be characteristic for the area under consideration. These first questions provided information on the respondents' interests and their specific perceptions regarding the GWB.

The third part in the interview guideline dealt with problems respondents have with respect to the implementation of their own interests. This way, diverse conflict issues between different actor groups could be revealed. In this context, respondents were asked about their fears and needs regarding the conflict issue. The following part of the interviews focused on the perceived importance of actors and the perceived power distribution among different actor groups in natural resource management in the case study. In an introductory question, respondents were asked to list

all actors they regarded as important in the case study area with respect to the management of natural resources. In a second question, respondents should evaluate their own personal and their actor group's influence, and likewise the influence of other actor groups involved in natural resource management in the case study area. They should further specify the reasons why they judged themselves or other actor groups as having a low or a high degree of influence. Both of these questions provide details about the mutual relevance of actors in a network. They methodologically implement the reputation approach, which is described in a later chapter.

The fifth part of the interview guideline served to gather sociometric network data as the essential basis for a social network analysis. Therefore, respondents were asked to name all actors they regularly contacted for professional reasons regarding issues related to the GWB and/or its coastal areas. Additionally, they should indicate the frequency and the reason of the contact. The respondents were further asked to evaluate the contact and to indicate whether the contact was one-sided or reciprocal. In a final part, I asked respondents what they would improve in the use and the protection of the GWB and its coastal areas. They further were invited to explain how they envisioned the future development of this area.

The interview phase with different respondents was continued until statements and opinions repeated themselves, nothing new could be learned, and the interview conversation did not contribute to or change the general overall picture. This phase was finalized when no new actors were designated by others as central/influential or marginalized within the considered policy network. I tried to include all of the mentioned actors in the assessment, but abstained from interviewing a person, if it could be assumed that this person would represent a very similar narrative and perspective to that of respondents who had already conducted interviews. Even though an optimal setting would require considering all assigned actors in the survey; limited time and resource availability prevented a more extensive approach.

3.1.2.3 Qualitative Data Processing

The first three interviews were conducted in December 2012 and used as a pre-test to validate the interview guideline. Most of the interviews took place between February 2013 and December 2013. The interview phase and the data-gathering process were completed, after having achieved a sufficient degree of theoretical saturation. Theoretical saturation was conceptualized as the moment in the research process where statements and opinions continued to repeat themselves, and new data would not have contributed to the further exploration of the research phenomena (Glaser & Strauss, 2010, p. 76; Mason, 2010: online). However, a small number of additional interviews was conducted to validate the previous interview findings. During this phase, unclear issues or ambiguities in the data were addressed and discussed.

In most cases, respondents were asked by e-mail or phone whether they agreed to a face-to-face interview. On average, the interviews took 1 ½ hours, with a minimum of 40 minutes and a maximum of almost three hours. Only three interview partners insisted on having the questions in advance to be able to prepare for the interview. All interview partners, except for two, agreed to an audio recording of the interview. These recordings have been transcribed in full length in order to realize a line-by-line analysis through systematic coding. One interview partner instructed me to switch off the recorder every time he gave evidence about topics that were, in his opinion, 'politically delicate' or 'explosive' (a total of three times). The data were treated in a highly confidential manner which had

been agreed upon before each interview started. Thus, particular care has been taken that interview statements in this work cannot be traced back to a single respondent. Data are completely anonymized, which was facilitated by the high number of conducted interviews. In order to refer to text passages from interviews, I assigned consecutive numbers to each of the interviews. Additionally, I provided the first letter of the group the respondent had been classified into. This is shown in table 2.

Table 2: Abbreviations to anonymize the interview respondents' statements

Fishery (F)	F1, F2, F3 … F9
Nature Conservation (N)	N1, N2, N3… N11
Spatial Planning (SP)	SP1, SP2, SP3
Agriculture (A)	A1, A2, A3
Mining (M)	M1
Scientific Institutions (S)	S1, S2, S3… S6
Environmental Consulting (E)	E1, E2, E3
Others (O)	O1

To adequately structure and evaluate the large volume of interview material gathered during the research, I used Atlas.ti®, an analysis software to systematically evaluate qualitative data. Data collection and data analysis took place simultaneously. The systematization and interpretation of the qualitative data accompanied the whole research process. Therefore, a sequence of different coding methods was applied. *Coding* is seen as a 'necessary prerequisite for a systematic comparison of text passages: text segments are retrieved and analyzed in order to discover 'dimensions' which can be used as basis for comparing different cases' (Kelle, 1997 § 5.9). Codes are defined as tags or labels that are applied to assign 'units of meanings to the descriptive or inferential information compiled during a study' (Miles & Huberman, 1994, p. 56). These units vary in size and consist of single 'words, phrases, sentences, or whole paragraphs' (Miles & Huberman, 1994, p. 56). Codes help the analyst to selectively retrieve and organize the text, and, moreover, to identify and cluster text segments that are related to a particular research question, hypothesis, construct, or theme (Miles & Huberman, 1994, p. 57). Thus, coding facilitates the systematical reduction of the complexity of the information been gathered during the qualitative data collection (Gläser & Laudel, 2013: Chapter 3). The development of an appropriate coding system varies according to the research approach. In this study, I applied 'theoretical coding' which is often associated with Grounded theory and comprises a sequence of three major types of coding (Kuckartz, 2010, p. 75). The sequence of coding started with 'open coding', which describes the introductory procedure 'of breaking down data into distinct units of meaning' (Goulding, 2002, p. 76 and 170). Relevant information in a text segment are determined by the researcher and attached to a specific code that had been identified either prior to the analysis or afterwards, during the text analysis itself. That way, the researcher tries to identify key words or phrases that connect the respondent's experiences and (subjective) perceptions to the questions under study (Goulding, 2002, p. 76). After the initial coding, the analysis continued, but rather focused on comparing and (empirically) generalizing the codes, and on finding connections between them (Charmaz, 2006, p. 80). In this step of the analysis, codes were reorganized and reformulated by 'axial coding' and 'selective coding.' Axial coding is the process of relating codes (categories and

concepts) to each other, applying a combination of a range of deductive or inductive approaches. Axial coding aims to find out how categories relate to their subcategories, and strives to complete categories with respect to their properties and dimensions (Strauss & Corbin, 1990, p. 210). Characteristic attributes of previously found concepts are specified and dimensionalized in terms of their manifestation, their intensity or weakness (Goulding, 2002, p. 78). In this phase of the research, categories and concepts that had been elaborated during open coding are entwined and empirically generalized while, at the same time, phenomena are linked to causal conditions (Strauss & Corbin, 1990, pp. 131-132). Axial coding emphasizes the generation of an understanding of the dynamic interrelationships of concepts and categories within the context of their specific attributes (Goulding, 2002, p. 78). Subsequent selective coding is defined as 'the process of integrating and refining the theory' (Strauss & Corbin, 1990, p. 143). In order to do this, categories are further linked to each other to develop an extensive descriptive narrative ('a story') about the central phenomenon of the study that is subsequently conceptualized (a 'storyline') and theorized (Strauss & Corbin, 1990, p. 148). Theoretical coding facilitates the empirical generalization and explanation of phenomena and patterns in the data material (Gläser & Laudel, 2013: Section: 4.4).

In this thesis, the conceived system of codes and categories was constantly reviewed for internal consistency and logic, leading to a steady adaption of the research design. The first interview transcripts were re-coded after the found codes within the category system proved to be much more 'stable' than right at the beginning of the open coding process. Thus, there was a constant dialogue between the research design and the ongoing data analysis and interpretation. The continual reflection of the data and the critical questioning of previously made assumptions or interpretations were regarded a necessary part of the qualitative research process, inducing an increased sensitivity to the concepts, their meanings, and relationships found in the data and subsequently utilized to develop a valid theory (Atkinson & Delamont, 2005, p. 833; Strauss & Corbin, 1990, p. 43). Experiencing uncertainties or gaps within the data during the initial analytical process may contribute to a more appropriate research design and, at the same time, reflect the learning process of the researcher (Charmaz, 2006, p. 48).

In this work, the interview evaluation was exclusively realized with Atlas.ti®. The benefits and jeopardies of computer-based programs are broadly discussed among social science scholars since the beginning of their application in qualitative research. Different software packages offer opportunities for researchers to systematically order and structure complex textual material and subsequently retrieve important text passages. While some researchers doubt the methodological quality and potential of computer-based analysis, others emphasize the provided facilities for complex and convenient storage and retrieval of text (Kelle, 1997 § 1.4). From a more optimistic perspective, technical support is supposed to increase the transparency and the rigorousness of qualitative research (Richards & Richards, 1991, p. 53), while analysis methods gain higher 'standardization' in order to repel the constant reproach of 'unsystematic' forms of inquiry (Kelle, 1997 § 1.4).

3.1.3 Roundtable Discussions and participatory Observations

During the course of the research, two roundtable discussions with different actors were initiated in order to gain an impression of their real interactions, their form of communication and discussion. It was further observed which topics were discussed, and how different problematic issues were treated during the discussion. Both of the roundtables took place in Stralsund and were organized

inter alia by the researcher. The first roundtable took place on two consecutive days in September 2013. Around 25 people from different political organizations and associations with formal responsibility or interests with respect to the management of the Greifswald Bay participated. They were state and non-state actors from the fishery, the nature conservation, and the agricultural part, as well as from spatial planning, resource extraction, and science. More than half of the participants belonged to the circle of interview respondents. The interviews had already been conducted prior to the roundtable. In an introductory step, the case study was presented to the audience. Therefore, lots of geographical maps showing anthropogenic uses in the coastal area of the Greifswald Bay were prepared. Subsequently, a discussion on the existing management structure, its potential gaps and perceived inconsistencies was initiated, simultaneously revealing conflict issues among different actor groups. This way, actors disclosed their needs and fears with respect to the use and the protection of the Greifswald Bay. This roundtable was concluded with a subsequent dialogue forum on aquaculture in which further actors, e.g. from economy and science, joined the discussion.

The Greifswald Bay was only one of three coastal case study areas. Researchers from the World Maritime University in Malmö and the National Marine Fisheries Research Institute in Gdynia were involved to assess the existing management structures for the Blekinge Archipelago and Skane in Sweden, as well as the Vistula Lagoon in Poland. Hence, the second roundtable was organized as a two day 'transnational workshop' in March 2014, inviting different actors from all three case study areas. Again, there were representatives from fishery, nature conservation, spatial planning and science, including governmental as well as non-governmental actors. The aim of the second roundtable was to identify best practices in each country and case study area to support an 'intercultural' exchange of possible management options. The results of these actor roundtables were summarized and discussed during a transnational project symposium that took place in Klaipeda, Lithuania in September 2014. For the symposium's discussion, especially marine and social scientists were invited and shared their specific impressions after almost two years of research in the case studies.

There were several more opportunities to observe the interaction among different actor groups' representatives. During an informal meeting of fishery association representatives, fishery scientists, and policy makers discussing the implementation of the European Marine Framework Directive strong tensions between the different actor groups were revealed. This meeting was scientifically interesting for this research since communication and interaction between these different actor groups could be observed in detail. Furthermore, actor groups' interests, needs and fears were revealed. The actual aim of this meeting was to find a mutual basis for discussion, since the relationship between the different participating actor groups was perceived as being rather tense by the group members. This meeting should further clarify the policy-making process and the participative options concerning the implementation of the MSFD.

Additionally, I attended four public hearing sessions regarding a controversially discussed gas and stream power plant to be built on the shoreline of the Greifswald Bay near Lubmin. These hearings gave an impression on how and with which arguments different actor groups publicly represented and defended their interests against others. The visit of the general assembly of the Fishery Association of the Cutter and Small Scale Fisheries (LdKKF) was another essential event to observe the interactions within a single actor group. This event was perfect in terms of observing in which way one actor group motivated its own members to reach the common goals that were clearly highlighted by dissociating them from other actor groups' interests, which were negated or

perceived as a threat to the own interests. During this meeting, I have put special focus on characteristic rhetoric elements that shaped the common discourse. In another discussion forum, fishery scientists and fishery representatives discussed the different stock assessment methods, their uncertainties and future challenges. During this occasion, a lot of problematic issues between nature conservation goals and fishery interests in marine areas were revealed.

The roundtable discussions and the public events helped to identify the different actor groups' interests and their specific needs and fears concerning the management of the Greifswald Bay and its coastal areas. These events further offered the opportunity to get an impression on the different actor groups' strategies with respect to their interest representation and their future actions. The findings were complemented by a review of actor groups' public statements, press releases and newspaper articles related to these events.

The following figure subsumes the different events I attended during the course of the research.

Roundtables and workshops
▪ First (case study) roundtable including the dialogue forum on aquaculture, 3. – 4. September, 2013 in Stralsund/Germany
▪ Transnational roundtable, 12. – 13. March, 2014 in Stralsund/Germany
▪ Transnational project symposium, 24. September, 2014 in Klaipeda/Lithuania
Public hearings and events
▪ Informal meeting of fishery association representatives, fishery research representatives, and policy makers on the implementation of the European Marine Framework Directive, 21. May, 2013 in Hamburg/Germany,
▪ Four hearing dates of a plan approval procedure of a gas and stream power plant on the shoreline of the Greifswald Bay near Lubmin, 27. May – 6. June, 2013 in Stralsund/Germany
▪ General assembly of the State Association for Cutter and Coastal Fishery (LdKKF), 31. May, 2013 in Negast/Germany
▪ Discussion forum on the benchmarking process and the assessment of Baltic cod with fishery scientists and fishery representatives, 3. July, 2013 in Rostock/Germany

Figure 6: Roundtables, workshops, public hearings, and events during the research

3.1.4 Conflict Analysis

The conflict analysis implemented in this thesis cannot be understood as an independent method. It is rather a combination and focused summary of the findings that arose during the semi-structured interviews and the roundtable discussions. In this analysis step, a specific emphasis was put on the various management conflicts that were identified by the respondents. One aim was to reveal the different actor groups' needs and fears and to compile these results in a manner that could serve as a basis for potential mediation processes. It is assumed that the negligence or the non-recognition of essential needs and fears impede collective approaches to the management of natural resources. That is why conflict analysis as such was highlighted as a particular method in this thesis.

3.1.5 Social Network Analysis

The social network approach 'seeks to describe social structure in terms of networks and to interpret the behavior of actors in light of their varying positions within social structure' (Marsden, 1990, p. 436). The emphasis lies on both the identification of constraints evolved by social structure on individual action and the various opportunities arising from an actor's favorable position facilitating access to social resources, social capital, or social support (Marsden, 1990, p. 436).

In general terms, network information can be expressed in graphs and matrices (Hanneman & Riddle, 2005: Chapter 1). The graphs provide a visual representation of the network where each node represents an actor and each arrow a directed relational link between two different actors. The social network data that were collected in the course of this research have been processed and analyzed with the help of UCINET 6 (Borgatti, Everett, & Freeman, 2002), that is one software (amongst many others) commonly applied in social network analysis. The collected data are entered into UCINET 6 creating DL files ('data language' files). That way, a binary sociomatrix of asymmetric data (i.e., ties are directed and might be or might not be reciprocal) is generated and continuously completed after each interview. This sociomatrix consists of a row and a column for each single actor node and indicates whether two actors are interlinked assigning the value '1' for an existing contact and '0' for the absence of a contact (J. Scott, 2000, p. 64). The visualizations of the networks is carried out with NetDraw, a program to display social network structures (Borgatti et al., 2002). To make these network maps more attractive, the network maps were redesigned with Adobe Illustrator CC.

Social network analysis offers different methodological approaches both of quantitative and qualitative nature to analyze relational data. In this work, I applied three different approaches: the interactional approach, the positional approach and the reputational approach that build on one another, but emphasize different analysis aspects. These approaches are treated in a complementary manner while the results are subsequently in the focus of a comparative analysis. The following subchapters will provide an overview on these different approaches and highlight their specific contributions to this research study.

3.1.5.1 The interactional Approach

The interactional approach in social network analysis focuses on the interpersonal and intergroup interaction processes within a network. 'Interactions' may considerably vary in form, intensity, or the degree of their institutionalization. While some interactions are compulsorily prescribed (e.g. in formal policy making), other interactions are voluntary and may possess a rather informal character. There may be various different reasons why actors interact or maintain contact with each other. Data on mutual interaction are normally gathered during interviews by asking the respondents to name all actors they regularly contact or meet for certain reasons. Among others, interaction may reflect communication, cooperation, coordination, exchange, advice, or resource flows within a network. Sociometric data on interactions may also be gathered by screening appointment calendars, telephone bills, e-mails, letters, and minutes of meetings (Tichy, Tushman, & Fombrun, 1979, p. 512). Observational or participatory methods (e.g. roundtable discussions or meeting events) are another way to collect interactional sociometric data, which attempt to answer questions like: 'Who speaks to whom?, 'Who interrupts whom?', 'Which wording is used by whom, why, and what are the consequences resulting from that?'.

For the purpose of this thesis, the interactional approach was applied in order to gain an understanding of the social interactions of the actors in the assessed policy network. Therefore, in a first step, I gathered egocentric network data of all actors that had been identified as being crucial with respect to the protection and use of the GWB. With this, it became possible to assess the actual degree of cooperation and coordination among different actor groups and their actors that were chosen as my interview respondents. The corresponding network data were queried during each interview. Therefore, respondents were asked to name *all* actors with whom they regularly stayed in professional contact to discuss (coastal) management issues or with whom they regularly coordinated their tasks. Furthermore, they were asked to indicate the frequency and the reasons for the contact. The respondents should additionally evaluate the contact and indicate whether the contact was one-sided or reciprocal. For this purpose, a *contact matrix* was prepared that was filled together with each respondent during the interview. This contact matrix is presented in the following table.

Table 3: Contact matrix to record sociometric data

Actor	**Frequency of contact**	**Reasons for the contact**	**Evaluation of the contact**	**Direction of the relation**
a) Could you please name *all* actors you have regular professional contact with?	**b) How often do you contact this particular actor? (please specify)**	**c) Why do you contact this particular actor?**	**d) How do you evaluate the contact with this particular actor? (positive/ negative/neutral)**	**e) Is the contact with this particular actor one-sided?**
Name of first actor				
Name of second actor				
…				

The personal network of an individual actor served to complement the overall network. All interview respondents and their professional contacts are represented as '*nodes*' in the policy network. Only those contacts that had been mentioned at least twice were included as nodes in the network map. Nodes were labeled by the name of the actors' affiliated organization or association. In the context of this research, contact among the different network actors may broadly represent regular patterns of *help, advice, information or money flow, conflict,* or *formal involvement in decision making.*

As soon as the respondents were finished designating their professional contacts, the researcher dug a little deeper by asking whether they had forgotten to mention any actors. In support of the respondent, different actor groups were suggested, however without specifying single actors. In some cases, this approach led to the disclosure of forgotten contacts, while in other cases it did not. Empirical research has evidenced that an open research approach based on an open choice design to collect sociometric data assures a higher reliability (Wasserman & Faust, 1994, p. 2). It is assumed that the relationships or contacts respondents fail to recall are weaker in their essence than those that are remembered by the respondent spontaneously. Those connections are more stable and, hence, have higher reliability (Marsden, 1990, p. 456). The quality and accuracy of network data is

comparatively higher for close and strong ties than for distal and weak ones. Informants are more likely to forget weak ties than strong ties (Brewer, 2000, p. 29; Campbell & Lee, 1991, p. 215; K. White & Watkins, 2000, p. 341). There is a higher probability that relationships that are characteristically less salient or absorbing tend to be accidentally omitted or forgotten by respondents, such as telephone calls or day-to-day communications (Bell, Belli-McQueen, & Haider, 2007, p. 283). Hence, the strength of interpersonal ties apparently determines the validity of sociometric network data (Marsden, 1990, p. 456). The strength of a social tie is defined as 'a (probably linear) combination of the amount of time, the emotional intensity, the intimacy (mutual confiding), and the reciprocal services which characterize the tie' (Granovetter, 1973, p. 1361). In this study, the focus was on the stronger relations as they reflect long-term behavior among the network actors and, thus, provide more reliable data on actual interaction.

3.1.5.2 The positional Approach

The positional approach may be used as an approach to gain (quantitative) information on structural characteristics of a network. Social network analysis provides a range of tools to analyze e.g. the integration or marginalization of actors within a network, the density and strengths of their linkages, and the cohesiveness of a network that indicates whether a network tends to 'stay together' or whether it is breaking apart in sub-structures (Prell, 2013, p. 166) due to only loose and non-binding connections.

The positional approach further deals with the concept of 'structural' or 'positional' power that is inherent in an actor's individual position in the network. In this thesis, high centrality values are assumed to provide an actor with more power to influence other actors in the policy network and to favorably determine decision making. Centrality measures have been applied on an individual actor's level, but also on an actor group's level. Each actor group comprised a set of actors with responsibilities or interests concerning the management of the Greifswald Bay and its coastal areas. To analyze centrality values of a group, individual centrality values of the group members were subsumed and averaged. The non-parametric Kruskal-Wallis *H* test was applied to determine whether there were significant differences in the median centrality values between the actor subgroups. Additionally, descriptive data analysis was carried out to identify statistical patterns and tendencies within the data and so gain a better basis for statistical interpretation. In a last step of statistical analysis, the Mann-Whitney *U* test was applied to examine whether there was a statistically significant difference between state and non-state actors with respect to their centrality scores. By applying these statistical procedures, it became possible to identify individual actors or actor groups with the highest (or lowest) centrality scores indicating a good (or bad) integration regarding natural resource management in the case study area. In this context, the specific position of an actor in the network and thus his embeddedness is assumed to provide information on the actor's potential power. Individual power derives from a good access to resources (such as information, money, or services), but also from other actors' respect and trust. Thus, if one actor has often been chosen as a reliable contact within the network, the power of this actor is assumed to increase through the confidence others put in him and through the potential rise of dependencies among these actors. In this study, I further assessed patterns of 'centralization', 'density' and 'homophily' within the policy network. These measures are providing (quantitative) information on the extent of interaction and cooperation among and within different actor groups. They may therefore help to assess how actors involved in natural resource management in the Greifswald Bay

succeed in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation.

UCINET 6 provides a variety of measures to analyze different aspects of social networks. These measures are theoretically explained in the following subchapters. The following figure gives a summary on the proceedings that have been applied to analyze the data in this research.

Centrality measures and power of actors in the network
▪ Degree centrality (in-degree centrality and out-degree centrality) ▪ Betweenness centrality ▪ Eigenvector centrality ▪ Closeness centrality
Structural network characteristics
▪ Network density ▪ Network centralization ▪ Homophily within a network

Figure 7: Measures and proceedings used to analyze the network data in this study

3.1.5.2.1 Degree Centrality

Equitation for actor i	
$C_D(i) = \sum_{j=1}^{n} x_{ij}$	Where, x_{ij} = the value of the tie between actor i and actor j (a value being either 0 or 1, with 0 = no link present and 1 = link present) n = the number of nodes in the network
Definition	
Degree centrality is generally estimated to be the most intuitive form of centrality (Degenne & Forsé, 1999, p. 133). It simply counts the number of immediate contacts an actor maintains in the network, without considering the direction of these contact ties (Borgatti et al., 2013, p. 160 and p. 165; Prell, 2013, p. 97). Hence, degree centrality is defined as the number of edges attached to an actor (M. E. J. Newman, 2008, p. 4; Wasserman & Faust, 1994, p. 43). Therefore, it is a reflection on the *involvement* or *activity* of an actor in the network. But it does not express whether or not an actor is influential or prestigious. Nevertheless, maintaining many contacts and being addressed by other actors in the network as a contact person may have positive effects on an actor's visibility and influence in many social settings (Borgatti et al., 2013, p. 164; Degenne & Forsé, 1999, p. 133). Taking a communication network as an example, an actor with high degree centrality is one that may be considered as a major information channel since the actor easily accesses different communication strands and furthermore is able to quickly spread information in different directions of the network (Prell, 2013, p. 97). Assuming that different things – such as information, money or even infections – 'are flowing' through the ties of a social network and thus are given from one actor to another, those actors with a high degree centrality are more exposed to receiving whatever flows though the network (may this be information in a gossip network, money in a finance network, or infections in a sexual network). The probability that something taking a random walk through the network reaches an actor is proportional to the actor's degree centrality (Borgatti et al., 2013, p. 166). But there are possible drawbacks, for instance having too many ties and feeling obliged to please all immediate neighbors in the network, by which the capacity of the actor's own action may be negatively constrained (Frank & Yasumoto, 1998, p. 645). Degree centrality values are calculated from matrices encompassing binary, symmetrical network data.	

3.1.5.2.2 Indegree Centrality

Equitation for actor i	
$C_I\,(i) = \sum_{j=1}^{n} y_{ji}$	Where, y_{ji} = the value of the tie from actor *j* to actor i (the value being either 0 or 1, with 0 = no link present and 1 = link present). n = the number of nodes in the network
Definition	
Indegree centrality is defined as the number of ties an actor receives from other actors in the network. It is therefore a measure for *prestige* or *popularity* of an actor in a network. It counts the number of links directed towards the actor (Jansen, 2006, p. 143; Prell, 2013, p. 99). Indegree is applicable except for directed network graphs.	

3.1.5.2.3 Outdegree Centrality

Equitation for actor i	
$C_0\,(i) = \sum_{j=1}^{n} y_{ij}$	Where, x_{ij} = the value of the tie from actor i to actor *j* (the value being either 0 or 1 with 0 = no link present and 1 = link present). n = the number of nodes in the network
Definition	
Outdegree centrality counts the number of ties that go out from one actor to other actors in the network. Hence, it measures the *expansiveness* of this actor. In terms of exchange relations, indegree centrality can be considered a measure for '*receiving*', outdegree centrality a measure of '*giving*' (Prell, 2013, p. 99). Outdegree is applicable except for directed network graphs.	

3.1.5.2.4 Betweenness Centrality

Equitation for actor k	
$C_B(k) = \sum \frac{\vartheta_{ikj}}{\vartheta_{ij}}\,, i \neq j \neq k$	Where, ϑ_{ikj} = the number of geodesics from actor i to *j* that pass through node k ϑ_{ij} = the number of geodesics from actor i to *j* (Ties are binary, with 0 = no link present and 1 = link present).
Definition	
Betweenness centrality defines the degree to which an individual actor connects other actors in the network that would otherwise not be linked (Burt, 1992, p. 74). It quantifies the number of times a node bridges the shortest path (the *'geodesic'*) between two other nodes (L. C. Freeman, 1979, p. 221; Wasserman & Faust, 1994, p. 44). A high betweenness centrality requires an actor to occupy an intermediary position in the network (Prell, 2013, p. 104). This actor is particularly important and crucial for other actors to efficiently reach other parts of the network. Betweenness centrality is a crude description of an actor's potential control over resource or information flows within the network and measures the probability that resources or information will flow through this actor on their way to wherever they are going (Borgatti et al., 2013, p. 175; L. C. Freeman, 1979, p. 221). An actor with a high betweenness centrality is able to exert substantial influence, not because of being in the middle of the network (which is indeed not a prerequisite), but by virtue of being situated *between* other actors (Granovetter, 1973, p. 1364; M. E. J. Newman, 2008,	

p. 6). These high-betweenness actors are in a position to disrupt or to support flows within the network (Borgatti et al., 2013, p. 175; Prell, 2013, p. 104), hence becoming '*bottlenecks'* or *'brokers'* (Burt, 1992, p. 78; Wasserman & Faust, 1994, p. 3). Betweenness centrality best portrays the most influential or powerful actors in the network and uncovers their structural advantageous positions. It is more significant compared to other centrality measures, as the scores are dispersed in a wider variance (L. C. Freeman, 1979, p. 221; Wasserman & Faust, 1994, p. 44). Hence, those who are more influential in the network are identified more clearly (Prell, 2013, p. 107). In this work, betweenness centrality was calculated for directed network graphs.

3.1.5.2.5 Closeness Centrality

Equitation for actor i	
$C_c\,(i) = \sum_{j=1}^{n} d_{ij}$	Where, $d_{ij} =$ the distance from actor i to actor j n = the number of nodes in the network
Definition	
Closeness centrality reflects the '*reachability*' of an actor in the network. Central actors tend to have a lower closeness centrality as average network distances to other nodes are shorter. Based on this, closeness centrality is defined as the sum of the shortest path lengths connecting one actor with all other actors in the network. Thus, it measures centrality as the *distance* between different actors (Borgatti et al., 2013, p. 173). Consequently, closeness or proximity is an index reflecting the social distance between individuals (McFarland & Brown, 1973 cited in Tichy et al., 1979, p. 513). Therefore, the efforts of central actors required to get in touch with other actors, and to access valuable information (Leavitt, 1951), or resources are lower compared to actors who are situated more peripherally and, hence, rely on others to relay information or resources through the network channels (Bavelas, 1950, p. 726; L. C. Freeman, 1979, p. 224). Central actors can more easily reach out to everybody else in the network so that the actors' capacity to mobilize other actors or network flows is distinctively higher than on average. These actors may use their positional advantage to easily disperse information or resources throughout the network and are more likely to get what they want. Whereas degree centrality describes the *activity,* and betweenness centrality the *potential control* over network flows, closeness centrality emphasizes an actor's *independency* (Prell, 2013, p. 107). The closer an actor is to many others in the network, the less dependent he is since he relies less on intermediaries (Prell, 2013, p. 107). Compared with other centrality measures, algorithms for closeness centrality compute reversed scores. Higher scores imply a lower closeness centrality, whereas lower scores signify a higher centrality of the actor in the network. In this work, closeness centrality was calculated for directed network graphs.	

3.1.5.2.6 Eigenvector Centrality

Equitation for actor i	
$\lambda C_E(i) = \sum_{j=1}^{n} x_{ij}\ C_E(\mathrm{j})$	Where, $C_E(i)$ = the eigenvector centrality score for actor i x_{ij} = the value of the tie between actor i and actor j (the value being either 0 or 1 with 0 = no link present and 1 = link present). x_{ij} is the (i, j) entry of the adjacency matrix. n = the number of nodes in the network λ = the (largest) eigenvalue of the adjacency matrix The eigenvector C_E is assumed to be normalized.
Definition	
Eigenvector centrality expands and refines the concept of degree centrality. It sums up the connections of a focal actor, but weighs these connections according to the other actor's degree centrality (Borgatti et al., 2013, p. 168). Therefore, eigenvector centrality acknowledges that not all connections or contacts are equal and that the power or influence an actor possesses is not necessarily dependent on how many contacts this focal actor has, but rather depends on the question *with whom* this focal actor maintains contact. Connections to persons who are themselves influential will provide an actor with more influence than connections to persons who are less influential (Hanneman & Riddle, 2005: Chapter 18). Hence, the status of an actor is a linear function of the status of those actors to whom he/she is connected (Bonacich & Lloyd, 2001, p. 192). The power and popularity of an actor in the network increases if this actor is connected to other actors who are themselves well connected (Borgatti et al., 2013, p. 168). In essence, each individual's eigenvector centrality score is merely proportional to the weighted sum of the degree centrality of the actors to whom this focal actor is connected (Bonacich & Lloyd, 2001, p. 193).	

3.1.5.2.7 Network Density

Equitation	
$d = \frac{L}{n(n-1)}$	Where, d = network density L = number of lines present in the network $n(n-1)$ = number of lines that can be present in a directed graph (this is equal to the number of pairs it contains)
Definition	
The average network density is defined as the ratio between the number of ties per node and the number of possible ties (Borgatti et al., 2013, pp. 151-152; Jansen, 2006, p. 94; Prell, 2013, pp. 166-167; J. Scott, 2000, p. 69). It measures the overall connectivity of all actors in a social network and in this way reflects a higher or lower level of interaction, communication, or resource flows within the network. Density expresses the statistical probability that a tie is existent between any pair of randomly chosen nodes (Borgatti et al., 2013, p. 152). The higher the density score, the more cohesive the considered network is (Prell, 2013, p. 167). Yet, the interpretation of density measures is strongly related to the issue of interest. A density of 0.3 in a small group might be considered very low, assuming that in a small group people may get to know each other easily. The same value in the same group could be considered incredible high, when focusing on sexual relations between these group members (Borgatti et al., 2013, p. 13). However, measurements do not provide the information whether density is evenly distributed or, in the case of fragmented networks, centralized or split among some cohesive subgroups (Friedkin, 1981, p. 41; Prell, 2013, p. 171). In this case, the calculation of density within subgroups, defined according to specific actor attributes, may help identify whether density is equally distributed within the network (Friedkin, 1981, p. 84). The equation given above is applicable for directed network graphs. Density in this work was calculated for directed network graphs.	

3.1.5.2.8 Network Centralization

Formula	
$C = \frac{\sum_{i=1}^{n}[C_D(n^*) - C_D(n_i)]}{n^2 - 3n + 2}$	Where, $C_D n^* =$ the actor with the highest degree centrality $\mathrm{C_D}(n_\mathrm{i}) =$ all the other single actors in the network $n =$ number of actors in the network $\sum_{\mathrm{i=1}}^{\mathrm{n}}[\mathrm{C_D}(\mathrm{n}^*) - \mathrm{C_D}(\mathrm{n_i})] =$ sum of the differences between each network actor's degree centrality and the actor with the highest degree centrality $n^2 - 3n + 2 =$ the maximal possible sum of the differences between the actor with the highest degree centrality and all other actors in the network of the size n (Jansen, 2006, pp. 138 - 139). C has a possible range from 0 to 1.
Definition	
Network centralization describes the degree of variability in centrality amongst the different network members (L. C. Freeman, 1979, p. 227; Wasserman & Faust, 1994, p. 6) and, thus, measures the extent to which only one or a few actors in a network maintain all of the ties (Prell, 2013, p. 169). A highly centralized management network may show an obvious concentration of power among members of a small political elite (Wasserman & Faust, 1994, p. 58). The uneven distribution of network ties among network members may imply asymmetries of power, advantaging certain actors and marginalizing others (Ernstson, Sörlin, & Elmqvist, 2009). Network centralization is applicable for undirected network graphs.	

3.1.5.2.9 Homophily within a Network

The 'homophily' hypothesis assumes that actors who share the same attributes are more likely to have ties to each other than those actors that have no common attributes (McPherson et al., 2001, p. 415). Attributes may be various but, for the statistical analysis, have to be defined as mutually exclusive, e.g. state or non-state actor, membership or non-membership, etc. UCINET provides two different options in order to test whether the tie density within and between two defined groups differs from what would be expected when ties were instead randomly distributed across all pairs of nodes without considering their attributes (Hanneman & Riddle, 2005: Chapter 18). This follows the same logic that the Pearson Chi-square test of independence is based upon. With this test, it is possible to show whether there is an interrelation between sharing the same attribute (e.g. belonging to the same group) and the likelihood of a social tie between two actors in the same network (Hanneman & Riddle, 2005: Chapter 18). The number of ties that ought to be present within a group and between two different groups can be roughly predicted. Therefore, the expected values can be compared to the actually observed frequencies of ties (Hanneman & Riddle, 2005: Chapter 18).

The procedure uses a binary graph and an additional (binary) partition vector. The latter is a vector that classifies each node as belonging to one group or the other by assigning a specific variable to each possible attribute. Afterwards, the actually observed network structure is compared to a huge number of random graphs (10,000 iterations) that have the same overall density and same-sized partitions. Thus, potential differences with respect to the observed and the predicted frequencies of social ties within a group and between different groups are revealed. With this, it can be concluded

whether a certain group membership and the likelihood of a relation are independent from each other or whether they are not (Hanneman & Riddle, 2005: Chapter 18).

3.1.5.3 The reputational Approach

Influence reputation in policy networks may be defined as the 'collective perception' of network members that are asked to evaluate another network member's relative capacity to steer policy processes and to affect policy outcomes. A high reputation may provide an actor with favorable opportunities to access resources that contribute to the actor's success to shape policy decisions advantageously to his interests. Therefore, influence reputation reflects social status relationships among actors in a social system (Knoke, 1998, pp. 508-509) and is further seen as a recurring concept of mutual relevance (Fischer & Sciarini, 2013, p. 1; J. Scott, 2013, pp. 44-45). Influence reputation may further be understood as a common variable to identify patterns of perceived power distribution and power asymmetries within a network of actors. Empirical data are usually gathered by asking interview respondents to evaluate their own influence and the influence of other actors in a defined network. That way, researchers try to obtain comparative rankings or ratings of an actor's/actor group's influence, sorting the results on a numerical or ordinal scale from highest to lowest influence reputation.

However, every individual's perception of influence is considerably dependent on, and affected by his surrounding environment (Beritelli & Laesser, 2011, p. 1300) that in turn is characterized by cultural, social, economic, and political settings. Thus, the social context in which actors are situated (Salancik & Pfeffer, 1978, p. 224), their personal affiliation to a group, their preferences, interests, and experiences, as well as their (social) integration may affect the subjective appraisal of their own influence and the influence of other individuals or institutions. Thus, influence reputation can be considered a social construct of perception (Beritelli & Laesser, 2011, p. 1300) that is not ascribing attributes to a social actor, but is a judgment about the actor's influence by others (Knoke, 1998, p. 509). Therefore, influence reputation is not a function of an actor's structural network position, or an actor's formal degree of institutionalization, but rather an expression of individual perceptions (Beritelli & Laesser, 2011, p. 1303). Although the reputational approach is criticized because it exclusively relies on subjective actors' perceptions, it delivers a quite realistic portrait of influence structures in a social setting, as the interview partners are in general directly linked to the focal policy issue and the related decision-making processes. Therefore, they are best situated to evaluate the other actors' influence. The personal evaluation of power structures within a defined policy network around a certain issue may disclose latent, or structural manifestations of power in actors' relationships that are conventionally difficult to measure (Bachrach & Baratz, 1962, pp. 948-949), and arise from social experiences of these actors within the policy system, e.g. the institutionalization of participative constraints in policy making, or a narrowly restricted agenda-setting, preventing public discussion of certain 'unpleasant' issues and marginalizing weaker actors and their interests in the network. Furthermore, the subjective perception of an actor is, in most cases, not independent from the actor's social behavior. Thus, 'the simple fact that an ego believes that its alter is powerful will lead it to behave as if alter was powerful, which in the end will render alter powerful anyway ('self-fulfilling prophecy')' (Fischer & Sciarini, 2013, p. 4). However, influence reputation is, in tendency, subject to erratic changes in the course of time due to changing social circumstances, as well as due to gossip and innuendos in social interactions (Knoke, 1998, p. 509), especially when actors intentionally try to discredit others in order to elevate their own status or to manipulate discourses to their own benefit. Hence, reputation may impinge on actors' credibility, their acceptance, and whether they are being trusted or shunned as partners in social interactions (Knoke, 1998, pp. 509-510).

For the purpose of this study, I conceptualized different dimensions of perceived power that are compared to each other. I particularly emphasized the individual actor's perception of other actors in the network. The other way around, I tried to find out how this individual actor's influence was in turn perceived by others. Therefore, the interview respondents were asked to evaluate how they perceived their own influence regarding the realization of their interests in management decisions and how they comparatively perceived the influence of other actors within the network. To this end, they should quantify their own influence and the influence of others on a 10-point scale, using 10 as the highest possible degree of influence and zero the lowest. However, most of the respondents restrained from numerically quantifying influence and instead preferred to weigh the degree of influence on an ordinal scale (very low, low, medium, high, very high). The ordinal categories were brought in line with the numerical values by splitting the 10-point scale up in five different categories and assigning each a defined range of numbers. In order to reduce the intervals derived from the numerical values, one category value was assigned which was further used to calculate averaged actor groups' influence level.

Table 4: Linkage between ordinal and numerical values to measure the degree of perceived influence

Ordinal value	very low	Low	medium	high	very high
Numerical value	1 - 2	3 – 4	5 – 6	7 - 8	9 - 10
Category value	1	2	3	4	5

To review the perceived influence of actors, I prepared a list of actors that were identified in a previous step of the analysis as being formally (politically) responsible or as having any kind of interest with respect to the use and the protection of the Greifswald Bay and its coastal areas. According to their responsibilities or interests, these actors and their specific influence values could be assigned to a specific actor group. The category values for each actor group were subsumed and averaged. If respondents indicated a degree of influence ranging from, e.g. medium to very high, then all three category values (medium, high and very high) were considered for the calculations. Furthermore, respondents were asked to provide explanations on why they perceived themselves or other actors/actor groups to have a high or low influence. All actors who were not on the actor list before, but were repeatedly mentioned as being influential or non-influential with respect to the realization of their specific interests in the research area, were additionally interviewed. Thus, different parts of the qualitative research contributed to recruit new interview partner through snowball sampling.

4 THE INSTITUTIONAL SETTING OF NATURAL RESOURCE MANAGEMENT

4.1 Analyzing Policy Fields and Policies

The institutional setting for natural resource management in the case study area has been suggested to be substantially fragmented (Strehlow et al., 2014, p. 3). The following subchapters provide an overview over the different policy fields and policies that are shaping natural resource management in the case study area. This policy analysis is then used to display the overall fragmentation of the institutional setting within that natural resource management takes place. Strengths and weaknesses of policies with respect to the sustainable development in the Greifswald Bay and its coastal areas are discussed in chapter 7 of this thesis.

Identifying the different policy fields and the respective responsible organizations on different political levels was primarily realized by analyzing policies and online documents. Additionally, during the interviews, respondents were asked to identify the major actors they estimated to be important regarding the use and the protection of natural resources in the Greifswald Bay. In many cases, actors were (political) organizations themselves that could be assigned to a specific policy field. The following table subsumes the different policy fields that were identified.

Table 5: Different policy fields determining the use and the protection of the Greifswald Bay and its coastal areas

Policy Fields	
▪ Fishery	▪ Spatial planning
▪ Nature and water conservation	▪ Mining and resource extraction
▪ Agriculture	▪ Water and shipping administration

Besides state actors, various different non-state actors were identified. Different sets of actors could not properly be assigned to one of the previous six policy fields. These actors are listed in the following table.

Table 6: Further important actors with respect to the use and the protection of the Greifswald Bay and its coastal areas

Further important Actors	
▪ Scientific organizations	▪ Water and soil associations
▪ Environmental consulting	▪ Actors from industry
▪ Actors from tourism	

The next subchapters provide an overview of the different organizational frameworks that determine sectoral policy making referring to separate organizations and policies. The organizational framework for each of the previously identified policy fields shaping natural resource management in the case study area was analyzed.

Thereby, all relevant organizations (administrative bodies) on the different political levels were revealed. Furthermore, concrete policies determining the protection or the use of natural resources in the Greifswald Bay and its coastal areas were analyzed regarding their major management objectives.

4.2 Organizational Framework of the Fishery

In Mecklenburg-Western Pomerania, the sector of small-scale fishery and inshore fishery (including gillnet fishery) has substantially decreased since the early 1990s. The adaption of market economic principles in the fishery sector combined with the constant need to stay competitive caused the insolvency of most of the fishermen. The number of fishermen in M-V whose main income source is based on fishery activities dropped from 950 in 1990 to 277 in 2012. Most of the fishery companies that conduct fishing as their main occupation are organized in fishery cooperatives or producer organizations (LALLF, 2014).

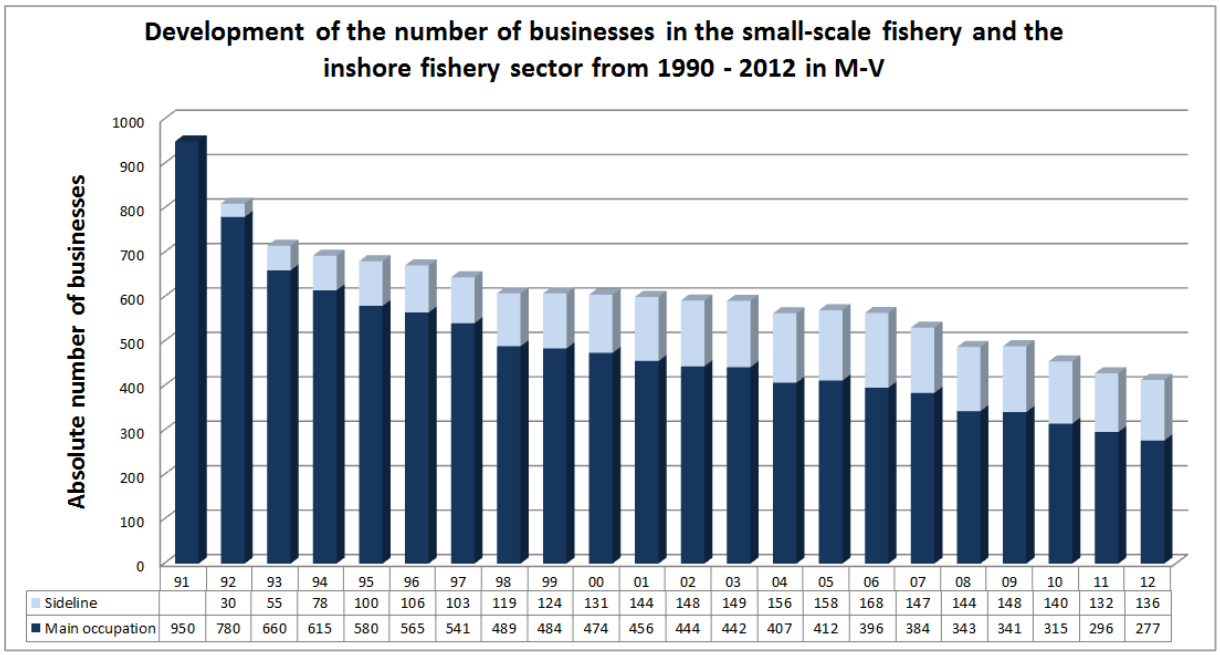


Figure 8: Development of the number of businesses in the small scale fishery sector and the inshore fishery sector from 1990 to 2012 in M-V (adopted from: LALLF, 2014)

The Greifswald Bay is one of the major spawning and nursery grounds for the western Baltic spring spawning (WBSS) herring stock (Hammer et al., 2009, p. 3). Statistics for the GWB revealed that herring catches constituted more than 90% of the total catches landed by local fishermen in 2014 (LALLF, 2015). Each spring, dense schools of the WBSS herring aggregates in the area of the GWB to spawn in its brackish water (Oeberst et al., 2009, p. 1667). Considering the whole sector of small-scale and inshore fishery along the entire coast of Mecklenburg-Western Pomerania, herring still made up almost 71% of the total catches in 2014. Other fish species play a subordinate role in the case study (LALLF, 2015).

The management of commercial fish stocks in member states of the European Union is exclusive subject to the European Commission and its Common Fishery Policy (CFP), while the subordinated political levels are charged with implementing and monitoring the provided directives. The following table illustrates the different political levels of the fishery administration in Mecklenburg-Western Pomerania.

Table 7: Fishing authorities on different political levels in Mecklenburg-Western Pomerania/ Germany

Political Level	Administrative Bodies	Policies
EU Level	Directorate-General for Maritime Affaires (DG MARE)	1. Common Fishery Policy (CFP) 2. Integrated Maritime Policy
Federal Government of Germany	Federal Ministry of Food and Agriculture (BMEL)	
	Federal Institute of Agriculture and Nutrition (BLE)	
State/Land	State Ministry of Agriculture, Nature Conservation and Consumer Protection of M-V (LUMV)	1. State Fishery Law (LFischG M-V) 2. Cormorant Ordinance M-V (KormVO M-V)
	State Office of Agriculture, Food Safety and Fishery (LALLF M-V)	Coastal Fishery Law (KüFVO M-V)
Region	Fisheries supervisory authority	1. Freshwater Fishing Law (BiFO) 2. Fishing Licence Law (FSchVO M-V)
Community Level	County commissioner and community mayors	

4.2.1 Fisheries Management on EU and National Level

Within the European Union, the Directorate-General for Maritime Affaires (DG MARE) is responsible for the implementation of the Common Fishery Policy (CFP) and the Integrated Maritime Policy. Among other things, it is commissioned with conservation, control, market measures, structural actions and international relations relating to fisheries (EC, 2014a).

There is a range of different European regulations in place for the management of commercial fish stocks, e.g. herring, cod, sprat, salmon and plaice. These fish stocks are primarily managed through the determination of total allowable catches (TACs) and through a sophisticated quota distribution system. TACs define the maximum amount (expressed in tons or numbers) of a commercial fish species that is legally allowed to be landed. For most of the fish stocks, TACs are annually set by the European Council of fisheries ministers. TACs are distributed between the different EU countries in the form of national quotas. For each fish stock, there is a fixed allocation percentage per EU country, known as the 'relative stability key' (EC, 2014e).

Herring stocks are exclusively managed by TAC and quota setting. TACs are in place to manage the adult spawning stock biomass (SSB). In the case of the considered herring stock, the SSB was at its lowest level in 2011 and has since then slightly increased. However, the recruitment of larvae (age 0) has shown a downward trend since 1991 (with some years of relaxation in between). Between 1991 and 2014, the stock recruitment reached its highest absolute value in 1999 (4164055 thousand), but is predicted to fall to less than half of this value in 2014 (1894376 thousand) (ICES, 2014, p. 9). The exact reasons for this downward trend are still unknown, but are suggested to lie in the combination of several ecosystem parameters (Polte et al., 2013, p. 2).

The European Commission formulates its recommendations on the basis of scientific advice addressing the actual state of the fish stock. The most important advisory boards are the International Council for the Exploration of the Sea (ICES) and the Scientific, Technical and Economic

Committee for Fisheries (STECF). In Germany, the Federal Institute of Agriculture and Nutrition (BLE) is the responsible authority for distributing the national quotas among fishery cooperatives and individual fishermen. The majority of fishermen is organized in and represented by fishery cooperatives. While the BLE is supposed to control and monitor fishery activities within the national marine territory, fishery surveillance authorities execute that task within the coastal areas up to 12 nm.

4.2.2 The State Fishery Law and the Coastal Fisheries Law

The state fishery law (Landesfischereigesetz, LFischG M-V) was passed in 2006 and constitutes the legal basis for the Coastal Fisheries Law (Küstenfischereiverordnung, KüFVO M-V) that is currently under revision. The latter provides the legal regulations for the coastal fisheries in Mecklenburg-Western Pomerania (M-V). It is applicable in the German coastal territorial sea (from the water baseline up to 12 nautical miles). There are clear regulations regarding species and gear restrictions, minimum landing sizes as well as closed seasons and areas (LUMV, 2006: §3 - §5). Additionally, there are spawning areas designated, where fishing activity is banned between the 1st of April and the 31st of May each year in order to ensure the smooth spawning of different vulnerable fish species. In the Greifswald Bay, there are eight defined areas that fall in this category – a) Outflow Freesendorf Sea, b) The Danish Wiek, c) The Gristower Wiek, d) The Puddeminer Wiek, e) The Schoritzer Wiek, f) The Wreechener Sea, g) The Neuensiener Sea, h) The Selliner Sea, i) The Zicker Sea (LUMV, 2006: §12 (3)). This regulation is primarily adopted for pike and pikeperch, but it is not suitable to protect herring stock recruitment as spawning time starts much earlier in the year and major identified herring spawning areas are not even mentioned. Fishing bans only exist for threatened fish species that are particularly protected by the EU's FFH-Directive (LUMV, 2006: §3).

4.3 Organizational Framework of the Nature and Water Conservation

For the last two decades, nature and water conservation have more and more been considered to be a transnational responsibility. The conjoint cooperation and effort of all EU Member States regarding the achievement of mutual environmental goals is reflected in an increasing number of European directives and regulative provisions that are crucial important for the implementation of resource management processes on the subordinated political levels. There is a complex variety of legal provisions that regulate nature and water conservation in the case study area. The following table summarizes the different levels of political decision making and briefly refers to the most important legal provisions on each level that directly or indirectly affect nature and water conservation in the area of the Greifswald Bay. In general, for the case study area, terrestrial nature conservation as well as marine nature conservation along the coast up to 12 nautical miles lies within the responsibility of the government on state level (BSH, 1014), and therewith is in the mandate of the State Ministry of Agriculture, Environment and Consumer Protection of M-V (LUMV).

Table 8: Environmental authorities on different political levels in Mecklenburg-Western Pomerania/ Germany

Political Level	Administrative Bodies	Policies
International Level	United Nations	1. Agenda 21 of the United Nations Conference on Environment & Development in Rio de Janeiro 2. Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area
EU Level	European Commission	1. Natura 2000 Directives (Flora-Fauna and Habitat Directive 1992/43/EC and Birds Directive 2009/147/EC) 2. Marine Strategy Framework Directive (2008/56/EC) 3. Water Framework Directive (2000/60/EC) 4. Nitrates Directive (1991/676/EEC) 5. Groundwater Directive (2006/118/EC)
Federal Government of Germany	German Ministry of Environment, Nature Conservation and Nuclear Safety (BMU) with the Federal Agency of Nature Conservation (BfN) and the Federal Environmental Office (Bundesumweltamt)	1. German Nature Conservation Act (BNatSchG) 2. Federal Water Resource Law (WHG) 3. German Species Protection Act (BArtSchG) 4. Federal Immission Protection Law (BImSchG) 5. National Strategy for Sustainability
State/Land	State Ministry of Agriculture, Environment and Consumer Protection of M-V (LUMV)	1. State Water Resource Law (LWaG) 2. Nature Conservation Execution Law (NatSchAG M-V) 3. Expert Landscape Programme 4. Regulation of the Landscape conservation area of the Greifswald Bay (2008)
	State Office of Agriculture, Nature Conservation and Geology (LUNG)	Expert Landscape Structure Plan
Region	Regional Agencies for Agriculture and Environment (Stalu VP)	FFH-Management Plan Voluntary agreement on nature conservation, water sports and recreational fishing in the GWB and Strelasund
	Department of the national parks and offices of biosphere reserve	Regulation of the Southeast Rügen Biosphere Reserve (1990)
Community Level	County commissioner and community mayors of the county borough	1. Communal landscape plan 2. Green ordinance plan
	Head officials and community mayors	

4.3.1 Agenda 21 of the United Nations Conference on Environment & Development in Rio de Janeiro

Agenda 21 is a non-binding, voluntary action plan of the United Nations (UN) with regard to sustainable development. It has had strong implications on the development of national environmental laws. It was elaborated during the UN Conference on Environment and Development (UNCED) held in Rio de Janeiro/Brazil in 1992 and contains a full range of provisions regarding the conservation and management of resources, the strengthening of major groups and possible ways of implementation. Chapter 17 deals with the protection of oceans and coastal areas; it states that marine and coastal management at the national, subregional, regional and global level needs further approaches that 'are integrated in content and are precautionary and anticipatory in ambit' (UN, 1992: Chapter 17 17.1). It aims for an integrated policy and decision-making process, including all the different actors involved in natural resource management to ensure sectoral coordination and a balance of uses (UN, 1992: Chapter 17 17.5 a). Furthermore, the Agenda stipulates the application of preventive and precautionary approaches in natural resource management (UN, 1992: Chapter 17 17.5 d). The precautionary approach states that actions or policies containing a suspected risk of causing harm to the public or the environment in terms of degradation are to interdict. The burden of proof that something is not harmful to the environment and complies with the existing protective framework falls on those taking the action. The absence of scientific consensus must not be taken as pretext to realize projects that might have detrimental impacts on ecosystems. Therefore chapter 35 (3) states that:

> *'[…] In the face of threats of irreversible environmental damage, lack of full scientific understanding should not be an excuse for postponing actions which are justified in their own right. The precautionary approach could provide a basis for policies relating to complex systems that are not yet fully understood and whose consequences of disturbance cannot yet be predicted' (UN, 1992: Chapter 35 (3)).*

The uncertainty with respect to the selection of a certain policy option can be reduced due to the implementation of the precautionary approach. The role and the use of sciences in supporting the prudent management of the environment are specified in the same chapter. Accordingly, one objective of science should be to support the decision-making process by providing information to better enable the formulation and selection of environmental and development policies. To ensure that science is responsive to emerging needs, it is essential to enhance scientific understanding, improve long-term scientific assessments, and strengthen scientific capacities (UN, 1992: Chapter 35 35.1). Current environmental management has to be constantly re-evaluated in the light of new findings in scientific research. The report remarks that there is an obvious communication gap among scientists, policy makers, and the public at large which is represented by both governmental and non-governmental organizations. In order to find sustainable and coherent solutions in regard to environmental degradation, a better communication is required among scientists, decision-makers, and the general public (UN, 1992: Chapter 35 35.5).

4.3.2 Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention)

The Helsinki Convention is another important instrument to ensure the persistent conservation of marine ecosystems, particular focusing on the Baltic Sea territory. The convention is the basis for HELCOM, an intergovernmental commission striving to ensure the protection of the marine

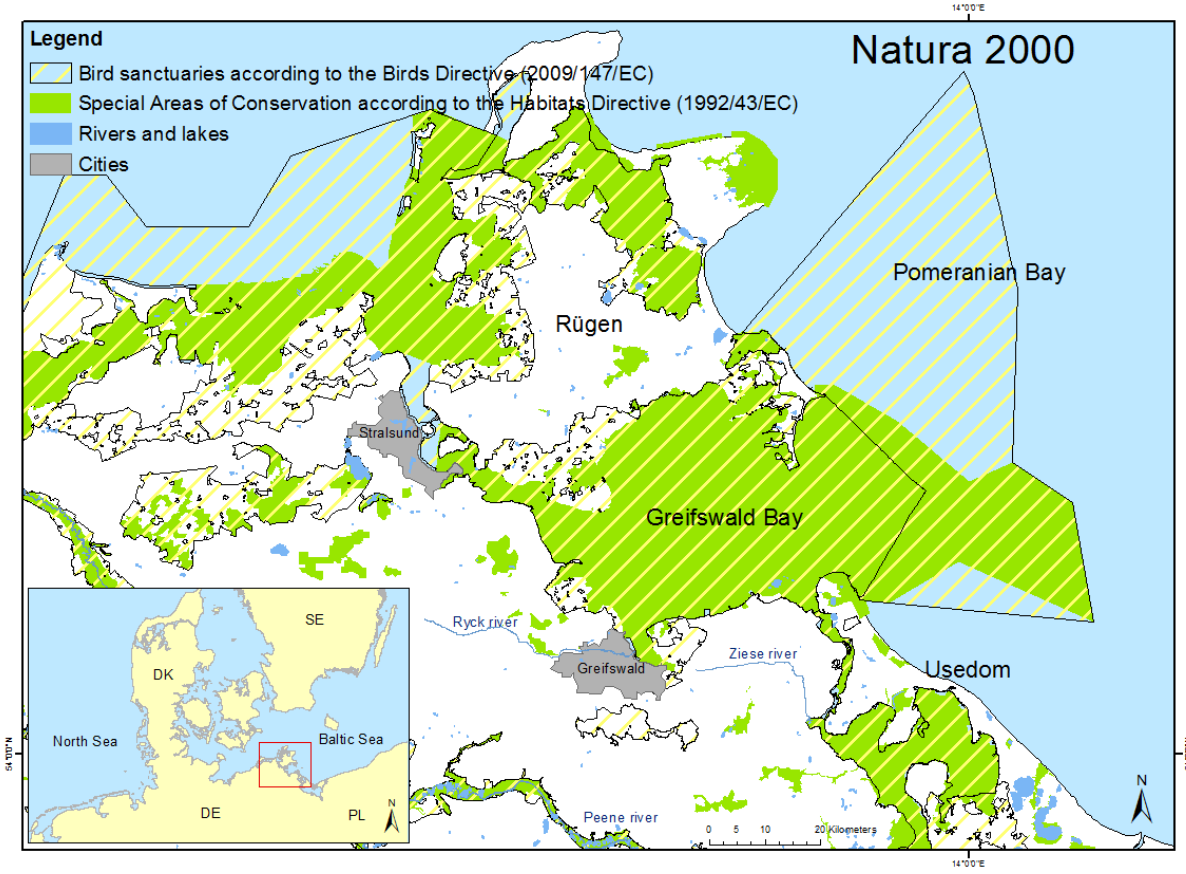
environment of the Baltic Sea. Basis of HELCOM is the Convention of the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention) that was passed in 1992 and came into force on January 17th, 2000 with the signatures of all HELCOM members (the European Community, Denmark, Germany, Estonia, Finland, Latvia, Lithuania, Poland, Russia and Sweden). Furthermore, also Norway and the Czech Republic have signed the Convention. HELCOM can give recommendations but is not able to adopt resolutions or legal guidelines. The Helsinki Convention covers the entire area of the Baltic Sea, including inland waters as well as the water of the sea and the seabed itself. Measures are also foreseen for the whole catchment area of the Baltic Sea in order to diminish land-based pollution (HELCOM, 2014). The contracting parties agreed to individually or jointly take all appropriate legislative, administrative or other relevant measures to prevent and eliminate pollution in order to promote the ecological restoration of the Baltic Sea area and the preservation of its ecological balance (HELCOM, 1992 Art. 3 (1)). They further agreed to apply the precautionary approach in cases in which ecological harm through substances or energy input into the marine environment may potentially bring about hazards to human health, living resources and marine ecosystems. This applies also to cases in which legitimate uses of the sea are interfered with (HELCOM, 1992 Art. 3 (2)). Emphasizing the polluter-pays-principle (HELCOM, 1992 Art. 3 (4)), the Convention highlights that the contracting parties shall promote the use of Best Environmental Practices and Best Available Technology (HELCOM, 1992 Art. 3 (3)). The aim of the Convention is to avoid and eliminate pollution of the marine environment of the Baltic Sea induced by harmful substances from all sources, including from land-based sources (HELCOM, 1992 Art. 6), from ships (HELCOM, 1992 Art. 8), from incineration (HELCOM, 1992 Art. 10) and dumping (HELCOM, 1992 Art. 11), and from exploration and exploitation of the seabed (HELCOM, 1992 Art. 12). In cases of pollution incidents in the territory of a HELCOM member state that are likely to cause harm to the marine environment of the Baltic Sea area outside its territory and within adjacent maritime areas, the state is obliged to notify all the other contracting states whose interests are affected or likely to be affected (HELCOM, 1992 Art. 13).

4.3.3 Natura 2000, FFH Management Plans and the Voluntary Agreement on Nature Conservation, Water Sports and Angling in the GWB and Strelasund

Natura 2000 is a European-wide coherent ecological network of terrestrial and marine protected areas in order to ensure and maintain durable biodiversity. It is made up of Special Areas of Conservation (SACs) that are designated by Member States under the European Habitats Directive (1992/43/EEC). Furthermore, Natura 2000 incorporates Special Protection Areas (SPAs) that are legal subject of the European Birds Directive (2009/147/EC) and again determined by the Member States (EC, 2014b). Overarching goal of Natura 2000 is to ensure a transboundary protection of endemic wildlife and endemic plants and their habitats (BfN, 2014a). In Germany, Natura 2000 became legally binding when its statutory provisions were transposed into the Federal Nature Conservation Act (BNatSchG) in 1998 (BfN, 2014b), and later on in its amendments from 2002 and 2007 (Chapter 4.3.7).

Altogether, 34.45% of the total territory in M-V is designated as Natura 2000 sites (LUNG, 2014c, p. 1). According to the criteria of the European Habitats Directive, the GWB, parts of the Strelasund and the northern top of Usedom are classified as '*sites of community importance*' that "contributes significantly to the maintenance or restoration at a favorable conservation status of a natural habitat

type in Annex I[2] or of a species in Annex II[3] and may also contribute significantly to the coherence of Natura 2000 […]" (EEC, 1992: Art. 1 (k)). The following map displays the spatial dimension of the Natura 2000 sites in the area of the GWB. It shows both Special Areas of Conservation (Habitats Directive) and Special Protection Areas (Birds Directive).



Map 2: Special Areas of Conservation (Habitats Directive) and Special Protection Areas (Birds Directive)

For the adequate management of Natura 2000 sites, management plans for each designated area had to be developed. These FFH management plans were supposed to determine the protective purposes and conservation goals for a designated area. In the case study area, the compilation of this management plan (FFH area coda DE 1747-301) was in the responsibility of the Regional Agency of Agriculture and Environment in Western Pomerania (Stalu VP) (StaluVP, 2014).

The **FFH (flora-fauna-habitat) management plan** of the Greifswald Bay comprises 55970 ha marine and 4249 ha terrestrial area. Until June 2014, a total of 30 different natural habitat types listed in the Annex I of the European Habitats Directive (1992/43/EEC) had already been identified in the case study area. Additionally, there were 16 animal and plant species found that are listed in the Annex II of the European Habitats Directive (LUNG, 2014b, p. 2).

The maps of the FFH management plan disclose '*shallow huge estuaries and bays*' (EU-Code 1160) as one of the largest natural habitat being found in the GWB. Referring to a best-case scenario, these

[2] Annex I includes all "natural habitat types of Community interest whose conservation requires the designation of *Special Areas of Conservation*

[3] Annex II includes all "animal and plant species of Community interest whose conservation requires the designation of *Special Areas of Conservation"*

habitats should be characterized by high diversity in macrophytes. The deepest growth limit of submerged vegetation in the GWB lies around 2.5 - 3 meters in the southern part and 4 meters in the northern part (Ifaö 2005 according to StaluVP, 2011, p. 110). The most widespread plant community in this habitat is Eurasian watermilfoil *(Myriophyllum spicatum)* and/or fennel pondweed *(Potamogeton pectinatus)* without charales, spiny naiad *(Najas marina),* common eelgrass *(Zostera marina)* spiral dichtgrass *(Ruppia cirrhosa)* and ditch-grass *(Ruppia maritime)* (MariLim 2009 according to StaluVP, 2011, p. 110). Especially *Zostera marina, Furcellaria fastigiata* and *Fucus vesiculosus* serve as important spawning substrate for herring eggs (Scabell, 1988, p. 28ff). These spawning grounds are considerable threatened by extensive nutrient discharges from adjacent agricultural land. A high eutrophication is supposed to have considerable adverse impacts on the density and the species diversity of macrophytes in the GWB. It could be observed and empirically studied that macrophytes decreased during the last decades (Hammer et al., 2009, p. 45f; Munkes, 2005, p. 10). In deeper water regions of the GWB macrophytes have disappeared to a large extent (Porsche, Schubert, & Selig, 2008, p. 109). For this reason, the habitat preservation status was classified as *'unfavorable'* (StaluVP, 2011, p. 110). The FFH management plan for the GWB mentions several other causes that may have potentially provoked habitat deterioration during the last years. These causes include interventions in the morphologic structure of estuaries (deepening of fairways), embankment, speed boat traffic, shore degradation through angling activities, the construction of harbor facilities, straightening of rivers, as well as nutrient discharge into the surface water (StaluVP, 2011, pp. 103-104).

There is a range of different means that were proposed in order to achieve the protective objectives determined in the FFH management plan. These means comprise voluntary agreements, administrative restrictions of certain usage forms, contracts to sustainable land use, support of environmental projects, public awareness raising and the legal assignment of reserves or sanctuaries (LUMV, 2014). Voluntary agreements strive to establish a consensus-oriented implementation of FFH conservation goals including negotiations between different private and public actors as well as different resource user groups. In 2004, the **'Voluntary Agreement on Nature Conservation, Water Sports and Angling in the GWB and Strelasund'** was established due to an initiative of the WWF. During the elaboration of the voluntary agreement, various associations promoting water sport activities like sailing, canoeing, rowing, wind and kite surfing, as well as angling were included. Concurrently, a continual consulting process with environmental authorities took place. This voluntary agreement was picked up as a measure for the effective implementation of the Habitats Directives in the case study area and is now regularly monitored in mutual cooperation between the WWF and the Stalu VP. With the voluntary agreement, a consensus could be achieved, combining nature conservation goals with the sustainable and thus temporarily restricted use of certain areas. Another aim was to strengthen the awareness of resource users in order to avoid disturbing and destructive effects on habitats (StaluVP, 2013, p. 1).

4.3.4 The Marine Strategy Framework Directive (2008/56/EC)

The Marine Strategy Framework Directive 2008/56/EC (MSFD) is one of the major European laws to protect, preserve and, where applicable, restore the marine environment (EC, 2008: Art. 3). It was formally adopted by the European Union in 2008 and is the environmental pillar of the EU's Integrated Maritime Policy (EC, 2014c). The MSFD aims to achieve a good environmental status of the EU's marine waters by 2020 through the application of an ecosystem-based approach to the

management of human activities with an impact on the marine environment (EC, 2008: (8)). The Directive emphasizes that the pressure on natural marine resources and the demand for marine ecological services are often too high and that the Community needs to reduce its impact on marine waters regardless of where these effects occur (EC, 2008: Art. 1 (3)). At the same time, the Directive promotes the integration of environmental considerations into relevant policies, agreements and legislative measures which have an impact on the marine environment, such as the CFP, the Common Agricultural Policy (CAP) and other relevant Community policies (EC, 2008 (9)). An explicit integration is supposed to ensure coherency of policy objectives in order to facilitate an effective implementation of environmental objectives and to diminish policy inconsistencies.

In this context, the Common Fisheries Policy (CFP) is responsible for the implementation of measures towards the achievement of a sustainable fisheries management that is compatible with the MSFD's objectives such as the long-term maintenance of fish stocks and the sustainable exploitation of fish resources. These measures are proposed to include 'the full closure to fisheries of certain areas, to enable the integrity, structure and functioning of ecosystems to be maintained or restored and, where appropriate, in order to safeguard, inter alia, spawning, nursery and feeding grounds' (EC, 2008: (39)).

In October 2011, the MSFD was transposed into German federal legislation and passed the German Bundestag (Bundestag, 2011, p. 1986). After defining the meaning of a 'Good Environmental Status' and setting up environmental goals, a monitoring program was developed and implemented in July 2014. Furthermore, a measurement program is to be completed until the end of 2015 (BLMP, 2009, p. 6). There is sound cooperation between different federal and state organizations in order to facilitate the monitoring of the Baltic Sea. This cooperation is established through the 'German Working Group on Marine Conservation Issues of the Federal States and the Federal Government' (Arbeitsgemeinschaft Bund/Länder-Messprogramm für die Meeresumwelt, BLMP). The working group aims to improve the national coordination of monitoring activities in order to meet the legal requirements that arise from international and national demands in the field of marine conservation (NLWKN, 2012).

4.3.5 The Water Framework Directive (2000/60/EC) and the Nitrates Directive (1991/676/EEC)

The Water Framework Directive (WFD) is closely linked to the MSFD (EC, 2014d) and the Nitrates Directive. It was adopted in 2000 by the European Parliament and the Council to establish a framework for Community action in the field of water policy. It requires the EU Member States (MS) to achieve a good qualitative and quantitative status of all water bodies (including marine waters up to one nautical mile) by 2015. The directive promotes the goal to establish a 'good status' for all ground and surface waters like rivers, lakes, transitional waters, and coastal waters in the EU (EC, 2000 (25)). The assessment of the ecological and chemical status of coastal waters includes the following criteria (EC, 2000, p. 42 (1.1.4)):

- **Biological quality elements** (composition, abundance and biomass of phytoplankton, of aquatic flora and of benthic invertebrate fauna)
- **Hydromorphological quality elements** (depth variations, structure and substrate of the coastal bed, structure of the intertidal zone, direction of dominant currents and wave exposure in tidal regimes)

- **Chemical and physicochemical elements** (e.g. transparency, thermal and oxygenation conditions, salinity, nutrient conditions)
- **Specific pollutants** (all priority substances being discharged into the body of the water and substances being discharged in significant quantities into the body of the water).

In Mecklenburg-Western Pomerania, the implementation of the WFD is coordinated by the State Ministry of Agriculture, Nature Conservation and Geology (LUNG M-V). This authority was responsible to set up a river basin management plan (LUNG, 2013b). The plan was last updated in 2009 (a first version was published in 2008) and encompasses a detailed description of the ecological characteristics of the river basins Warnow and Peene, which are the major river basins in M-V. The report further includes a summary of all significant stressors regarding the maintenance of ecosystems and determines objectives and measures that support the successful compliance with the environmental aims of the WFD (LUNG, 2009, p. 2). The LUNG M-V has the task to regularly inform the European Commission about progress in implementation.

The Nitrates Directive (1991/676/EEC) is an integral part of the WFD and a major instrument concerning the protection of waters against agricultural pressure. It strives to protect the water quality across Europe by avoiding nitrates from agricultural sources polluting ground and surface waters and by supporting the application of sustainable farming practices (EC, 2015d). The directive demands a common effort and concerted actions to control ecological problems arising from intensive livestock production and the application of nitrogen-containing fertilizers. As a precondition, the directive requests that agricultural policy must take environmental policy into greater account (EEC, 1991, p. 2).

4.3.6 The German National Strategy for Sustainability

The federal German government passed the National Strategy for Sustainability (Nationale Nachhaltigkeitsstrategie[4]) in 2002 and published a progress report in 2012. One chapter of the latter report deals with the pressure on oceans, coastal waters and coastal zones due to immensely increased anthropogenic use. The designation of ten marine Natura 2000 areas – four in the North Sea, six in the Baltic Sea – is seen as a first step to promote ecological sustainability in marine and coastal areas (Die Bundesregierung, 2012, p. 167). The strategy further emphasizes the need for integration of sustainability goals into the Common Fisheries Policy (Die Bundesregierung, 2012, p. 42) and the importance of the effective implementation of the ecological objectives promoted in the Water Framework Directive (2000/60/EC), the Marine Framework Directive (2008/56/EC) and the Directive on the assessment and management of flood risks (2007/60/EC). All of these directives support the ecological integrity of surface and ground water bodies, coastal waters, and oceans (Die Bundesregierung, 2012, p. 168) and are therefore suggested to have positive impacts on sustaining coastal spawning areas in the GWB.

[4] The original title of the document is less known and would be translated as follows: 'Perspectives for Germany. Our strategy for a sustainable development'

4.3.7 The Federal Water Resource Law and the State Water Resource Law

The purpose of the Federal Water Resource Law (Wasserhaushaltsgesetz, WHG) is to protect all water resources by means of sustainable water resource management. This includes surface and groundwater resources as well as coastal waters and the territorial sea (BMJV, 2009 §3). The WHG strives to maintain the durable ecological function of water bodies as a natural habitat for animals and plants, prohibiting detrimental modifications of essential properties. It furthermore interdicts severe distortions of the hydrologic balance, pointing to the fact that interferences may have adverse impacts on dependent terrestrial and marine ecosystems (BMJV, 2009 §6 (1)). Additionally, the WHG emphasizes the protection of the sea and promotes the realization of the EU's MSFD (BMJV, 2009 §45b - 45l). Ecosystem harm due to anthropogenic pressure must be avoided or reduced to ensure the maintenance and the restoration of marine biodiversity. Diverse anthropogenic usages ought to be, in any case, environmentally compatible. Discharges of detrimental substances, energy or noise into the marine environment must not have negative impacts on biodiversity, human health and other acceptable marine usage forms (BMJV, 2009 45b (2)).

The WHG provides the set-up of riparian buffer strips. These strips serve to maintain and improve the ecological function of surface and groundwater bodies. Furthermore, they are important to store water, to ensure and regulate water runoff and to reduce discharges of substances from diffuse sources (BMJV, 2009 §38(1)). Within the buffer strips, it is prohibited to convert grassland into arable land, to remove site-appropriate trees or shrubs, to apply water-hazardous substances and to store material that could disturb water runoff or that could be washed away (BMJV, 2009 §38(4)). The WHG has arranged a buffer strip of at least five meters, but allows governments on state level to enact different regulations (BMJV, 2009 §38(3)). In most states of Germany, riparian buffer strips are set to ten meters from the shore onwards or five meters in built-up areas. In December 2007, the State Government of Mecklenburg-Western Pomerania revised the State Water Resource Law (Wassergesetz des Landes Mecklenburg-Vorpommern, LWaG) which is conceived to implement the superordinate WHG. In this revision, the width of the riparian buffer strips was reduced from initially seven meters to three meters. In cases in which the spreading width of agricultural machinery was adjustable and controllable, fertilization and application of pesticides was allowed within a riparian distance of one meter (LUMV, 2008c: Sixth part §81 (3)). The same regulations are specified in the Fertilizer Ordinance applicable in M-V (BMJV, 2012b §3 (6)).

4.3.8 The Federal Nature Conservation Law

The Federal Nature Conservation Law (Bundesnaturschutzgesetz, BNatSchG) was passed in 1976 and has undergone several revision processes during the last decades (DBU, 2014). As a major law regulating the conservation of nature and landscapes, it covers all territorial and coastal areas in Germany and is thus crucial important with respect to natural resource management in the case study area. It aims to durably conserve biodiversity and to maintain ecosystems, their functionality and services, including their regenerative capacity in order to ensure sustainable resource use. All threats to flora and fauna and their natural habitats ought to be avoided (BMJV, 2010: First chapter §1 (1) - (2)).

In regard to the protection of marine areas, the BNatSchG aims at their sustainable preservation and their integration into a coherent and representative network of marine protected areas that are also arranged by the MSFD (BMJV, 2010: Chapter six §56 (2)). The assignment of marine protected areas in coastal waters as well as in the exclusive economic zone (EEZ) is realized by the Federal Agency of Nature Conservation (BfN) in coordination with the German Ministry of Environment, Nature

Conservation and Nuclear Safety (BMU). However, all concerned federal ministries ought to be included in the assignment process (BMJV, 2010: Chapter six §57 (1) - (2)).

The BNatSchG emphasizes the establishment of a network of interlinked natural biotopes that ought to encompass at least ten percent of the total area of each federal state. Therefore, it legally defines seven specific protective statuses that can be assigned to components of nature and landscapes. They differ in the degree of protection and are divided in nature reserves, national parks (and national nature monuments), biosphere reserves, landscape conservation areas, nature parks, natural monuments, and protected landscape components (BMJV, 2010: Chapter 4 Section 1 §20 (1) - (2) 1-7). The coastal and marine ecosystems of the GWB often fall under different protective statuses that overlap spatially. For instance, landscape conservation areas broadly overlap with FFH-regulations, and nature reserves with nature parks. A map at the end of this subchapter will clarify the protective provisions within the case study area.

Paragraph 30 of the BNatSchG declares that certain components of nature and landscapes, that have particular functions as biotopes, are to be legally protected (BMJV, 2010: Chapter 4 Section 1 §30 (1)). Activities that would destroy or significantly harm these biotopes are strictly prohibited (BMJV, 2010: Chapter 4 Section 1 §30 (2)). This provision includes natural (or nature-close) riparian zones and their pristine vegetation and geomorphologic characteristics (BMJV, 2010: Chapter 4 Section 1 §30 (2) 1). It further encompasses, e.g. moors and swamps, damp and wetland meadows, open inland dunes, fen woodlands and alluvial forests, reedbeds and sedge swamps, as well as limestone grassland (BMJV, 2010: Chapter 4 Section 1 §30 (2) 2-4). Additionally, bay morphologic and biologic characteristics, seaweed and other submerged macrophytes as well as species-rich gravel, coarse sand or coquina bottom substrate in marine or coastal areas are explicitly mentioned.

In 1990, the southeastern part of Rügen has gained the legal protection status of a biosphere reserve that is defined in §25 of the BNatSchG (LUMV, 1990 §1). One year later it was approved by the UNESCO and thus was included into the ‘UNCESCO Man and Biosphere Programme’ (BSR, 2014). Biosphere reserves are particularly dedicated to the maintenance, development and restoration of natural and cultural landscapes (BMJV, 2010: Chapter 4 Section 1 §25). In biosphere reserves the emphasis is put on the improvement of the overall relationship between people and their environment. A balance of nature conservation and human uses is promoted, following principles of ecological, social and economic sustainability (UNESCO, 2014). An appropriate zoning scheme in biosphere reserves and a collaborative management are supposed to ensure an effective combination of nature and landscape conservation, sustainable resource use and knowledge generation. Thus, biosphere reserves are divided into core area, buffer zones and transition areas, according to the different degrees of human influence and use (UNESCO, 2013). Core areas are primarily reserved for the undisturbed and natural development of ecosystems. To ensure and facilitate the unaffected dynamic of ecosystem processes, human activities and uses have to be precluded. The access to the core area is merely allowed for non-destructive research or other low-impact uses, such as education or monitoring purposes. The core zones should encompass at least 3% of the total biosphere reserve (BfN, 2014c; UNESCO, 2013). Buffer zones surround or adjoin the core zones and serve to maintain ecosystems that have been strongly shaped or influenced by human activities. The objective of buffer zones is to preserve anthropogenic, biological and cultural diversity. Buffer and core areas should at least encompass 20% of the total area of the biosphere reserve (BfN, 2014c; UNESCO, 2013). The transition areas that are defined around the buffer zones have the central function of supporting a sustainable development enclosing a variety of different

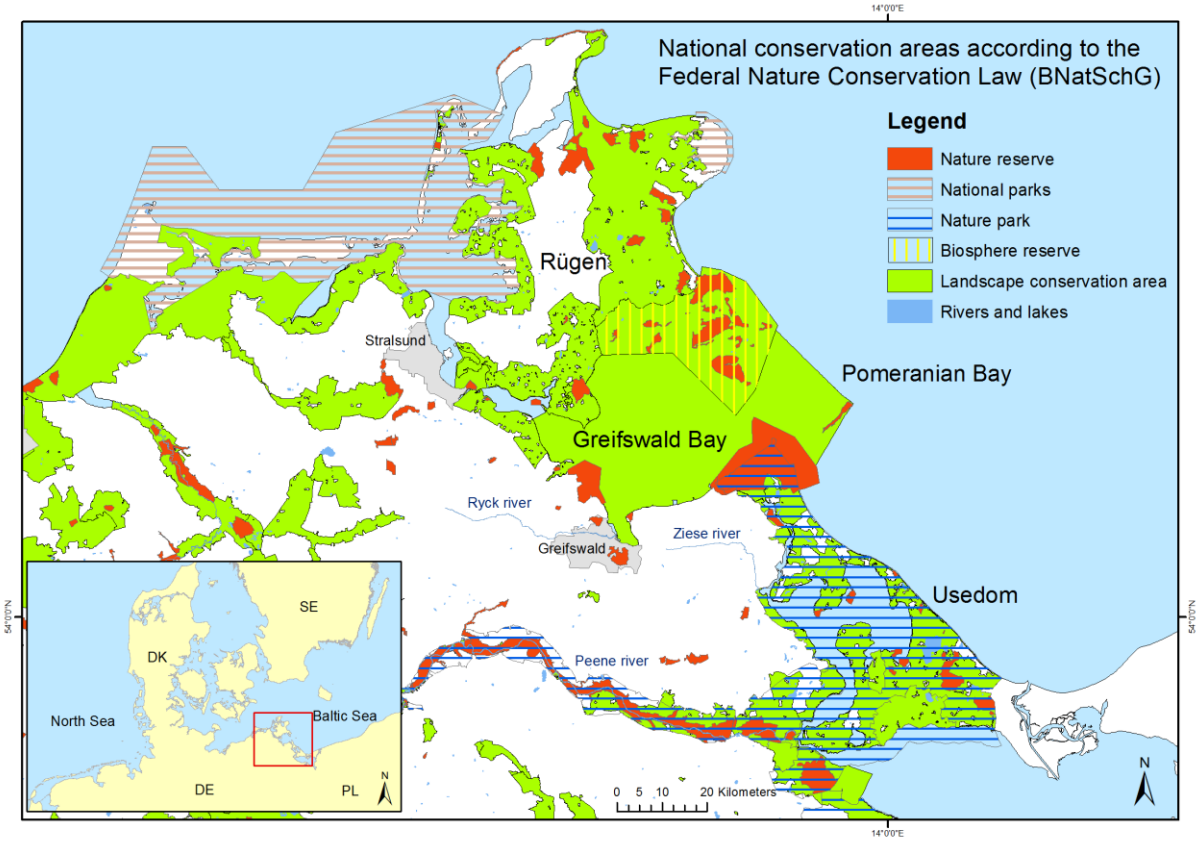
human uses, such as agricultural activities or settlements. An integrated, cooperative management is envisaged for these areas. Therefore, practices for sustainable development should include local communities, management agencies, scientists, non-governmental organizations, cultural groups, economic interests and other stakeholders (UNESCO, 2013). Biosphere reserves are to be protected the same way as nature conservation or landscape conservation areas (BMJV, 2010: Chapter 4 Section 1 §25 (3)). Parts of the Rügen biosphere reserve are additionally assigned as FFH area.

As early as 1925 (revision in 2008), the Peenemünder Haken, as well as the islands Struck and Ruden were legally provided with the protection status of a nature reserve (LUMV, 2008b §3 (1)). This area covers 7,600 ha and encompasses considerable parts of the Greifswald Bay and its coastline (LUMV, 2008b § 1 - §2). The main objectives in this nature reserve are to maintain the undisturbed development of the large shallow water areas and their characteristic biodiversity. Additionally, the maintenance of the natural morphological dynamic of the local coastline and the avoidance of contaminant and nutrient discharges are envisaged (LUMV, 2008b §3 (1) 1-2). These local coastal habitats include characteristic species-rich salt meadows and coastal forests that are essential habitats for a huge number of plants and animals. Furthermore, this nature reserve plays a very important role for a variety of water birds, such as waders, ducks, gulls and terns which use the area as a place for feeding, resting, breeding, molting and hibernating (LUMV, 2008b §3 (1) 8; StaluVP, 2011, pp. 58-65). Most of these bird species are further protected by the Birds Directive 2009/147/EC (LUMV, 2008b §3 (3) 1-2). The shallow waters around the two islands and along the local coastline are covered with fennel pondweed *(Potamogeton pectinatus),* common eelgrass *(Zostera marina)* (Hammer et al., 2009, p. 133)*,* spiral dichgrass (*Ruppia cirrhosa)*, horned pondweed *(Zannichellia palustris)* and charales *(Charophyceae).* Seaweed meadows follow in the deeper waters (StaluVP, 2011, p. 103). These areas are likely to be of high importance for herring spawning activities and further serve as nursery grounds for herring larvae (Hammer et al., 2009, p. 145). All actions and interferences that destroy, damage or change the defined nature reserve and its areas that are additionally under the protection of the Birds Directive are strictly prohibited (BMJV, 2010: Chapter 4 Section 1 §23 (2); LUMV, 2008b §5 (1) - (2)).

Almost the same area is additionally protected in form of the nature park ‘Usedom’ which includes the eastern coastline of the municipality Lubmin, the Freesendorfer Haken and the Spandower Hakener Wiek as well as the two islands of Struck and Ruden (LUNG, 2014a). Half of the nature park that further encompasses large parts of the island of Usedom are marine and coastal areas. The area is one of the most important places for birds in the eastern part of Germany. There are at least 280 observed bird species of which 150 breed within the area (LUNG, 2014a). The BNatSchG defines nature parks as areas that have to be coherently developed and maintained. Nature parks are often nature reserves or landscape conservation areas. They are characterized by diverse usage forms while aiming to maintain environmental compatibility and sustainability (BMJV, 2010: Chapter 4 Section 1 §27 (1)).

Since 2008, almost the entire GWB and all of its shore areas fall under the protective status of a landscape conservation area (LUMV, 2008a: §2) These areas are legally designated to maintain, develop and reestablish ecosystem services and ecosystem functionality (BMJV, 2010: Chapter 4 Section 1 §26; LUMV, 2008a: §4 (1)). The regulation emphasizes the areas’ high ecosystem value especially with respect to the huge number of birds that use the area for breeding, feeding, hibernating and molting (LUMV, 2008a: §4 (2)).

The following map displays all the different protective statuses determined by the Federal Nature Conservation Law. It is shown that protective statuses overlap in many cases.



Map 3: National conservation areas in the area of the Greifswald Bay according to the Federal Nature Conservation Law (BNatSchG)

4.4 Organizational Framework of the Agriculture

With an agricultural land use of more than 1.34 million hectare and a relatively sparse population density of 69 inhabitants per km^2, Mecklenburg-Western Pomerania is a typical agricultural site that is shaped by an overall rural structure. There are around 4,700 agricultural companies that employ more than 25,000 people. The agricultural focuses are plant and crop cultivation which take up 75% of the total agricultural land use. Furthermore, maize, potatoes, sugar beets, and forage crops are produced. Eco-farming is practiced on 9% of the total agricultural land showing an upward tendency. Additionally, the field of renewable raw materials and bioenergy is steadily increasing (LUMV, 2015).

Table 9: Agricultural authorities on different political levels in Mecklenburg-Western Pomerania/Germany

Political Level	Administrative Bodies	Policies
EU Level	European Commission	1. Common Agricultural Policy (CAP) 2. Nitrates Directive (91/676/EEC) 3. Plant Protection Directive (91/414/EEC) 4. Directive on the sustainable use of pesticides (2009/128/EC)
Federal Government of Germany	Federal Ministry of Food and Agriculture (BMEL)	1. Fertilizer Ordinance 2. Plant Conservation Law (PflSchG)
	Federal Institute of Agriculture and Nutrition (BLE)	
State/Land	State Ministry of Agriculture, Environment and Consumer Protection (LUMV)	Development Program for Rural Areas in M-V for 2014 to 2020 (EPLER M-V)
	State Office of Agriculture, Food Safety and Fishery (LALLF M-V)	
Region	Regional Agencies for Agriculture and Environment (Stalu)	

In Mecklenburg-Western Pomerania, agricultural production and the development of rural areas is still determined by financial subsidies based on the EU's Common Agricultural Policy (CAP). The financial support is bound to the compliance of agricultural practices with environmental standards. This kind of cross-compliance legislation led to higher standards regarding environmental conservation and livestock production. Furthermore, farmers are free to voluntarily implement agri-environmental measures, while potential financial losses compared to traditional agricultural practices are (partly or fully) compensated (EC, 2015c). These alternative practices aim to improve the soil structure, and try to maintain biodiversity. Other objectives are the reduction of nutrient discharges in order to enhance the quality of the water body and the reduction of CO_2 emissions. Measures may include the introduction or maintenance of ecological plant cultivation, an environmentally conform usage of grassland, the diversification of crops and an extensive land use supporting biodiversity in fruit and vegetable cultivation.

There are many different legal provisions governing agricultural activities in M-V, including several regulations on the processing and marketing of agricultural products (such as milk, meat, eggs, fruits, vegetables etc.). Major specific regulations concerning agricultural practices are prescribed in the Fertilizer Ordinance (BMJV, 2012b) and the Plant Conservation Law (Pflanzenschutzgesetz, PflSchG) (BMJV, 2012a). These regulate the application of fertilizer and pesticides on agricultural land. Agricultural legislation is closely linked to soil, nature and water conservation laws. Specific development programs which are supported by the European Union aim to maintain rural life, income diversification and an economic agricultural production.

4.5 Organizational Framework of Spatial Planning

Spatial planning as a separate policy sector, possessing its own separate system of organizations and laws, has often been looked upon as the main coordinating system to bridge the various policy sectors. Its major task is the development of a holistic and 'interdisciplinary approach directed towards a balanced regional development and the physical organization of space […]' (EEC, 1983, p. 13). In fragmented institutional settings, a coordinated approach implies the replacement of a sectoral management perspective in favor of a holistic natural resource management involving all relevant stakeholders, societal groups, policy departments, and organizations on different political levels. A unidimensional management approach is thought to be unable to cope with the rising pressure on coastal areas and its natural resources (AMMV, 2005, p. 67). In this context, it is important that sea side and land side are seen as a functional and spatial unit that should also be treated as such in management. This is still a problem in the case study area as administrative boundaries artificially separate land and sea management.

Spatial planning takes place on different political levels dependent on the spatial scale that is considered in the planning process. This necessitates a strong coordination between the local, regional, national and European level. A subordinate planning level must not contradict the planning effort of its superior levels, whereas the latter have to appropriately take into account the concerns and interest of the subordinate levels. They have to keep one another regularly informed regarding their intentions and progresses in spatial planning (EEC, 1983, p. 15).

Only recently, spatial planning has started to include marine and coastal areas in planning processes, while thus far the exclusive focus had been put on terrestrial areas only. During the last decades, marine areas, including the case study's area, became increasingly subject to divergent spatial claims of different user groups amplifying the need for a broad coordination. Marine spatial planning (MSP) is defined as

> '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 that usually have been specified through a political process' (MSPI, 2014).

It is further emphasized as a suitable 'way to create and establish a more rational use of marine space and the interactions between its uses, to balance demands for development with the need to protect the environment, and to achieve social and economic objectives in an open and planned way' (MSPI, 2014). The three German states Mecklenburg-Western Pomerania, Schleswig-Holstein and Lower Saxony bordering the Baltic Sea or the North Sea have the competence to regulate marine spatial planning up to 12 nautical miles, whereas the federal German government is provided with the same responsibility in the EEZ (Wenk, 2005, p. 69).

There are different regulatory provisions and documents that organize spatial planning in Germany. The following table summarizes the most important political authorities in M-V and their respective legal enforcement.

Table 10: Spatial planning authorities on different political levels in Mecklenburg-Western Pomerania/Germany

Political Level	Administrative Bodies	Policies
EU Level	European Commission	1. European Spatial Development Perspective (ESDP) 2. EU recommendation 2002/413/EC concerning the implementation of Integrated Coastal Zone Management in Europe
Federal Government of Germany	Ministry of Transport and Digital Security (BMVI)	1. Federal Spatial Planning Act (ROG) 2. Regulation on Spatial Planning in the German EEZ of the Baltic Sea from 2009 3. National Strategy of the Federal German Government for an Integrated Coastal Zone Management
	Federal Institute for Shipping and Hydrography (BSH)	
Ministerial Conference for Spatial Planning composed of the National Minister for Spatial Planning and the Ministers of the State Departments (MKRO)		Guidelines and Strategies for Spatial Planning in Germany
State/Land	State Ministry of Energy, Infrastructure and State Development of M-V (EMMV)	1. State Planning Act (LPlG) 2. State Development Program (LEP)
Region	Department of Spatial Planning and Regional Development Western Pomerania with the Regional Planning Unit (RPVVP)	Regional Spatial Development Program (RREP)
Community Level	Elected community mayors	1. Land-use Plan 2. Building Plan

4.5.1 The European Spatial Development Perspective

The European Spatial Development Perspective (ESDP) is a document which was approved in May 1999 by the Informal Council of EU Ministers responsible for Spatial Planning held in Potsdam (EC, 1999: Foreword). It is a legally non-binding document forming a policy framework intending to strengthen an integrated approach in European spatial planning. It recognizes the threat to the marine environment due to the discharge of nutrients and harmful substances (EC, 1999, p. 33). Water resource management is acknowledged as a special challenge for spatial development in order to guarantee a continual water supply in quantitative and qualitative terms (EC, 1999, p. 32). Spatial and land use planning are emphasized as important tools for the improvement of the water quality within the application of a holistic management approach which considers different spatial usage forms. A coherent and integrated marine management is proposed as a political option to sustain and enhance ecosystem health. The strengthening of the regional responsibility in water resource management is also emphasized as a major objective in order to preserve and restore water bodies and ecosystems (EC, 1999, p. 33).

4.5.2 EU's Recommendation 2002/431/EC concerning the Implementation of ICZM in Europe and the National Strategy for an Integrated Coastal Zone Management

In 2006, the National Strategy for an Integrated Coastal Zone Management (ICZM) in Germany was passed and is celebrated as a milestone towards the sustainable development and preservation of coastal zones. It is of crucial importance for the management of natural resources in the case study area. This strategy is based upon the EU's recommendation 2002/413/EC concerning the implementation of ICZM in Europe. The recommendation emphasizes the huge environmental, economic, social, cultural and recreational importance of coastal zones, which additionally possess a unique biodiversity in terms of flora and fauna (EC, 2002: No. 1-2). It argues for the implementation of "an environmentally sustainable, economically equitable, socially responsible, and culturally sensitive management of coastal zones" (EC, 2002: No. 9). ICZM is defined as an informal planning approach that tries to unbureaucratically integrate conflicting interests into marine spatial planning through strong stakeholder participation, coordination, and transparent communication (BMU, 2006, p. 5). It therefore strives to involve "all parties concerned (economic and social partners, the organizations representing coastal zone residents, non-governmental organizations and the business sector) in the management process, for example by means of agreement and based on shared responsibility" (EC, 2002: Chapter I (f)). The ICZM Strategy puts further emphasis on the "support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate" (EC, 2002: Chapter I (g)).The ICZM Strategy states the necessity to use and develop a suitable combination of tools that facilitate coherence between sectoral policy objectives and between planning and natural resource management (EC, 2002: Chapter 2 (f)-(h)). The ICZM Strategy puts further emphasis on the "support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate" (EC, 2002: Chapter I (g)). ICZM is highlighted as an instrument that does not enforce individual or partial interests. It determines comprehensive guidelines that ought to be considered in all relevant policy sectors that directly or indirectly affect coastal zones and their ecosystems (BMU, 2006, p. 5). Additionally, the ICZM approach is "based on an ecosystem approach preserving the integrity and functioning, and sustainable management of the natural resources of both the marine and terrestrial components of the coastal zone" (EC, 2002: Chapter I (a)). In this thesis, an ecosystem-based management approach is seen as being equally important with respect to a coherent and sustainable natural resource management. Such a management should consider the interrelations of different ecosystem components and functions and should not dissolve the link between marine and terrestrial areas (EC, 2002: Chapter I (a)).

4.5.3 The Federal Spatial Planning Act

The Federal Spatial Planning Act (ROG) constitutes the political framework for spatial planning in Germany. It clarifies the responsibilities of spatial planning authorities on different political levels and provides those authorities with guidelines (BMJV, 2008: Content). The ROG postulates that nature and landscapes are to be preserved and maintained in the long term (BMJV, 2008: Section 1 §2 (2) No.6). Furthermore, the ROG determines spatial categories in order to structure the planned area. It defines e.g. certain areas as 'priority areas' (Vorranggebiete) or 'reserved areas' (Vorbehaltsgebiete)

for different uses. Priority areas are exclusively designated for one particular kind of usage, excluding any other usages that are not compatible (BMJV, 2008: Section 2 §8 (7) No.1). On the other hand, reserved areas consider one determined usage as priority usage against which other usages are weighed (BMJV, 2008: Section 2 §8 (7) No.2). The exact areas designated as priority areas or reserved areas are defined in the Spatial Development Program of Mecklenburg-Western Pomerania which is explained in the following subchapter 4.5.4. Particular agricultural actors in the case study area, consider the designation of priority areas for agricultural land use as an important mean to establish exclusive usage rights in this area (cf. Chapter 6.1.5). On the other hand, fishermen and representatives from fishery associations are more skeptical regarding the assignment of priority area to fishing grounds. They strongly fear that their traditional rights and their access to fishing grounds might be limited (cf. Chapter 6.1.2).

4.5.4 The State Development Program for Mecklenburg-Western Pomerania

In August 2005, the State Ministry of Labor, Construction and Spatial Planning (AMMV) (today called the State Ministry of Energy, Infrastructure and State Development, EMMV) passed the legally binding State Development Program (Landesraumentwicklungsprogramm, LEP), which is crucially determining the distribution of natural resources and land uses in the case study area. It describes the objectives and guidelines of spatial planning on the state level including marine areas up to 12 nautical sea miles. The LEP is a comprehensive planning instrument (consisting of a textual part and a map scaled 1:250000) that strives for coordinating different spatial usages in M-V such as settlement, infrastructure, and economic development. It further determines areas for the purpose of energy generation, agriculture, forestry and water, and nature conservation (EMMV, 2014a). The plan further determines certain ‘priority areas’ and ‘reserved areas’ for different land uses and thus provides these usage forms with a more favorable position on the institution level. With respect to the current economic, social and ecological situation in Mecklenburg-Western Pomerania, the creation and the maintenance of jobs is given a high priority in any weighing processes (AMMV, 2005, p. 13).

Once every ten years, the LEP has to be revised. The revision process started in 2014 and is not yet concluded. There is a two-step participation procedure inviting individuals and actor groups to bring forward their statements and objections regarding spatial land use issues and prospective provisions. During the first round of public hearings, several hundred statements from different individual actors and actor groups were brought forward to be taken into consideration in the upcoming LEP.

The intensifying pressure on coastal zones due to new usage forms and a growing economic interrelation within the Baltic Sea region necessitates an increased coordination of spatial claims. The LEP emphasizes ICZM as an important tool to coordinate diverging usages, and to minimize conflicts (AMMV, 2005, p. 16 and 67). Coordination in coastal zones is especially important in regard to a variety of usages listed below:

- Areas suitable for wind energy generation
- Pipelines and cable trays
- Areas for nature conservation
- Tourism
- Securing the safety and facility of shipping
- Sustaining cultural heritage
- Arrangement of aquaculture facilities
- Defense

- Resource extraction
- Sustaining and development of fishery
- Ocean dumping

The LEP recognizes the importance of the Baltic Sea as a traditional fishing ground. It states that in order to ensure the commercial fishery in the Baltic Sea, it is required that main fishing grounds are kept free from usages that disturb or exclude fishery. The LEP further acknowledges the important ecological function of spawning grounds in shallow water along the coast and emphasizes their continual preservation to ensure sustainable fish stock reproduction (AMMV, 2005, p. 68). In addition to the sustainable management of fish stocks, the LEP underlines the importance of taking appropriate measures to ensure the existence of the coastal fishery itself (AMMV, 2005, p. 50 and 52). Fishery, as one of the major human uses of marine waters, is as of yet still not included in marine spatial planning. However, it is pointed out that in order to integrate all competing claims and prospective uses of natural resources in coastal areas, it is necessary to incorporate fishery activities in spatial planning. Furthermore, this is supposed to advance an ecosystem approach in spatial planning, as all human activities have to be coordinated to prevent environmental degradation or an overuse of the available assets (Schiedel & Winter, 2012, p. 2). In consideration of nature conservation and landscape preservation goals, the integration of reserved areas for fishery is envisaged in the upcoming LEP (AMMV, 2005, p. 52).

The LEP further emphasizes that the designation of terrestrial and marine areas with priority in nature conservation and landscape preservation helps to sustain biodiversity and population density (AMMV, 2005, p. 43 and 70). In these areas, contradicting usages are to be excluded. Coastal areas serve as places for (water) bird migration, rest and hibernation. Equally significant, coastal areas are of great importance as habitats for aquatic fauna and flora (AMMV, 2005, pp. 69-70). In three coastal case studies (the Greifswald Bay, the Wismar Bay and the Kleines Haff, Peenestrom and Achterwasser), development concepts have been created in order to avoid detrimental impacts through water sports activities in these areas. The results are visualized via maps that give a very detailed demarcation of ecologically sensitive areas, in which water sports activities are seasonally or permanently admissible or inadmissible. By this means, seasonal and permanent priority areas for nature or landscape preservation are marked. These concrete outcomes are directly implemented in the upcoming LEP to ensure the area's ecological integrity (AMMV, 2005, p. 70).

4.5.5 The Regional Spatial Development Programs and Communal Land Use Plans

The LEP constitutes the basis for the Regional Spatial Development Programs (Regionale Raumentwicklungsprogramme, RREP). In Mecklenburg-Western Pomerania, there are four different Regional Planning Units (Planungsverbände in Western Mecklenburg, Central Mecklenburg with Rostock, Western Pomerania and Mecklenburg Lake District), which implement the legal requirements of the State Development Program and integrate their own development targets on a regional scale. The setup of the RREP includes a two-level participation procedure, which is open for the general public (EMMV, 2014b).

The RREP strongly advises a constant economic development to support regional growth and employment, since so far Western-Pomerania is one of the structurally most disadvantaged areas compared to other German states (RREP, 2010, p. 15). This aim shall be achieved by strengthening

agricultural production through modern equipment and the development of new technologies (RREP, 2010, p. 69). As is similarly stated in the LEP, the withdrawal of agricultural land is to be avoided in any case. The RREP emphasizes the important role of agriculture in M-V as an essential sector with high employment rates for the rural population (RREP, 2010, p. 73). In order to maintain small-scale fishery activities as another economic branch within the region, it is further stated that e.g. resource extraction, energy generation, shipping way expansion, and boat traffic have to take fishery concerns into account (RREP, 2010, p. 73). However, the RREP also emphasizes the importance of nature conservation to maintain ecosystems and biodiversity. The analysis of the RREP reveals a variety of different competing land use claims that are characterizing natural resource management in the case study area.

On the community level, the lowest planning unit in Germany, each municipality or county borough has to implement a land use plan (Flächennutzungspläne). This plan has to realize the superordinate regional planning goals and specify communal needs and ideas. The land use plan encompasses projected long-term usages (e.g. communal settlement, business and industry, infrastructure, agriculture, and nature conservation) (BMJV, 1960: Second section §5 (1)-(2)). The municipal area and thus administrative responsibility ends at the landward water baseline that separates territorial waters from coastal waters and conforms with the mean spring low water (Springniedrigwasser) (StaluVP, 2014). Exceptions are re-municipalized areas of water, e.g. marinas or piers, which are in the responsibility of the municipality.

4.6 Organizational Framework of Mining and Resource Extraction

The administrative structure of the mining authorities in Mecklenburg-Western Pomerania is organized on two different political levels. The State Ministry of Energy, Infrastructure and Spatial Planning of M-V (EMMV) is the highest regional mining authority. The mining authority in Stralsund is subordinated and enforces supervision and control of all the mining activities in terrestrial areas of M-V as well as in the Baltic Sea. The legal basis is the Federal Mining Law (Bundesberggesetz, BBergG) from 1980 (BMJV, 1980). At the same time, the mining authority Stralsund is responsible for plan approvals related to mining and energy generation. It handles all mining authorizations and technical working procedure plans (BASMV, 2015). As of yet, there is no sand and gravel extraction in the GWB.

Table 11: Mining authorities on different political levels in Mecklenburg-Western Pomerania/ Germany

Political Level	Administrative Bodies	Policies
State/ Land	State Ministry of Energy, Infrastructure and State Development of Mecklenburg-Western Pomerania	Federal Mining Law (BBergG) German Energy Act (EnWG)
	Mining Authority Stralsund	

4.7 Organizational Framework of the Water and Shipping Administration

The Greifswald Bay is an important area for shipping. Major industrial ports with considerable transshipment of industrial goods are located in Wolgast, Greifswald, Ladebow, Vierow, and Lauterbach. These goods include bulk and construction materials, crude iron, agricultural goods, wood, and oil from other countries bordering the Baltic Sea (StaluVP, 2011, pp. 36-37). Furthermore, there are several shipping companies that offer sightseeing tours by ship in the Greifswald Bay and along its shoreline. Increasing numbers of tourists have led to a growing demand for such offers. Additionally, there are more than 4000 berths in various marinas for private sailing and motor boats (StaluVP, 2011, p. 23ff).

The water and shipping administration works on three different political levels (WSV, 2014). The Water and Shipping Office in Stralsund (WSA) is responsible for the maintenance of all federal shipping and transport routes in the coastal waters of the Baltic Sea up to 12 nautical miles from Kühlungsborn to the German-Polish border (WSA, 2011). This includes the shipping routes in the GWB that are especially important for the supply of the shipyard in Stralsund and the industrial ports of Wolgast, Greifswald, Ladebow, Vierow, and Lauterbach. The tasks of the WSA include regular dredging activities to maintain shipping routes. The Federal Water Way Law (Bundeswasserstraßengesetz, WaStrG) specifies that the traffic on federal shipping routes in nature protection areas and national parks protected under §§ 23 and 24 of the BNatSchG may be regulated, restricted or forbidden in consultation between the BMVI and the BMU (BMJV, 2013 : Third section §5). The construction, reconstruction or removal of shipping routes requires a plan approval procedure. This procedure must consider public and private concerns as well as the environmental compatibility. Responsible approval authority is the Water and Shipping Directorate (BMJV, 2013 : Fifth section §§13-14).

Table 12: Water and shipping administration on different political levels in Mecklenburg-Western Pomerania/Germany

Political Level	Administrative Bodies	Policies
Federal Government of Germany	Ministry of Transport and Digital Security (BMVI)	Federal Water Way Law (WaStrG) Federal Maritime Responsibilities Act (SeeAufG)
	Federal Water and Shipping Administration Office (WSV)	
	Federal Office for Shipping and Hydrography (BSH)	
State/Land	Water and Shipping Directorate North in Kiel (there are 7 in Germany)	
Region	Water and Shipping Office Stralsund (there are 39 in Germany) (WSA)	

5 ACTORS, INTERESTS, PERCEPTIONS AND CONFLICTS IN NATURAL RESOURCE MANAGEMENT

5.1 Actors shaping Natural Resource Management in the Study Site

The previous analysis step provided a picture and overview of the different policy fields and policies that are shaping natural resource management processes in the case study area. By analyzing the different organizational frameworks that regulate single aspects with respect to the use or the protection in the case study area, institutional fragmentation became apparent. The following chapters do not focus on policies but on all the different actors that are integral 'part' of the management system due to their official responsibilities or due to their own interests as resource users. The actors with respect to the use and the protection of natural resources in the Greifswald Bay and their different interests shall be identified. Another focus is put on the analysis of different actors' and actor groups' perceptions regarding various management issues in the case study area. Divergent interests and perceptions are often creating conflicts. Conflicts among different actor groups in natural resource management in the study site will be analyzed in subchapter 5.5 of this thesis. The empirical research used here is based on a mixture of qualitative methods, such as semi-structured interviews and roundtable discussions.

The identification of policy fields was taken as a basis for choosing an initial circle of interview respondents. This circle was more and more expanded through snowball sampling (cf. Chapter 3.1.2.1). In total, 36 interviews were conducted with actors from 31 different organizations and associations. In three of the interviews, there were two respondents instead of only one. I interviewed 17 state actors representing a total of 14 different political organizations (or ministerial departments) on different political levels. That way, I could cover five of the six policy fields that were identified as being crucially important with respect to natural resource management in the region of the GWB and its coasts (cf. Chapter 4). Additionally, I had interviews with 12 non-state actors representing a variety of interests regarding the management in coastal areas. In all cases were these actors organized in bigger or smaller associations that varied in size and resources to influence policy making. While, for instance, the Fishery Association of the Cutter and Small Scale Fisheries in Mecklenburg-Western Pomerania (LdKKF) only has some hundred members, the State Association for Angling in M-V (LAV) and the WWF can refer to several thousand members. The most important associations with an interest in or an impact on the Greifswald Bay and its coastal areas are fishery and angling associations, nature conservation and touristic associations, farmers' and agricultural associations, as well as industry associations and commercial enterprises. I could not obtain interview appointments with representatives from touristic and industry associations. However, their interests were reflected in official public hearings in the course of a plan approval procedure on behalf of a gas and stream power plant on the shoreline of the GWB. Additionally, I included 10 actors from scientific institutions and environmental consulting offices in my research to receive some 'external' perspective from actors who do not have a direct interest or political mandate in the research area, but do some kind of research on coastal areas in general and/or spawning areas in particular. Several of these scientists are strongly involved in policy consultation processes.

All interviewed actors were grouped according to their similarities regarding specific actor characteristics (state or non-state actor) and their interests concerning the use and the protection of

the Greifswald Bay. Thus, I derived ten different subgroups of actors that are displayed in the following table.

Table 13: List of all interview partners grouped according to their organizational similarities (state/non-state actors) and their interests concerning the use and the protection of the GWB. The number of actors interviewed is added in brackets.

Stakeholder Category	Actor Group	Interview Respondents assigned to a specific Actor Subgroup
1	Fishery Authorities (3)	State Ministry of Agriculture, Nature Conservation and Consumer Protection M-V (Department of Fishery and Fishing Industry) (1)
		State Office for Agriculture, Food Safety and Fishery in M-V (2)
2	Fishery and Angling Associations and Fishing Industry (6)	Fishery Association of the Cutter and Small Scale Fisheries in M-V (1)
		Fishery Cooperative in Freest (1)
		Federal Association of the German Fish Industry and Fish Wholesale (1)
		German Fisheries Association (2)
		State Association for Angling in M-V (1)
3	Nature Conservation Authorities (9)	Federal Agency for Nature Conservation (1)
		State Ministry of Agriculture, Environment and Consumer Protection in M-V (Department of Water and Soil) (1)
		State Office of Agriculture, Nature Conservation and Geology in M-V (2)
		Regional Agencies for Agriculture and Environment in Western Pomerania (1)
		Southeast Rügen Biosphere Reserve (1)
		Lower Nature Conservation Authority (3)
4	Nature Conservation Associations (3)	WWF Baltic Sea Office (1)
		WWF International Hamburg (1)
		NABU M-V (1)
5	Environmental consulting offices (3)	Institute for Applied Ecosystem Research (2)
		Private Consulting Office (1)
6	Spatial Planning Authorities (3)	Federal Institute for Shipping and Hydrography (1)
		State Ministry of Energy, Infrastructure and Regional Planning M-V (Department of Spatial Planning) (1)
		Office of Spatial Planning and Regional Development Western Pomerania (1)
7	Mining and Extraction Authorities (1)	Mining Authority Stralsund (1)

8	Scientific Research Institutions (7)	Thünen Institute of Baltic Sea Fisheries (4)
		University of Rostock, Department for Fishery Biology (1)
		State Research Institute of Agriculture and Fishery M-V (1)
		Fish and Environment Research Association (1)
9	Agricultural Authorities (1)	State Ministry for Agriculture, Nature Conservation and Consumer Protection (Department of Agriculture) (1)
10	Agriculture Associations und Agricultural Consulting Offices (3)	Farmer Association of Northern Western Pomerania (1)
		LMS - Agricultural Advice Service (1)
		Water and Soil Association 'Barthe Küste' (1)

The differentiation and determination of actor groups may be inherently conflictive and not necessarily a depiction of reality. In the context of this research, it is crucial to acknowledge that my respondents are entrusted with different professional tasks and at the same time occupy different (social) roles. For example, an employee of the fishery office could at the same time be an active member of the NABU and thus, may not agree on every single issue of the authority that he or she was affiliated with. In most of the cases, my respondents clearly divided between the 'perspective' of their affiliated organization or association and their 'own subjective' perception in regard to conflicts that had been touched upon during the interview. In all cases, my interview respondents could refer to a wealth of expert knowledge as they had gained many years of professional experiences in their working fields. In general, I addressed an organization's or association's director, and was then in some cases redirected to other employees.

The interviews were transcribed and systematically coded line-by-line following theoretical coding approaches. In total, I have assigned 90 different codes.

The major thematic categories and their sub-codes are summarized within the following figure.

- **Awareness with respect to a sustainable natural resource management in the case study area**
  - Perceived changes (positive and negative trends) in the last decades with respect to the development of terrestrial and marine ecosystems in the region of the Greifswald Bay
  - Valuation of the ecosystem status of marine and terrestrial ecosystems in the region of the GWB
  - Justification of further protective measures
  - Rejection of further protective measure
  - Awareness of environmental degradation in coastal regions
  - Perceptions and ideas of an integrated coastal zone management (ICZM) and an ecosystem based management (EBM)
  - Sustainability from an actor group's perspective
- **Current practices of natural resource management in the case study area**
  - Positive and negative criticisms on current natural resource management practices
  - Options for improving current natural resource management practices
- **Role of different actors**
  - Role of science with respect to natural resource management in coastal areas
  - Role of spatial planning with respect to natural resource management in coastal areas
- **Perception of negative effects on coastal ecosystems and spawning areas**
  - Perceived positive or negative effects of either human activities or natural factors

- Perceived negative behavior of certain actors/actor groups with respect to the ecological sustainability in the case study region

- **Institutional fragmentation & related problems**
  - Perception of institutional problems with respect to an efficient implementation of policies
  - Criticisms of current natural resource management practices
  - Institutional problems with respect to mutual cooperation and collective approaches to the management of natural resources

- **Interests of actors**
  - Interests and objectives of a certain actor group
  - Perception of the integration of actor interests in the policy-making process
  - Facilities of interest representation in policy making

- **Conflicts between different actor groups**
  - Conflicts between different actor groups' objectives related to natural resource management
  - Perception and criticisms of certain actors or certain actor groups
  - Perceived inequalities (advantages and disadvantages) between certain actor groups
  - Fears and needs of specific actor groups

- **Influence & power structures in natural resource management**
  - Influential actors or organizations with respect to natural resource management in the case study area
  - Perception of own influence
  - Perception of other actors'/actor groups' influence
  - Facilities of influence exertion
  - Perception of powerful policies

- **Interaction and network data**
  - Contact between actors
  - Evaluation of the contact
  - Reason of the contact
  - Perceived interaction and cooperation between different actor groups

- **Policy options for improving natural resource management in the case study area**
  - Option for a better integration and involvement of certain actor groups
  - Options for better policy outcomes
  - Options for a better conflict management and mediation between different actors' interests
  - Options for institutional adaption

Figure 9: Major thematic categories with sub-codes (selection)

With the help of these codes the interview data was structured and systematized to facilitate the further evaluation process.

The following subchapters focus particularly on the different actor groups' interests (Chapter 5.2). These interests are usually based on certain ideas of an ideal approach to natural resource management. This thesis bases upon the assumption that an integrated coastal zone management (ICZM) in combination with an ecosystem-based management (EBM) approach (cf. Chapter 1.1) may support a sustainable development in coastal and marine areas. Thus, it was considered to be important for this thesis, to broadly analyze the different actors' ideas and perceptions regarding the implementation of an ideal management approach in the study site. Therefore, all actors were asked to provide their definition of a sustainable ICZM and an EBM approach (cf. Chapter 5.2). They should further rank all those impacts that they considered to have the most negative effects on coastal and marine ecosystems (cf. Chapter 5.3). Natural resource management in the study site was found to be highly conflictual. Chapter 5.4 and its subchapters analyze the concrete conflicts that are still

impeding a conjoint and coordinated management approach. All these previous findings are summarized in a SWOT analysis table (cf. Chapter 5.6).

5.2 Divergent Interests in Natural Resource Management

Interests direct actors towards specific ends. Understanding an actor's interest is crucial in order to understand this actor's behavior and perspective regarding current management practices in the case study area. Therefore, in the interviews, I asked the respondents to specify their interests with respect to the use and the protection of the GWB and its coastal areas. The answers are compiled in the following text and summarized in a subsequent table.

The major interest of all fishery representatives is to maintain and strengthen small-scale fishery activities. They themselves assess the small-scale coastal fishery to be of crucial importance for the region in terms of its economic and cultural value. As a precondition for that objective, they pleaded for the establishment of multi-annual fish stock management plans to ensure higher reliability regarding the prospective fishing effort. Many fishery representatives see a need to establish an efficient cormorant management that would legally allow the reduction of the cormorant population size in coastal areas. Fishery authority representatives stated that one of their major interests was to adequately represent fishery concerns in policy making and to strengthen fishery law. Moreover, they support the diversification of the employment structure within the fishery sector in order to stabilize and prospectively increase income. In this context, they support the introduction of aquaculture facilities and mussel farms. The same representatives have a strong interest in enhancing the availability of fishery data. Fishery representatives are not uniform in their opinions on the sustainable management of fish stocks. Some accept the reduction of quotas in order to ensure the long-term maintenance of fish as the basis for prospective fishing activities. The majority of fishery representatives, however, wish for higher quotas to ensure livelihood security and to improve living conditions of fishermen. Based on this, they have a high interest in an unlimited access to all fishing grounds and the maintenance of traditional fishing rights. Fishery association representatives demanded financial subsidies and compensation for damages caused by seals or cormorants to nets or catches. Furthermore, especially local fishery association representatives emphasized the importance of the Marine Stewardship Council (MSC) certification process to continue. The MSC certification is considered a big advantage regarding the marketing of the regional fish. Fishery association representatives furthermore strongly advised the adequate consideration of fishery concerns in the policy-making process and the consideration of local knowledge. Moreover, they struggle for an improvement of the fishery's image in the media and the public.

Environmental representatives have a major interest in sustaining terrestrial and marine ecosystems and supported the restoration of natural habitats in order to promote the resettlement of endemic, native plant and animal species. They strongly emphasized the need for a precautionary approach in decision making and pleaded for alternative, sustainable fishing gears to avoid seabird and mammal bycatch. Some representatives support the assignment of zero-use zones to maintain biodiversity and to establish pristine ecosystems. They highlighted the need for an adequate and continual monitoring of anthropogenic ecosystem impacts. Representatives from environmental authorities see their major interest in an effective implementation of existing environmental policies and guidelines (e.g. MSFD, WFD, FFH Directives, BNatSchG). Another pressuring interest of environmental authority representatives is the re-expansion of riparian buffer strips in order to reduce nutrient

discharges to help improve the water quality of surface, groundwater, and coastal water bodies in the long term. Additionally, environmental associations strive for the reduction of agricultural land and the prohibition of ploughing up grassland.

The respondent scientists from research institutions have a strong interest in generating scientific knowledge and advice (e.g. on sustainable fish stock management). They emphasized the importance that this knowledge, in the end, is taken as the basis for decision making. Scientists further have a high interest in intensifying basic research and addressing data gaps. In this context, they emphasized their interest (and therefore the need) to consolidate knowledge on ecosystem relations (characteristics of spawning grounds, fish and spawning behavior, etc.) and human impacts. In cooperation with business actors, scientists from different disciplines currently pursue the development of an electronic monitoring system to observe fishery activities and to support the policy-making process in efficiently implementing the discard ban.

Agricultural representatives pursue the interest to avoid any loss of cultivable agricultural land in order to ensure agricultural competitiveness and farmers' livelihood security. Their major interest consists in strengthening and expanding agriculture in Mecklenburg-Western Pomerania. This is supposed to be achieved with the development and promotion of modern technology that at the same time should be certified being environmentally friendly.

Representatives from spatial planning see their major organizational interest in developing a holistic management strategy for natural resource management in the case study area, taking into account all the different spatial claims and usage forms. Therefore, spatial planning representatives strive to establish a balanced regional development. They see their major current and prospective task in bridging the different policy sectors. In this context, they emphasized the need to integrate all those sectors that are still not integrated in spatial planning, even though being a major usage form in the case study area (e.g. fishery).

The representative from the mining authority explained that with respect to natural resource management in the case study area, their major task is to coordinate different usage claims and thereby to support decision making in plan approval procedures. The mining authority is the responsible approval authority, particularly in the planning phase of huge projects dealing with terrestrial or marine resource extraction or pipeline constructions.

The major organizational interest of water and soil associations was defined as preventing floods in urban and rural areas by an appropriate clearance of river catchment areas. The respondent stated that water and soil associations that are commissioned with this task by municipalities have a strong interest in establishing a better cooperation with environmental authorities. The respondent further emphasized the need for a better legal position of water and soil associations as clearance tasks along riverbanks are in many cases perceived to contradict environmental objectives.

The interests of the different actor groups with respect to natural resource management in the case study area are quite diverse and in some cases even contradicting. The conflicts arising from divergent interests are the subject of the discussion in chapter 5.5. The following table gives a summarized description of the different actor groups' interests.

Table 14: Summary of the interests of different actor groups with respect to natural resource management in the case study area. Several actor groups share common interests. These interests are highlighted in darker grey in between these groups. Interests that only apply to a single actor group are highlighted in a lighter shade of grey (see legend):

Shared interests **Interests that only apply to a single actor group**

Fishery authorities	▪ Adequate representation of fishery concerns in policy making ▪ Strengthening and improvement of fishery laws ▪ Diversification of the employment structure and increased income for fishermen ▪ Introduction of aquaculture facilities and mussel farms ▪ Better availability of (scientific) data
Fishery associations	▪ Maintenance of small-scale fishery activities ▪ Multi-annual management plans to ensure reliability of quota levels ▪ Preservation of fish stocks in the future ▪ Cormorant management to reduce the population size or at least to avoid their growth
	▪ Higher quotas to ensure livelihood security ▪ Access to all fishing grounds and maintenance of traditional fishing rights ▪ Marine Stewardship Council membership for the regional gillnet fishery ▪ Financial subsidies for fishery activities ▪ Compensations for damages caused by seals and cormorants to nets or catches ▪ Recognition of local knowledge and experiences in decision making ▪ Improvement of the fishery's image in the media and the public
Nature conservation authorities	▪ Effective implementation of environmental policies and guidelines ▪ Reduction of nutrient discharge from diffuse and point sources → re-expansion of riparian buffer strips and improvement of the water quality
Nature conservation associations	▪ Maintenance of terrestrial and marine ecosystems ▪ Resettlement of endemic, native species (flora/fauna) ▪ Alternative, sustainable fishing gears and avoidance of seabird and mammal bycatch ▪ Implementation of the precautionary approach ▪ Strengthening of consumer protection and awareness ▪ Zero-use zones to maintain biodiversity and to restore natural ecosystem dynamics ▪ Stricter control of fishery activities
	▪ Reduction of agricultural land and prohibition of ploughing up grassland
Research institutions	▪ Generation of knowledge and advice on the sustainable management of fish stocks ▪ Intensification of basic research and addressing data gaps ▪ Consolidation of knowledge on ecosystem relations and human impacts ▪ Development of an electronic monitoring system to observe fishery activities and to implement the discard ban
Agriculture authorities	▪ Competitive, but environmentally friendly agriculture in M-V ▪ Expansion of livestock production ▪ Strengthening and expansion of the agricultural potential of M-V
Agricultural associations	▪ Cooperation between agricultural and environmental/water (research) institutions to minimize nutrient discharge ▪ No loss of cultivable agricultural land ▪ High economic income through agricultural activities to ensure livelihood security
	▪ Maintenance of competitiveness to ensure livelihood security
Spatial planning authorities	▪ Developing a holistic management strategy to natural resource management ▪ Balanced regional development ▪ Bridging different policy sectors and integrating those sectors that are still not integrated in spatial planning (e.g. the fishery sector)
Mining authorities	▪ Coordination of different usage claims with respect to natural resource management in the case study area ▪ Supporting decision making in plan approval procedures
Water and Soil associations	▪ Prevention of floods in urban and rural areas by an appropriate clearance of river catchment areas ▪ Better cooperation with environmental authorities and better legal position

5.3 Integrated Coastal Zone Management and the Ecosystem-based Management Approach in the Study Site

There are a few policies that try to strengthen coordination among different sectoral policy fields and actor groups in the case study, as a sustainable development in coastal areas is suggested to be particularly dependent on a cooperative approach and the inclusion of major resource users. In respect thereof, in this thesis, integrated coastal zone management (ICZM) is considered to be an ideal approach to the coherent management of natural resources in the case study area. The National Strategy for an Integrated Coastal Zone Management from 2006 provides a guideline towards the sustainable development and preservation of coastal zones. It emphasizes the need for a management that is 'environmentally sustainable, economically equitable, socially responsible, and culturally sensitive […]' (BMU, 2006, p. 6; EC, 2002: No. 9). Furthermore, an ICZM approach supports the involvement of "all parties concerned (economic and social partners, the organizations representing coastal zone residents, non-governmental organizations and the business sector) in the management process, for example by means of agreement and based on shared responsibility" (EC, 2002: Chapter I (f)). The ICZM Strategy puts further emphasis on the "support and involvement of relevant administrative bodies at national, regional and local level between which appropriate links should be established or maintained with the aim of improved coordination of the various existing policies. Partnership with and between regional and local authorities should apply when appropriate" (EC, 2002: Chapter I (g)). Additionally, the ICZM approach is "based on an ecosystem approach preserving the integrity and functioning, and sustainable management of the natural resources of both the marine and terrestrial components of the coastal zone" (EC, 2002: Chapter I (a)). In this thesis, an ecosystem-based management approach is seen as being equally important with respect to a coherent and sustainable natural resource management. Such a management should consider the interrelations of different ecosystem components and functions and should not dissolve the link between marine and terrestrial areas (EC, 2002: Chapter I (a)).

It is the aim of this chapter to shed light on the different actor groups' ideas on what they actually mean when referring to an integrated coastal zone management (ICZM) or to an ecosystem-based management (EBM) approach. Different management ideas may be based on divergent interests and may therefore provoke tensions between different actor groups, potentially impeding coherent and collective management approaches.

During the interviews, I asked the respondents to clarify their ideas on what they personally mean by an integrated coastal zone management or an ecosystem-based management approach and whether they have ideas how to implement both in the case study area. The study revealed that there are various different understandings across the different actor groups and that both terms are applied rather diffusely. I further asked the respondents to name all difficulties they see with respect to the implementation of these management approaches (cf. Chapter 3.1.2.2). The following text provides insights into the respondents' answers. At the end of this chapter, a table summarizes the results.

Representatives of environmental consulting offices see ICZM as an approach to coordinate different usage claims within coastal areas. According to them, such an approach would have to include measures to sustain natural coastal habitats and geomorphological processes on the one hand, but should also deal with the preservation of cultural landscapes that are shaped by human activities (settlement, agriculture, industry etc.) on the other hand. They stated that such an approach should put a focus on the prevention of negative impacts on coastal habitats caused by human impacts. With respect to an ecosystem-based management, they pointed out that, in a first step, it was crucial

to commonly define what was actually meant by such an approach. They feel that an EBM approach is still jeopardized by a lack of scientific knowledge that could serve as a reliable basis for management decisions. Following this argumentation, they criticized that ecosystem relations are in many cases not conjointly considered in decision making. According to the respondents, this situation is aggravated by the negligence of the precautionary approach [E1, E2, E3].

Fishery representatives see integrated coastal zone management as an approach that could promote an equal balance of all human usages in marine areas [F1, F9]. They criticized management practices in the case study area for being opaque and determined by sectoral interests. In this context, they feel their interests are being neglected in decision making and declared themselves in favor of bottom-up approaches in natural resource management as they are promoted by ICZM. An ICZM approach is further considered to provide a crucial opportunity for compiling area specific data that could subsequently serve as basis for knowledge-based decision making [F9]. ICZM has foreseen such a data collection right at the beginning of each ICZM process to gain an understanding about site specific issues. An EBM approach is understood as an approach considering all the different dependencies among the different ecosystem components [F7].

Environmental representatives have many different ideas of an integrated coastal zone management, its potentials and difficulties. They defined ICZM as an informal process of systematically coordinating all natural and human-induced developments in coastal areas. This process would have to go ahead with the holistic consideration of human impacts on ecosystems [N3, N6]. The attempt to include various relevant actors into decision making was highlighted as innovative. However, at the same time, it was problematized that the definition of 'relevance' should be kept flexible in order to avoid the marginalization of certain actors or actor groups. It was further critically discussed that the spatial boundaries to implement measures in the course of an ICZM process are blurry. While some actors exclusively considered marine areas and their adjacent coasts, others argued that an integrated approach requires a holistic perspective both including terrestrial and marine areas into management decisions. This argumentation is underlined by the fact that in many cases detrimental effects in coastal areas can be proven to have their causes far away. For instance, eutrophication is accumulated in coastal waters, but induced in the entire adjacent river catchment areas [N4]. That is why many representatives emphasized the need to address all actors that can be identified to directly or indirectly affect coastal areas. They further see a strong need for strengthening knowledge on ecosystem dependencies and argued that it is important to consider ecological functions of specific ecosystem components or spatial patterns in management decisions to prevent harm to the entire ecosystem [N1, N5, N8]. Their understanding of an ecosystem-based approach is strongly determined by precautionary or restrictive measures in cases of potential harm or uncertainty [N1, N2, N3, N8]. According to these environmental representatives, the temporal closure or restriction of certain usages should be societally and politically accepted in order to preserve ecosystems in the long term [N3, N8]. In order to strengthen an EBM approach, all environmental representatives agreed that it was crucial to generate further scientific knowledge on socio-ecological interrelations that can then serve as a basis for knowledge-based decision making.

Two respondents from research institutes highlighted the benefits of an ecosystem-based management approach taking into account the interrelatedness and dependence of different ecosystem components. They declared that quotas and TACs were insufficient to sustainably manage fish stock. They further oppose management decisions supporting sectoral interests and instead promoted the idea of a coherent, multidimensional management approach taking into account

spatial particularities in an area [S3, S4]. With respect to an integrated management approach, many scientists see a major challenge in generating sufficient scientific knowledge in order to understand complex ecosystem processes. In this context, different scientists agreed that it is difficult to implement an EBM approach because many ecosystem processes are still not scientifically assessed [S2, S3, S5].

Representatives of spatial planning consider an ICZM approach to be a feasible solution to coordinate various usage claims in a region and to mitigate conflicts among different actor groups. ICZM is seen as a valuable strategy to support diversity within coastal areas and to unbureaucratically involve those actors that are concerned by management decisions. They highly appreciated the idea of bottom-up approaches in management practices to increase the acceptance among those that are concerned. However, the representatives emphasized that the great variety of actors and their specific sectoral interests are difficult to mediate. Another challenge they see with respect to the implementation of an effective ICZM is the growing need for a strong cooperation of different political authorities on different political levels. They emphasized that an ICZM is built on the idea to find consensus between diverse policy sectors and their interests. From their own experiences, they know that it is difficult and in some cases impossible to bridge opposing interests. They further stated that, in a first step, organizational responsibilities have to be clarified. They feel that as of yet, the problem of degrading coastal areas is no one's problem. The achievement of a mutual agreement on goals with respect to the integrated management of coastal areas and the creation of a shared responsibility are seen as the urgent challenges for an ICZM [SP1, SP3].

Table 15: Actors' understanding and ideas of an ICZM and an EBM approach in the case study area. Actors were further asked to name all difficulties they see with respect to the implementation of these management approaches.

Actor groups	Ideas of ICZM and EBM	Perceived difficulties
Representatives from environmental consulting	▪ Coordination of different usage claims in coastal areas ▪ Measures to sustain and preserve natural and cultural landscapes ▪ Prevention of negative anthropogenic impacts on coastal habitats ▪ Consideration of ecosystem relations in management practices and decision making	▪ Lack of a shared definition and strategy regarding an EBM ▪ Lack of scientific knowledge ▪ Appropriate consideration of ecosystem relations in management decisions
Fishery representatives	▪ Equal balance of all human usages in marine areas without prioritizing certain usages ▪ Bottom-up approaches in planning and management decisions ▪ Transparency in decision making ▪ Consensus-building among diverse actor groups ▪ Knowledge-based decision making	▪ Huge variety of actors pursuing various objectives in the case study ▪ Political premises marginalizing specific actor groups' interests in favor of others ▪ Sectoral decision making
Environmental representatives	▪ Informal process of systematically coordinating natural and human-induced developments in coastal areas ▪ Holistic perspective on human impacts ▪ Stakeholder involvement ▪ Consideration of the interrelatedness of certain ecosystem components	▪ Lack of scientific knowledge regarding ecosystem interrelations ▪ No shared understanding among actors of what ICZM actually means ▪ Defining the 'relevance' of actors

	▪ Consideration of spatial particularities ▪ Precautionary or restrictive measures in cases of potential harm or uncertainty ▪ Awareness raising among actors directly or indirectly affecting coastal zones	in participation processes without marginalizing others ▪ Uncertainty concerning the spatial boundaries of an ICZM ▪ The origin of detrimental effects in coastal areas might be found somewhere far away
Scientists	▪ Expansion of traditional management instruments (e.g. quotas and TACs) ▪ Consideration of the interrelatedness of certain ecosystem components and socio-ecological interrelations ▪ Coherent management practices	▪ Sectoral management decisions ▪ Lack of scientific knowledge
Spatial planning representatives	▪ Tool to coordinate various usage claims and to mediate conflicts among different actor groups ▪ Bottom-up approach directly including those actors being concerned by management decisions ▪ Strong cooperation of different political authorities on different political levels	▪ The huge variety of actors complicates mediation ▪ Need for a strong cooperation of different political actors ▪ Clarification of organizational responsibilities ▪ Lack of shared responsibility and goals

The analysis shows that actor groups partially had different understandings of ICZM or EBM approaches. Both terms are applied rather diffusely and related to various different challenges and difficulties regarding their prospective implementation. In most cases, understandings are shaped by the specific actor groups' interests with respect to the management of natural resources in coastal areas. While fishery representatives put a strong focus on the economic importance of coastal zones, environmental representatives emphasized their ecological value and pleaded for restrictive measures to ensure ecosystem maintenance. However, all actor groups acknowledged the potential of ICZM to coordinate usages within coastal areas. Almost all respondents agreed that an EBM approach is elusive and that there still is a considerable lack of scientific knowledge regarding ecosystem interrelations.

5.4 Perception of Negative Impacts on Coastal Ecosystems from different Actor Groups' Perspectives

It has been suggested that a shared understanding of problems facilitates collective action with respect to an adequate management to resolve these problems (Stokke, 2006, p. 129). In this part of the analysis, I asked the interview respondents to list all issues that they personally estimate to have negative impacts on coastal ecosystems. The answers are quite diverse among the different actor groups. In general, the argumentation seems to be mainly dominated by assumptions, but seldom by expertise. Almost all actors avoided mentioning any negative impacts that might somehow be connected to their own activities or interests in the Greifswald Bay. Thus, different actor groups have quite different perceptions on what is actually considered a problem with respect to coastal ecosystems. There is no consensus among the respondents on critical issues, impeding ecological sustainability in the case study area. Rather, the perception and valuation of problems can be suggested to have been directed by interests. The answers further reflect disagreement concerning prospective management strategies. The following figure visualizes the answers given by each respondent group.

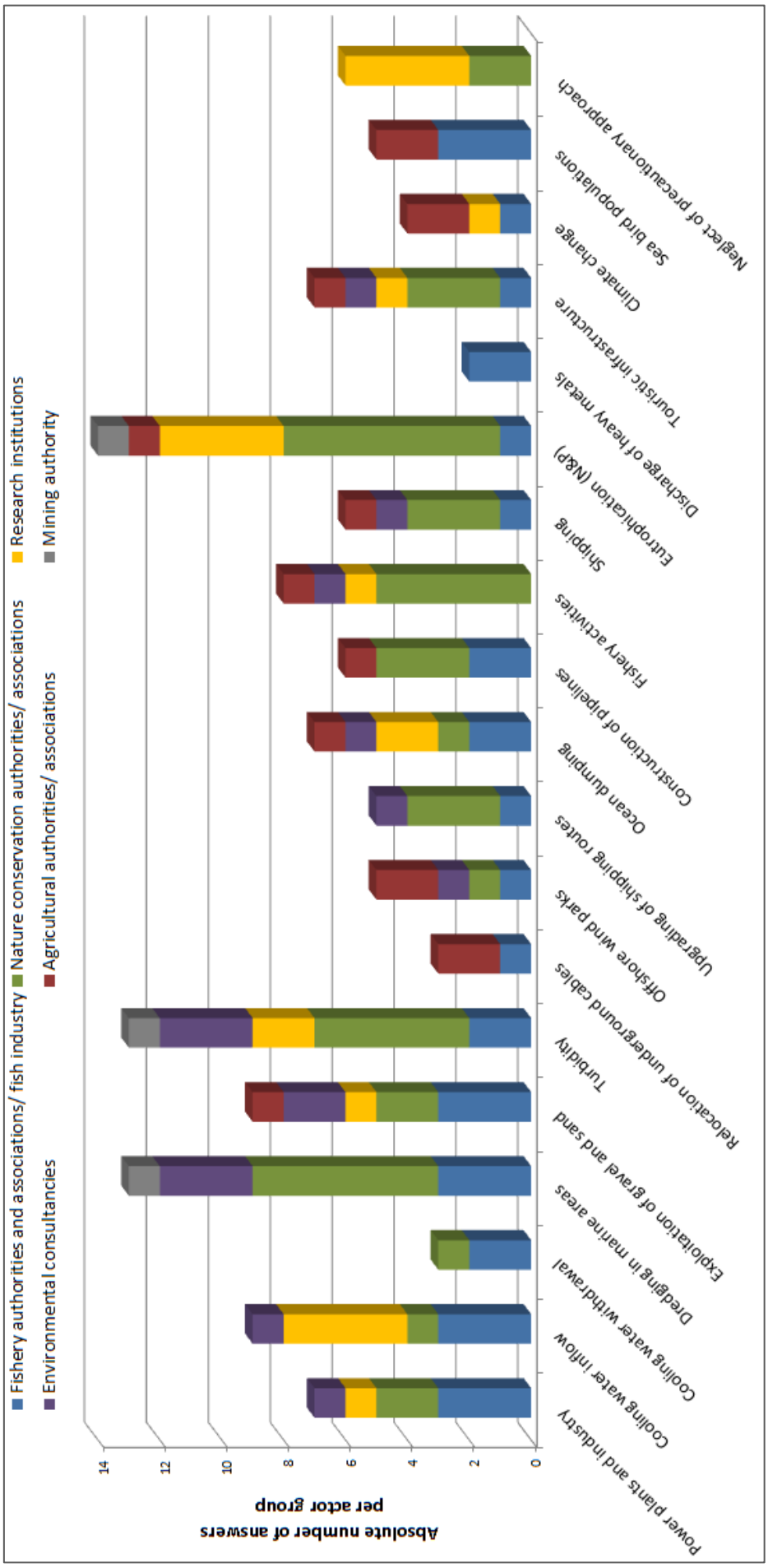


Figure 10: Perception of negative impacts on coastal ecosystems from an actor perspective

Many of the actors perceive eutrophication as an immense problem for the ecosystem, although discharges of nitrogen and phosphorus have steadily decreased during the last years. The Greifswald Bay and all of its inflows are still highly eutrophic. In 2012, the LUNG M-V (State Office of Agriculture, Nature Conservation and Geology in M-V) stated that almost all of the surface water bodies, including coastal waters in M-V, will most probably fail the criteria for a 'good ecological status' that were specified by the Water Framework Directive (WFD) and that should have been achieved by 2015 (LUNG, 2012b, p. 5). Most of the nutrients are discharged directly from agricultural areas into the water body. Additionally, large quantities of phosphorus accumulate in the sediments on the bottom of the Greifswald Bay and may easily be remobilized by e.g. the dredging of shipping routes [N5]. Especially representatives from nature conservation and science see a considerable need to reduce discharges [N1, N2, N5, N7, N9, S1, S2, S3, S4]. According to these respondents, nutrient loads have already caused heavy damages to the submerged vegetation, and thus to the spawning and nursery grounds for herring in the GWB. The density of macrophytes has considerably declined due to eutrophication provoking the expansion of algae. These algae lead to anoxic water conditions and a high turbidity [N5, N7]. As a consequence, the conditions for the growth of macrophytes and the successful development of fish spawn have deteriorated. In contrast, almost none of the fishery representatives see a high ecosystem risk due to eutrophication. Instead, they pointed to the positive effects of nutrients providing food for zooplankton, larvae, and young fish [F4, F6, F7].

Almost all actor groups agreed that water turbidity is a major cause for a deteriorating ecosystem quality. Many representatives mentioned an increasing eutrophication, as well as dredging and exploitation activities in marine areas as major reasons for high turbidity [F1, N1, N4, N5, N9, N10, S2, S5, E1, E2, M1]. Other usage forms that have been critically reflected with respect to their specific ecosystem harm were enumerated. These included e.g. the upgrading of shipping routes, ocean dumping, the installation of offshore wind parks, the relocation of underground cables, as well as the construction of pipelines [F2, F4, F6, F7, N1, N2, S5, S6, E3, A1, A3].

Many representatives estimate that the settlement of power plants and industry in the area of the GWB and along its shorelines could entail negative impacts on coastal ecosystems [F6]. The withdrawal and the discharge of cooling water were evaluated to seriously impact flora and fauna in proximity to the plant. An official statement of the State Office of Agriculture, Food Safety and Fishery in M-V (LALLF) explained that the water withdrawal could harm fish of different development stages and their food supply. Through the withdrawal of water and its strong suction effect, fish and large amounts of zooplankton get sucked in and killed (LALLF, 2012, p. 2). Furthermore, the discharge of heated water, having been used as cooling water beforehand, is estimated to considerably change the regional water temperature regime [F1, S1, E1]. This can potentially provoke a broad shift of ecosystem components. For instance, it is conceivable that there is a shift of the major spawning time that then might not any longer coincide with the major period of high food availability [F2, S2, S3, S4]. Furthermore, an increased water temperature may induce anoxic water conditions harming small and large marine organisms [F4] and impeding spawning success [S3]. Two fishery representatives are also worried about the discharge of heavy metals, such as mercury, due to industrial activities on the coastline. These contaminants would be accumulated in fish leading to serious consequences for the organism [F1, F2].

Several respondents from nature conservation, science, environmental consulting, and agriculture deemed fishery activities as potentially harmful to coastal ecosystems, due to the unsustainable extraction of fish and the potential bycatch of mammals and seabirds [N1, N2, N5, N8, S3, E1, A1]. On the

other side, fishery representatives denied having any negative impacts on coastal and marine areas. They explained that gillnet fishery is highly selective and low in their actual ecosystem impacts [F4, F6].

Representatives from fishery and agricultural authorities and associations agreed upon the negative effects that sea bird populations and cormorants could potentially have on the coastal ecosystem. They complained about an 'insufficient' cormorant and sea bird population management and supported pro-active ideas of reducing and controlling population growth [F4, F5, F6, A3].

The growing tourism sector and the expansion of touristic infrastructure in the region of the GWB are estimated to potentially threaten the sustainable ecological development of coastal ecosystems and habitats. Many respondents critically questioned the impacts of leisure sports, such as sailing, kiting, surfing, kayaking, rowing, and the increasing traffic with motorized boats. They emphasized that these usages might be potentially harmful to the ecosystem [F6, N4, N5, N9, S6, E3]. However, most of the actors do not support a general closure of the area for certain usage forms such as touristic activities, but encouraged a careful and responsible use of the coastal areas and their resources.

Especially scientists argued that it is very difficult to identify single aspects of potential negative ecosystem impacts and emphasized the need for a holistic perspective on ecosystem components and their interactions. For instance, an increased water temperature may have serious impacts on the development of fish spawn and the hatching of larvae and may thus considerably change patterns of predation. This example shows that environmental changes or human-induced impacts on certain ecosystem components may have substantial consequences for a range of interrelated ecosystem elements [S3, S4]. Some respondents strongly criticized that the precautionary approach is neglected in decision making, even if data are incomplete or totally lacking [N7, N8, S3].

Some representatives stated that the predicted effects of climate change on coastal areas and ecosystems should be taken seriously and considered immediately. An increase of temperature is predicted to provoke a considerable shift of ecosystems [S3, S4].

The following table summarizes and quantifies the previous results of the different actor groups' perception regarding negative impacts in the GWB and its coastal areas.

Table 16: Perception of negative impacts on coastal areas from different actor groups' perspectives. The number of explicit references is the result of asking interview partners to name negative impacts on the GWB. The last column shows the distribution of answers per actor group in absolute numbers: F = Fishery, N = Nature conservation, S = Science, A = Agriculture, M = Mining, E = Environmental consulting

Negative impact	Number of explicit references	Contribution to the answers per actor group in absolute numbers
Eutrophication (N&P)	14	F(1), N(7), S(4), A(1), M(1)
Dredging in marine areas	13	F(3), N(6), E(3), M(1)
Turbidity	13	F(2), N(5), S(2), E(3), M(1)
Cooling water inflow	9	F(3), N(1), S(4), E(1)
Exploitation of gravel and sand	9	F(3), N(2), S(1), E(2), A(1)
Fishery activities	8	N(5), S(1), E(1), A(1)
Power plants and industry	7	F(3), N(2), S(1), E(1)
Ocean dumping	7	F(2), N(1), S(2), E(1), A(1)

Negative impact	Number of explicit references	Contribution to the answers per actor group in absolute numbers
Touristic infrastructure	7	F(1), N(3), S(1), E(1), A(1)
Neglect of the precautionary approach	6	N(2), S(4)
Shipping	6	F(1), N(3), E(1), A(1)
Construction of pipelines	6	F(2), N(3), A(1)
Upgrading of shipping routes	5	F(1), N(3), S(1)
Offshore wind parks	5	F(1), N(1), S(1), E(2)
Sea bird populations	5	F(3), A(2)
Climate change	4	F(1), S(1), A(2)
Cooling water withdrawal	3	F(2), N(1)
Relocation of underground cables	3	F(1), A(2)
Discharge of heavy metals	2	F(2)

Most of the interview respondents estimate eutrophication, dredging in marine areas, and turbidity to have serious impacts on coastal areas and ecosystems. However, it became obvious that different actor groups differed in what they estimated to negatively impact coastal areas. To test the differences, I ranked the impacts according to the number of their explicit references and the actor groups' perceptions (dependent on how often a specific negative impact was mentioned within this group). The results are presented in the following table, but cannot be said to be statistically significant due to a low sample size. The average is seven.

Table 17: Average perception of negative impacts divided by actor groups

Actor group	Rank of perception
Mining	10.09
Environmental consulting	7.1
Nature conservation authorities/associations	7.09
Research institutions	6.89
Fishery authorities/associations	5.56
Agricultural authorities/associations	5.25

The results show that representatives from fishery and agricultural authorities and associations in particular had different perceptions regarding negative impacts on coastal areas, when comparing their answers to those of other groups. They were prone to answers that are, on average, less emphasized or mentioned by other actor groups. In contrast, the representative from the mining authority mentioned three of the highest ranked impacts as potentially negatively affecting the coastal habitats of the GWB. That is why the representative's rank was high in the analysis. Respondents from environmental consulting and nature conservation authorities and associations tended to critically question the impacts of almost all anthropogenic usages in the respective coastal areas. Thus, their rank of perception concerning negative impacts was higher than in other actor groups. Scientists from research institutions rather refrained from judging the impacts of certain usages as there are many uncertainties about them.

Divergent interests and perceptions may provoke conflicts among the different actor groups. Natural resource management in the case study area is characterized by a variety of different conflicts that will be analyzed in the following chapter 5.5.

5.5 Conflicts among different Actor Groups in the Greifswald Bay

Conflicts in natural resource management can impede collective action and delay joint solutions towards the sustainable development within a region (Falleth, 2006, p. 65). In many cases, conflicts evolve if goals and interests of two or more conflict parties are mutually exclusive or, at least, are perceived as being incompatible with each other (Esser, 1993, p. 90; Galtung, 1972, p. 113; Schneckener, 2014, p. 15). There are a lot of different conflict issues burdening the relationships of the different actor groups involved in natural resource management in the area of the Greifswald Bay. To identify these conflicts, I asked the respondents in the interviews to describe their major problems with respect to the realization of their interests. I further wanted them to specify their fears and needs regarding the revealed conflict issues (cf Chapter 3.1.2.2). An overview of the different conflict issues is given within the next figure.

Identified conflicts

- Fishery interests vs. nature conservation interests
  - Seabird and mammal bycatch
  - Cormorant population
  - Grey seal population
  - Discard ban
- Integration of fishery in spatial planning
  - Lack of integration of fishery in spatial planning
- Relation between fishery and science
- Lack of science-policy interface
- Application of the precautionary approach
- Intensive agricultural practices vs. water and nature conservation
- Management of river basins vs. nature conservation
- Communication and trust among different actor groups

Figure 11: Overview of the different conflict issues between different actor groups with respect to natural resource management in the case study area

The more threatening a conflict issue is perceived by a certain respondent, the higher is the urgency for the respondent to influence the course of conflict. According to Mitchell et al. (1997), urgency constitutes the degree to which actor claims call for immediate attention in policy and decision making. The degree of urgency (low – medium – high) is derived indirectly from the interview data. The following text gives a detailed analysis of the different conflicts among the different actor groups with respect to natural resource management in the case study area.

5.5.1 Fishery Interests vs. Nature Conservation Interests

The Southern Baltic and its inner coastal waters are very important areas for a huge variety of breeding and hibernating seabirds that enjoy special protection through the European Birds Directive (2009/147/EC) (HELCOM, 2011). Fishery induced bycatch of seabirds and marine mammals, such as grey seals or harbor porpoise, is a very sensitive and emotionally discussed issue that has been picked up in almost all of my interviews with representatives of different actor groups. While many

environmental representatives see gillnets and other fishing gears as potentially harmful to seabirds and marine mammals who may get entangled and drown in the nets [N8, N9], almost all fishery representatives denied that these fishing practices have any adverse impact on the ecosystem [F2, F3, F4, F5, F6]. To solve the problem of bycatch, environmental representatives emphasized the development and application of alternative fishing gears [N8, N9]. Fishermen and fishery representatives however explained that, as of yet, there are no alternative fishing gears that allow for an economical and efficient fishery practice. Fishermen are afraid to lose their income basis through further net restrictions [F4, F5, F9].

Another conflict issue that is perceived as a menace especially by fishery representatives is the steady increase of the grey seal population *(Halichoerus grypus)* in the Baltic Sea. Extensive hunting and a continual deterioration of the environmental quality since the 1950s, particularly caused by polychlorinated toxins in the Baltic Sea, have evoked a significant decline of the number of grey seals, who suffer from poor living conditions in their natural habitats. Due to these toxins, their reproductive capacity has been heavily constrained (Harding & Härkönen, 1999, p. 619; Nyman et al., 2003, p. 74). Today, grey seals are protected by the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention) and the Habitats Directive (1992/43/EEC) that includes grey seals as a species of community interest in its Annexes II and V (EEC, 1992). Since the early 1990s, the population has steadily recovered and resettled in the Baltic Sea (Härkönen, Galatius, Bräeger, Karlsson, & Ahola, 2013, p. 5). In the Greifswald Bay and along its coastline, occasionally there have been discovered up to 60 grey seals (WWF, 2014). Monitoring data from December 2006 to March 2012 attest that the population has steadily increased. More and more grey seals are observed resettling in the GWB and along its shorelines (LUNG, 2012a, p. 4). Many of the respondents from local small-scale fishery perceive grey seals as a huge menace to fishery activities, competing for fish, taking fish from fishing gears, and in some cases even destroying gears and fishermen's catches. Fishermen in this region are very annoyed about attempts to resettle grey seals in the GWB and fear further damage to fishing gears and catches [F4, F5, F6]. On the other side, representatives from environmental authorities and associations struggle for the recovery of the natural habitats of grey seals and harbor porpoises.

Harbor porpoises *(Phocoena phocoena)* are also listed in the Annexes II and IV of the Habitats Directive (1992/43/EEC) (EEC, 1992) and classified as being critically endangered by HELCOM (HELCOM, 2013). The number of harbor porpoises in the Baltic has considerably decreased during the last decades. In 2013, the population of harbor porpoises in the Central Baltic was estimated to comprise an average of 200 to 600 individuals only. The major threats are ascribed to fishery activities, underwater noise, chemical pollution, overfishing, and habitat destruction (ASCOBANS & Bräger, 2010, p. 1). In order to protect harbor porpoises, environmental representatives favor the closure of fishing activities in special protected marine areas that ought to be kept free from all human interference [N1, N9, E1]. In 2014, a political petition was launched via change.org, addressing the current state minister of environmental (and agricultural) affairs in M-V to restore the natural habitats of the grey seal population in the Greifswald Bay even against the will of the local fishermen (Karlowski, 2014a). This petition was signed 695 times until July 2015, but is closed now.

Because of the controversial discourse on adverse impacts of fishery activities, fishermen and fishery representatives felt heavily threatened in their existence [F4, F5, F9]. They are angry about accusations they perceive as being arbitrarily directed against them and argued that their local knowledge and experiences with harbor porpoises have not been taken into consideration [F3, F4,

F5, F9]. In order to mitigate this conflict, several respondents from science argued for the intensification of research assessing fishery activities and their actual harm on marine mammals and sea birds [S2, S4, S6]. In this context, it has become apparent that respondents differ in their opinions about the 'admissible' harm to an ecosystem. Respondents from environmental associations argued that a single seabird or mammal killed because of fishing activities is already a reason for the closure of the fishery sector [N8, N9]. Other respondents objected that all usage forms involve some extent of adverse impacts on nature. They favor an approach that determines whether harm occurs on the population level of a species, or not [S1, S2, S6, F2, F4, F5, F6].

The protection of the Great Cormorant *(Phalacrocorax carbo)* in 1979 through the European Birds Directive (2009/147/EC) has led to a fast increase of the cormorant population in Mecklenburg-Western Pomerania, growing from less than 500 breeding pairs in 1980 to an estimated number of 11,500 breeding pairs in 2012. Especially along the Eastern coastline of M-V and the Greifswald Bay, breeding colonies have expanded (LUNG, 2013a, p. 2). Cormorants must not be hunted. It is forbidden to capture, kill, or disturb cormorants, to destroy their nests, or to take off their eggs. However, article 9 of the Directive determines exceptions to the previous provisions in cases where serious damage to crops, livestock, forests, fisheries, and water cannot be prevented by other means (EC, 2009: Art.9; 2015a). In the case study, cormorants have been perceived as a threat by coastal fishermen as soon as their population size increased. Fishermen complained about a loss of catches, not only because of cormorants eating the fish, but also because of fish being damaged by bite marks. They said that cormorants chop all the fish that is caught in a net, which usually leads to considerable financial losses. The predation takes place during the entire gillnet season from early spring to late autumn [F3, F4, F5, F6]. In 2012, a new Cormorant Ordinance in Mecklenburg-Western Pomerania was passed that, in exceptional cases, allows for the shooting, or the chasing away of cormorants to avert damage to the fishery (LUMV, 2012: §1). However, nature reserves, national parks, sleeping berths, and breeding colonies are excluded from this provision (LUMV, 2012: §2). There are also specific temporal restrictions during the breeding phase between the 1st of August and the 31st of March each year (LUMV, 2012, p. §3). In 2013/14, there were a total of 268 cormorants shot on the basis of the Cormorant Ordinance in M-V. There are further exceptions that allow cormorants to be chased (based on §45 Sec. 7 BNatSchG) around two of the biggest fish ponds in M-V (Boek and Lewitz) which are entirely or partly located in nature reserves. As a consequence, an additional 653 cormorants were killed to prevent economic damage to fishery activities (LUNG, 2015, p. 11). Especially fishermen, anglers, and their representatives complained that there is no management in place that allows a broader scope for a continual reduction of the population size, particular in coastal regions. They explained that the financial damage to the local fishery due to cormorants is immense [F4, F5, F6, F7]. Opposed to that, environmental associations strongly criticized the Cormorant Ordinance and stated that there is no adequate scientific evidence of the actual damage caused by cormorants (NABU, 2013). Different interview respondents from nature conservation authorities and associations criticized that the strict protection of cormorants through the European Birds Directive (2009/147/EC) is being undermined by the Cormorant Ordinance [N3, N8]. They proposed a stronger cooperation with fishermen to achieve a mutual solution [N4, N9].

In January 2015, the European Commission adopted a plan to reduce the practice of discarding unwanted catches into the sea. According to it, all catches have to be kept on board and landed. The landing obligation applies to all fishermen and is supposed to help manage fish stocks in a more sustainable way (EC, 2015b). However, the actual implementation of the landing obligation and the monitoring of the discard ban are not clear yet. Currently, scientists are developing electronic

monitoring systems including cameras and hydraulic sensors to monitor catch size and composition. On the other hand, fishermen fear that their privacy will be compromised with such measures and that their public image may be damaged as this constant surveillance suggest that fishermen continually break legal provisions [F4, F5, F9]. Opposed to that, other actors support these measures, arguing that fish is a common resource and hence should be managed collectively. Therefore, society should have the right to control fishing activities [N3, N8]. The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs. Furthermore, it specifies the urgency (low – medium – high) with which actor claims in the conflict call for immediate attention.

Table 18: Conflict between fishery interests and nature conservation interests; fears and needs of those concerned and the degree of urgency

Fishery interests vs. nature conservation interests				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Seabird and mammal bycatch	Fishery repre-sentatives	Introduction of alterna-tive fishing gears ham-pering economical fishing; Loss of income; Total closure of fishing activities; Not being eligible for MSC certification	Development of economical and efficient (alternative) fishing methods; Compensation measures if nets or catches get damaged by, e.g. seals; Better scientific knowledge of ecosystem implications induced by fishing activities; Recognition of local knowledge and experiences in decision making; MSC certificate for local gillnet fishery	High
	Environmental representatives	Numerous seabirds and mammals get entangled and killed in gillnets or other traditional fishing gears	Development and application of alternative fishing gears; Closure of fishery in protected marine areas	High
	Scientists		Enhancement of scientific knowledge of ecosystem implications induced by fishing activities; Introduction of an electronic monitoring system to control bycatches and discards	High
Grey seal population	Fishery representatives	Increase of the grey seal population; Damage to fishing gears; Loss of catches and respective income; Bad public image	No measures to support resettlement of grey seals in the Baltic Sea and its coastal waters; Rehabilitation of fishery activities	High
	Environmental representatives		Resettlement of grey seals in the Baltic Sea and its coastal waters; Restoration of the grey seals' natural habitats	High
Cormorant population	Fishery representatives	Increase of the cormorant population; Reduction of different fish populations; Loss of catches and respective income	Cormorant management limiting population size in coastal areas; Acknowledgement and compensation of financial damage due to cormorants	High
	Environmental representatives	Undermining environmental policies (Birds Directives)	Strict protection of cormorants; Strengthening of scientific knowledge; Stronger cooperation with the fishery	High
	Scientists		Enhancement of scientific knowledge on the diets of cormorants	Medium

Discard ban	Fishery representatives	Violation of privacy rights; Loss of public image	Self-monitoring; Public acceptance of fishery activities	High
	Environmental representatives		Avoidance of discards and high grading; Efficient control of fishery activities; Acknowledgement of fish as a common good	High
	Scientists		Development of an electronic monitoring system	High

5.5.2 Integration of the Fishery in Spatial Planning

Several different respondents emphasized the need to integrate fishery activities into marine spatial plans in order to sustainably coordinate human usages in coastal regions [SP2, E1, E3, N1]. Coordination is supposed to prevent environmental degradation and an overuse of the available natural assets (Schiedel & Winter, 2012, p. 2). The integration of fishery activities in spatial management plans has not been realized yet, as many fishery representatives are opposed to this for several reasons. They argued that it is impossible to determine the most important fishing grounds due to temporal and seasonal changes. In this context, they critically questioned the usefulness of assigning reserved or priority areas to fishing activities. Instead, most fishermen declared the entire sea to be of substantial interest and importance for fishing activities. They strongly fear that their traditional rights and their access to fishing grounds might be limited [F1, F4, F7].

Representatives from spatial planning problematized that they lack reliable spatial data concerning fishing activities. They stated that due to this, fishery concerns cannot adequately be considered in spatial planning [SP1, SP2, SP3]. On the other side, fishermen argued that they would not reveal information on fishing grounds etc. for competitive reasons [F4, F5].

Representatives from spatial planning argued that the spatial assignment of a reserved or priority area status to a specific usage form constitutes this usage's legal institutionalization. Such an institutionalization is estimated to be of crucial importance, especially in regions characterized by scarce resources and a high pressure of diverse usage claims [SP1, SP2, SP3]. The assignment of reserved areas for fishing activities is considered an efficient option for the fishery to strengthen its position, especially when competing with other usages for spatial access rights [SP2, SP3, E3, A3]. Representatives from spatial planning wish to improve the dialogue with fishery representatives, but acknowledged their fears with respect to further restrictions [SP2, SP3].

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 19: Lack of integration of fishery in spatial planning; fears and needs of those concerned and the degree of urgency

Integration of the fishery in spatial planning				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Lack of integration of fishery in spatial planning	Fishery representatives	Closure of fishing activities; Restriction of traditional rights to fishing grounds; Competitive disadvantages	Unrestricted access to all marine areas; Adequate representation of fishery concerns in spatial plans; Better inclusion of fishery concerns in planning processes	Low
	Spatial planning representatives		Coordination of different usage claims on different spatial scales; Acquisition of spatial data on fishery activities; Better dialogue and cooperation with the fishery	High
	Environmental representatives and others	Harmful fishery activities in areas being important for nature conservation	Better coordination of usage claims in coastal areas; Inclusion of marine areas into spatial planning	Medium

5.5.3 Relation between Fishery and Science

The tense relationship between the fishery sector and research institutions providing advice on fishery issues is another issue problematized in the interviews. Fishery representatives complained that local knowledge was not taken adequately into account when preparing management advice. Policies are perceived as arbitrary and opaque [F4, F5, F6]. Fishery representatives strongly argued for multi-annual fish stock management plans in order to reduce uncertainty with respect to the quota setting. They fear that quotas might be reduced to a disadvantageous and unprofitable level on the basis of opaque advice. In 2010, the European Commission reduced herring quota in the Western Baltic Sea by 30 percent. Fishermen publicly campaigned against this quota reduction and discredited this advice. They felt unfairly treated as, in their eyes, it was not fishery pressure that led to a steady depletion of fish stocks. Rather, changing environmental conditions were suggested to have brought about the degradation of fish stocks (OAR, 2010). However, many fishery representatives highlighted that the enhancement of scientific knowledge including knowledge of ecosystem relations and fishery activities is essential in order to implement sustainable management measures. They therefore wished for a better cooperation with fishery scientists [F1, F2, F5]. Also, scientists emphasized that a mutual cooperation with the fishery is very important to ensure the sustainable management of fish stocks [S1, S4]. However, they have had different experiences with respect to a mutual cooperation. While some scientists have very close connections to many fishery representatives and fishermen [S4, S5, S6], others are annoyed by an unconstructive dialogue [S1, S2, S3].

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 20: Relation between fishery and science; conflict patterns, fears and needs of those concerned and the degree of urgency

Relation between fishery and science				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Relation between fishery and science	Fishery representatives	Negligence of fishery concerns in advice and decision making; Constant management uncertainty; Implementation of precarious and opaque policies	Integration of local knowledge in management advice: Preparation of multi-annual management plans; Higher quotas; Transparency with respect to the advice drafting; Enhancement of scientific knowledge of ecosystem relations and marine fishery; Improvement of the relations between science and fishery	High
	Scientists		Sustainable fish stock management; Policy-relevant advice; Mutual cooperation with the fishery	High

5.5.4 Science-Policy Interface in Natural Resource Management

Science-policy interfaces are critical in natural resource management (Koetz, Bridgewater, Miller, Norgaard, & Pielke, 2009; UNEP, 2015). They reflect the relationship between scientists and other actors in policy processes and ought to facilitate exchange, co-evolution, and joint construction of knowledge, aiming to enrich decision making (van den Hove, 2007, p. 824). Many decision makers on different political levels perceive a continual gap between policy making and science in the field of natural resource management. They criticized that often, data or research on policy-relevant issues are not available in a format which supports the decision-making process. Existing scientific results are not adequately communicated or prepared. They see it as the scientists' responsibility to publish and communicate their results in an understandable and open manner [F1, F2, F3 N2, N7]. Some respondents complained that most research projects are only short-term and thereby hamper continuous in-depth research [S1, S3, N5]. On the other hand, several decision makers criticized that many research projects deal with issues which are not policy-relevant. However, they emphasized that policy-relevant research could establish a crucial basis for decision making [F1, F2, A1, N5, N8]. On the other hand, scientists agreed that it is, in most cases, not possible to definitely explain complex ecosystem relations and establish one-fits-all solutions to solve environmental problems [S3, S4, S5]. They criticized that there is no intermediate institution that can take the lead in bridging scientific knowledge and political decision making. As there is no constant dialogue or feedback loop between scientists and policy makers, some scientists fear that their results might be misunderstood and used in an unsustainable manner. They feel that the funding of research is often subject to political premises that are not oriented towards scientific needs [S3, S5].

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 21: Lack of science policy interface; fears and needs of those concerned and the degree of urgency

Science-policy interface				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Lack of science-policy interface	Actors on different political levels		Provision of policy-relevant scientific data; Application-orientated preparation and communication of research results; Policy-relevant research	Medium
	Scientists	Research that is determined by political premises; Difficulties in ensuring scientific objectivity; Misunderstanding of scientific advice in policies	Better political support for application-orientated research; Establishment of an intermediate institution bridging science and policy making	Medium

5.5.5 Application of the Precautionary Approach

The Agenda 21 of the United Nations Conference on Environment and Development, which took place in Rio de Janeiro in 1992, stipulates the application of preventive and precautionary approaches in natural resource management (UN, 1992: Chapter 17 17.5 d). Actions and policies with a suspected risk of causing harm to the environment in terms of degradation are to be avoided deliberately. In any case, the probability of environmental harm should be considered in decision making, even if there is no full scientific proof of the actual adverse implications (UN, 1992: Chapter 35 (3)).

Fishery representatives criticized the implementation of the precautionary approach in decision making. They fear that the fishery sector is being discriminated on the basis of unproven assumptions. This fear is based on attempts to close fishing activities in marine protected areas, whereas the actual harm of those activities to the ecosystems has not been scientifically proven yet [F7, F9]. Fishing activities are seen as harmful to the otter population, and to seabirds and marine mammals, however, there are as of yet no scientific data confirming these adverse implications. Fishermen feel a considerable threat to their existence with respect to those discussions. It is up to them to provide evidence that their activities are harmless. They claimed not to have the adequate means for this and wish for a better cooperation with scientists [F2, F4, F5, F9]. In contrast, most of the representatives from nature conservation authorities and associations, but also from scientific institutions and from environmental consulting offices, believe that the precautionary approach is generally neglected in decision making. They feel that economic interests are prioritized instead. Environmental objectives are seen as rather weak compared to other interests [N1, N2, N3, N4, N5, N7, N8, N9, S3, S5, E1].

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 22: Application of the precautionary approach; conflict patterns, fears and needs of those concerned and the degree of urgency

Application of the precautionary approach				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Application of the precautionary approach	Fishery representatives	Restriction of fishery activities; Criminalization of fishery activities	Rehabilitation of fishery practices; Equal treatment of all usages within marine areas; Scientific knowledge of actual ecosystem implications of fishing practices	High
	Actors from different actor groups	Negligence of the precautionary approach and prioritization of economic and industrial development at the expanse of environmental standards	Strict consideration of the precautionary approach in decision making	Medium

5.5.6 Intensive Agricultural Practices vs. Water and Nature Conservation

Another manifest conflict problematized by many interview respondents is the conflict between intensive agricultural practices on the one hand, and water and nature conservation objectives on the other hand. The maintenance of a competitive agricultural sector in Mecklenburg-Western Pomerania is one of the major interests emphasized by agricultural representatives [A1, A2]. They declared their support for ecological measures to reduce nutrient discharges but oppose the abandonment of any arable land for reasons of nature or water conservation. They are critical towards alternative and extensive agricultural practices and claimed that further environmental restriction would result in financial disadvantages [A1, A2]. In 2007, under the pressure of agricultural representatives, the width of the riparian buffer strips was reduced from initially seven meters to three meters in M-V. In cases where the spreading width of agricultural machinery is adjusted and controllable, fertilization and application of pesticides are allowed within a riparian distance of one meter (LUMV, 2008c: Sixth part §81 (3)). The riparian buffer strips are supposed to regulate water runoff and to reduce discharges of substances from diffuse sources (BMJV, 2009 §38(1)). Especially representatives from environmental conservation criticized this decision, arguing that extensive nutrient discharges from agricultural land are still a major problem, especially for riparian and marine ecosystems in M-V [N5, N7, N9, N11]. They emphasized that the reduction of riparian buffer strips has thwarted the successful implementation of the Water Framework Directive (WDF) and the Marine Strategy Framework Directive (MSFD) that both aim to restore a good ecological status and a balanced physiochemical condition of water bodies. Particularly in this context, they argued that environmental protection concerns are considered much less in policy making than economic or industrial interests [E1, N7, N9, N11]. The environmental objectives promoted by the WFD are very likely to fail the envisaged criteria in M-V that are supposed to be achieved until the end of 2015. High amounts of nutrients entering surface and ground water bodies as well as coastal waters are made responsible for this (LUNG, 2012b, p. 5).

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 23: Intensive agricultural practice vs. water and nature conservation; conflict patterns, fears and needs of those concerned and the degree of urgency

Intensive agricultural practices vs. water and nature conservation				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Intensive agricultural practices vs. water and nature conservation	Agricultural representatives	Competitive disadvantages and financial losses; Restriction of agricultural practices; Loss of arable land for reasons of nature or water conservation; Further pressure through environmental provisions	Integration of arable land in the form of priority areas in spatial plans and thus legal institutionalization of agricultural claims	High
	Environmental representatives	High amounts of nutrient discharges from agricultural land caused by the reduction of the width of riparian buffer strips; Non-compliance with the WFD and the MSFD; Prioritization of economic concerns in decision making; Undermining of environmental standards	Broad reduction of nutrient discharges into water bodies from agricultural land Compliance with environmental provisions; Restoring a good ecological status and a balanced physiochemical condition of water bodies; Stronger political support of environmental conservation objectives; Consideration of environmental concerns in decision making	High

5.5.7 Management of River Basins vs. Nature Conservation

Another problem that was addressed by a representative from the water and soil association is the conflict between water and river course protection ensured by a huge body of environmental policies on the one hand, and the municipal duty to restore and manage river basins of second order to avoid destructive floods on the other hand. The representative feels that environmental provisions, especially regarding particular protected species and habitats (e.g. Natura 2000 Directives, BNatSchG, BArtSchG), are much higher prioritized than the prevention of floods in urban and rural areas, which is the major task of water and soil associations. The management of river basins requires the removal of weeds and deadwood in the river course and along the riverside, and the clearance of drainages. The clearance along the entire riverside is important to ensure the continual water runoff. However, most of these areas are legally protected by environmental policies prohibiting any human interference due to special species or habitat protection objectives. The representative argued that delayed clearance measures potentially provoke higher adverse impacts on new habitat structures that have developed through non-interference. As one example, the appearance of beaver dams hampering the river runoff and causing backwaters was cited. Beavers are protected by the Federal Species Protection Act (BArtSchG) and therefore are not allowed to be chased, killed or disturbed in their natural habitats. It is further prohibited to destroy their dams – dams that cause backwaters which may destroy arable land potentially leading to high compensation claims from farmers [O1]. The representative regretted that water and soil associations are under steady pressure of environmental legislation which broadly constrains the realization of their duties [O1]. The representative argued further that water and soil associations considerably contribute to the achievement of objectives promoted by the Water Framework Directive (WFD) which aims to

establish the maintenance of river continuity (EC, 2000: Chapter 1.2.1, p. 40) in order to allow the barrier-free migration of fish. The removal of deadwood or weeds supports the extraction of organic biomass which otherwise would stress the river ecosystem and its oxygen regime [O1]. The representative emphasized that there is an obvious institutional failure evident in policies prescribing contradictory objectives without adequately balancing and coordinating different goals [O1]. The representative pointed out that the Federal Nature Conservation Law (BNatSchG) prioritizes agriculture, forestry and fishery activities. Therein, it is defined that these usages are eligible as long as the preservation of local species does not deteriorate on a population level and good professional practices are applied. The representative wished to gain the same exceptional status for water and soil associations, so that they can effectively realize their tasks. The representative argued for the enhancement of cooperation with water and nature conservation authorities on the municipal level in order to prevent conflicts before they intensify and to stipulate collective actions regarding management strategies. A continual dialogue is considered crucial in order to achieve conjoint agreements on management objectives [O1].

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 24: Management of river basin vs. nature conservation; conflict patterns, fears and needs of those concerned and the degree of urgency

Management of river basins vs. nature conservation				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Management of river basins vs. nature conservation	Water and soil associations	Prioritization of environmental provisions at the expense of effective flood prevention; Reduction of the scope of action; Heavy flood events	Undermining of environmental provisions concerning an effective restoration and management of river basins to avoid heavy floods; Broader scope of actions; Coordination of river basin management and environmental objectives; Enhancement of cooperation between municipal water and nature conservation authorities and representatives from water and soil associations	High
	Environmental representatives	Non-compliance with environmental provisions	Strict implementation of environmental provisions without leaving much room for exceptions	High

5.5.8 Communication and Trust among different Actor Groups

Another conflict impeding mutual cooperation and coordination in natural resource management is a lack of communication and constructive dialogue among the different actor groups in the case study area.

Especially fishery representatives feel that they are being discriminated by the current social discourse which condemns fishery activities from the outset, without proof that the degradation of fish stocks and ecosystems can be reliably traced back to fishing activities. They claimed to suffer from a general criminalization of fishery activities. Many fishery representatives see themselves isolated in communication structures and in this context complained that their interests and fears are not taken seriously into account in decision making [F4, F5, F6, F9]. Furthermore, fishery representatives stated that they are regularly confronted with hostility from other actor groups and have to struggle against a bad image in the media. They perceive themselves confronted with a

constant mistrust which is perceived as a burden regarding the maintenance of relationships with other actor groups [F1, F2, F4, F5, F9].

Many representatives from different actor groups stated that the discourse on natural resource management in the case study is driven by single individuals who uncompromisingly insist on maximal demands with respect to their interests. Altogether, the respondents disclosed the names of at least four key persons and/or organizations that are seen as driving forces in stirring up conflicts and thereby constantly hamper communication and dialogue. Under those circumstances, mediation among the different actor groups is difficult [F5, F6, N5, N8]. Furthermore, relationships among the actor groups are overshadowed by mutual mistrust and suspicion [F4, F5, F6]. As soon as existential fears or the limitation of usage rights are touched upon, the discourse between actor groups becomes harsher [F1, N5, N8].

However, there are a couple of collaborations among different actor groups that have been perceived as successful examples enhancing collective action in natural resource management in the case study area. For instance, respondents referred to the 'Voluntary Agreement on Nature Conservation, Water sports and Angling in the GWB and Strelasund' implemented in 2004. This agreement strives to establish consensus between envisaged protection objectives and different resource user groups in the case study [F3, F9, N1]. Almost all respondents expressed their interests in improving and enhancing communication between different actor groups in order to gain mutual solutions for sustainability in the region [F2, F5, N1, N2, N3, N5, N8, N9, M1, E1, E3, S3].

The following table summarizes the different arguments that characterize the conflict and specifies the different actor groups' fears and needs.

Table 25: Communication and dialogue among different actor groups; conflict patterns, fears and needs of those concerned and the degree of urgency

Communication and trust among different actor groups				
Issue	**Actor groups**	**Underlying fears**	**Underlying needs**	**Urgency**
Communica-tion and dialogue among different actor groups	Fishery representatives	Discrimination and negligence of fishery concerns in decision making General criminalization of fishery practices Loss of livelihood through public discourse emphasizing the negative implications of fishery practices	Recognition of fishery concerns and involvement of fishery representatives in decision making Rehabilitation of fishery practices Improvement of communication structures Fair communication that is based upon scientific proof Political and societal support	High
	Actors from different groups		Better cooperation and communication with representatives of different actor groups Abstaining from maximal demands	Medium

5.6 Implementing a Management Approach towards Sustainability

Conflicts among different actor groups may impede a conjoint management approach to sustainably develop coastal and marine areas. On the other hand, 'sustainability' is an all-embracing concept in the natural resource management debate, leaving room for various interpretations and emphases (Ott & Döring, 2008). Based on the interviews, I compiled a comprehensive picture of the different respondents' ideas and understandings of sustainability in the area of the Greifswald Bay. This helped to contextualize the respondents' interests in the natural resource management process in the case study area and to further reveal potential conflicts. It may further help to reveal the respondents' ambitions to either support a conjoint management approach or to block it.

The respondents were asked to list all factors that they think strengthen or threaten sustainability in the Greifswald Bay and its coastal areas. Additionally, they were asked to think about opportunities potentially enhancing and weaknesses potentially thwarting sustainability. The results were compiled in a SWOT analysis table. SWOT stands for Strengths, Weaknesses, Opportunities and Threats. These four terms are interlinked and in some cases overlapping. On this basis, it was possible to classify three different aspects of sustainability that are best suited to summarize the different respondents' answers. The analysis includes environmental aspects, socio-economic aspects, and management aspects. While environmental representatives, in general, put a strong emphasis on ecological aspects of sustainability, fishery and agricultural representatives highlighted socio-economic aspects of a sustainable development. The analysis results presented in the following two subchapters are not assigned to a specific actor group as intergroup differences are only marginal. The analysis starts with the specific strengths regarding ecological, socio-economic, and management aspects in the GWB, before summarizing respective weaknesses, identified by the respondents.

5.6.1 Strengths and Weaknesses with respect to the Achievement of Sustainability in the GWB

The Greifswald Bay is a crucial habitat for a variety of endemic animal and plant species. It is further one of the most important spawning and nursery grounds for the Western Baltic Spring Spawning (WBSS) herring in the Southern Baltic. In contrast to outer marine areas, the GWB has been evidenced to provide, in general, more favorable ecological conditions for the recruitment of larvae and their growth through lower salinity values and higher water temperatures. Respondents positively highlighted the plethora of environmental policies covering the area to ensure ecological sustainability (e.g. Natura 2000, the WFD, the MSFD or the BNatSchG), but at the same time recognized that some of these provisions lagged behind their ambiguous goals. Also, fishery law includes a number of regulative mechanisms to prevent fish stock degradation. In this context, European fishing quotas and TACs for commercial fish stocks were mentioned to be supportive instruments towards the sustainable development within the case study area. Additionally, fishery law on the regional level (KüFVO M-V) determines the temporal restriction of fishing activities and the assignment of specific protection areas for fish. The GWB and its coastal areas are of high economic importance with respect to tourism and fishery activities. Herring is one of the major target fish for the regional gillnet fishery that, in 2014, generated about 90% of its yearly income from herring catches (LALLF, 2015). The development of a broad tourism sector is seen as an important source of income for the local population. Spatial planning in the case study area is seen as a valuable management tool to ensure the balance of different usage claims and thus to strengthen different aspects of sustainability equally.

The high nutrient discharges into coastal waters are estimated to constitute a major weakness with respect to the ecological sustainability in the Greifswald Bay. Through the river catchment areas of the Oder and the Peene river, large amounts of nutrients continually enter the GWB. Eutrophication is said to seriously deteriorate habitat conditions and negatively affect the growth of submerged vegetation that serves as a major spawning substrate for the western Baltic herring stock. The coverage ratio of submerged vegetation in the GWB is estimated to have significantly decreased during the last decades. The general awareness on the ecological function of the GWB is relatively low within different actor groups. Especially the low prices for herring are held responsible for creating a low resource protection awareness. The limited knowledge of ecosystem interrelations is seen as a considerable weakness regarding the realization and implementation of a sustainable ecosystem-based management approach in the case study areas. Another issue that is considered a weakness with respect to the ecological sustainability in the GWB is the actual lack of fishing quotas for recreational fishery and a constant uncertainty concerning recreational fishery's share of fish extraction.

Socio-economic sustainability within the region is linked to a steady increase of economic activities generating income through the creation of employment to ameliorate livelihood conditions for the local population. The constant income dependency of the local population on tourism is estimated to impede a balanced socio-economic development. Moreover, an increased tourism exerts pressure on other usage forms in the same area, due to the competition for space and natural resources. The expansion of touristic infrastructure provokes negative impacts on the ecological sustainability in the region by increasing the amount of traffic and waste. The rise of modern water sports activities is estimated to seriously deteriorate aquatic habitats.

Several weaknesses have been identified with respect to the implementation of a sustainable natural resource management in the case study. Several state actors criticized a lack of management harmonization as a major reason for impeding sustainability. Further, there is a constant uncertainty about responsibilities. In some exemplary cases, specific regulations are considered to contradict socio-political objectives. Especially environmental objectives, such as those promoted by the WFD or the MSFD, are perceived to have been neglected in provisions determining fishery or agricultural practices. Most of the respondents are unsure about how to initiate an ICZM, whom to integrate, which interests to consider and how to find a consensus between all those different actors pursuing divergent interests. On the one hand, ICZM is estimated to be a suitable tool to integrate different interests. However, on the other hand, strong interest conflicts that have already burdened some of the actors' relationships for a long time impede a consensus on sustainable goals in the coastal area of the GWB. It was also emphasized that as of yet, the dependence of different ecosystem components has not been appropriately considered in management practices and decision making. Actors further criticized that there is no area-specific management implemented in the GWB. Instead, management tends to promote one-fit-all solutions that ignores spatial particularities. Many actors noted that as of yet, there is no adequate monitoring system conceived and implemented to disclose environmental infringements. Many of the respondents criticized a lack of communication between science and policy making. A weak policy-science interface impedes sustainability in management practices and decision making.

Table 26: Strengths and weaknesses from an actor perceptive with respect to sustainability in the GWB (SWOT table, first part)

STRENGHTS	WEAKNESSES
ENVIRONMENTAL ASPECTS	
▪ Crucial habitats for a variety of endemic animal and plant species ▪ Important spawning and nursery ground for the WBSS herring providing favourable ecological conditions (higher water temperatures, lower salinity etc.)	▪ High amounts of nutrient discharges ▪ Successive reduction of submerged vegetation that serves as major spawning substrate ▪ Low awareness of the ecological function of the GWB within different actor groups ▪ Low knowledge of ecosystem interrelations ▪ Low prices for herring, creating a low resource protection awareness ▪ No fishing quota for recreational fishery
SOCIO-ECONOMIC ASPECTS	
▪ Herring is an important target fish for the local fishermen community ▪ Development of a broad tourism sector generating income for the local population	▪ Low regional economic development ▪ Income dependency on tourism ▪ Increasing tourism - competition for space and natural resources (infrastructure expansion, increase of traffic and waste) ▪ An increase in water sport activities may seriously deteriorate the habitat quality
MANAGEMENT ASPECTS	
▪ Plethora of environmental policies setting high environmental standards (Natura 2000 Directives, WFD, MSFD, BNatSchG etc.) ▪ Spatial planning to ensure a balance of different usage claims in the case study area ▪ Fishing quotas and TACs for commercial fish stocks to prevent overfishing ▪ Regional fishery law (KüFVO M-V) to determine temporal restrictions for fishing activities and the assignment of specific protection areas for fish	▪ Lack of management harmonization ▪ Great variety of different actors pursuing divergent interests ▪ Uncertainty about the implementation of an ICZM ▪ Strong interest conflicts among different actor groups and personal hostilities ▪ Lack of an ecosystem-based management approach in decision making ▪ One-fit-all solutions instead of an area-specific management ▪ No adequate monitoring system ▪ Weak policy-science interface

5.6.2 Opportunities and Threats with respect to the Achievement of Sustainability in the GWB

Respondents mentioned several opportunities to enhance sustainability within the case study area. Those that emphasized environmental aspects argued for a change in agricultural practices. They highlighted the ecological advantages of extensive approaches in agriculture in order to conserve soils and to reduce discharges into water bodies. Moreover, they demanded a re-expansion of riparian buffer strips that have been set up to filter and reduce direct nutrient discharges from agricultural land. In M-V, their width has been reduced in 2007 from initially seven to three meters, in some cases to even only one meter. Therewith, the distance of fertilized land to surface water bodies has been diminished, likely allowing contaminants and harmful substances to enter surface

and groundwater bodies more easily. They further emphasized the need for the enhancement of scientific knowledge on socio-ecological systems and ecosystem interrelations.

Several respondents see the development of alternative fishing gears in order to prevent seabird or mammal bycatch as another opportunity to ensure ecological sustainability in the case study area. Related to livelihood security, the MSC certification of the gillnet fishery in the Greifswald Bay is supposed to help the local fishermen to sell their fish for higher prices. Therefore, proof is required that gillnet fishery is not detrimental to seabird and mammal populations. In this context, many respondents see a huge need in diversifying regional income structures to prevent unemployment. The promotion of sustainable forms of tourism has been stated to be an effective opportunity to strengthen socio-economic sustainability in the region.

Respondents further identified several opportunities to improve management practices in the case study area. They emphasized that in a first step, organizational responsibilities should be clarified. Moreover, they see a huge importance in linking organizational responsibilities on different political levels in order to foster a strong vertical and horizontal cooperation among the different political actors. A strong cooperation and communication are seen as a way to mitigate adverse effects resulting from institutional fragmentation. It was further emphasized that spatial particularities in an area should be better integrated in management decisions. A rigid management promoting a one-fit-all solution was suggested to impede long-term sustainability goals. Several respondents emphasized the need for a holistic perspective in natural resource management that includes different aspects of sustainability and considers the variety of needs and fears of those that are directly concerned by these management decisions. In this context, they support the implementation of bottom-up processes including local population and local actor groups to promote a collective approach to the management of natural resources based on a mutual consensus. Voluntary agreements are estimated to be an important management instrument establishing a shared responsibility among the participants. The acceptance of management decisions is higher in cases in which the concerned actors have had the chance to actively participate. Therefore, bottom-up processes and the inclusion of local knowledge are considered opportunities which strengthening sustainable management practices in coastal areas. A common dialogue and a strong cooperation between different actor groups are crucial with respect to the enforcement of sustainable management decisions. Apart from the actual resource users in the coastal area of the GWB, most respondents argued for a consequent application of precautionary or restrictive measures in cases of uncertainty. The successful implementation of sustainable management practices depend on the strengthening of the general awareness with respect to ecological challenges in the case study area. The introduction of sanctioning mechanism was promoted as an opportunity to effectively prevent infringements.

The respondents identified several threats with respect to sustainability in the GWB. These threats include high nutrient discharges harming marine ecosystems, and potential seabirds and mammal bycatches through fishery activities. Further threats are the continuation of the increase of multiple usage forms. In this context, it was emphasized that the actual effects of human uses on natural ecosystems are unpredictable in some cases due to a high interdependency of different ecosystem components and a lack of knowledge on these ecosystem interrelations. Respondents criticized that this uncertainty is often not considered in decision making. They think that the precautionary approach is often neglected in favor of economic or industrial interests.

Furthermore, the consequences of climate change are further considered to threat environmental sustainability. Respondents are particularly concerned about the maintenance of the biodiversity and a steady deterioration of habitat conditions. The consequences of climate change are also perceived as threats to the promotion of socio-economic sustainability. Especially coastal regions will have to deal with increasing water levels and extreme weather events, very likely affecting the fishery and the tourism sector. However, the region of the GWB is strongly dependent on income from fishery activities and tourism due to a low general income diversification. A collapse of these economic branches would increase the regional unemployment rate. In this context, fishermen strongly fear that further environmental restrictions will prospectively constrain fishing activities and thus, their livelihoods. The steady migration of young people to other regions with higher employment rates, the demographic change, and a perceived lack of political support are further threats to the socio-economic sustainability in the region.

Another aspect seen as threatening the sustainable implementation of management measures in the GWB is the fact that in most cases, adverse impacts on coastal ecosystems are caused somewhere far away. Thus, usually the actual polluters cannot be identified or held accountable. The table on the following page summarizes the previous findings.

Table 27: Opportunities and threats from an actor perspective with respect to sustainability in the GWB (SWOT table, second part)

OPPORTUNITIES	THREATS
ENVIRONMENTAL ASPECTS	
▪ Changing highly intensive agricultural practices in coastal areas to extensive approaches conserving soils and reducing discharges into water bodies ▪ Re-expansion of the riparian buffer strips ▪ Development of sustainable fishing gears to prevent seabird and mammal bycatch ▪ Enhancement of scientific knowledge on socio-ecological systems and ecosystem interrelations	▪ Discharges of nutrients into rivers and coastal water bodies ▪ Further decline of submerged vegetation that serves as important spawning substrate ▪ Bycatch of seabirds and mammals through fishing activities ▪ Increase of multiple usage forms in coastal and marine areas affecting ecosystems ▪ Negligence of the precautionary approach ▪ Political prioritization of economic, agricultural, or industrial interests ▪ Climate change effects
SOCIO-ECONOMIC ASPECTS	
▪ Development of sustainable, but nevertheless economically efficient fishing gears to maintain coastal fishery ▪ MSC certification ▪ Diversification of income structures to prevent unemployment ▪ Promotion of sustainable tourism	▪ Low income diversification and dependency on fishery and tourism ▪ Proof of seabird and mammal bycatch through fishing activities that may potentially lead to restrictive measures ▪ Demographic change
MANAGEMENT ASPECTS	
▪ Clarification of organizational responsibilities and strengthening of cooperation ▪ Implementation of a coherent management approach ▪ Consideration of spatial particularities ▪ Consequent application of precautionary approach in cases of uncertainty ▪ Implementation of bottom-up processes ▪ Inclusion of local knowledge into decision making ▪ Voluntary agreements ▪ Strengthening dialogue and cooperation among different actor groups ▪ Fishing quotas for recreational fishery ▪ Awareness raising for sustainable behaviour and effective sanctioning mechanisms	▪ Political prioritization of economic or industrial interests ▪ Political premises marginalizing specific actor groups' interests in favour of others ▪ Negligence of the precautionary approach in decision making ▪ Low acceptance of management decisions due to the neglect of specific actor groups' needs and fears ▪ Adverse impacts on coastal ecosystems are caused somewhere far away ▪ 'One-size-fits-all' management approach

6 THE DISTRIBUTION OF POWER IN NATURAL RESOURCE MANAGEMENT

6.1 Who is powerful and who is not?

Who is powerful and who is not – with respect to natural resource management in the case study area - was the guiding question that will be illuminated in the following subchapters. The distribution of power among all the different actors and actor groups in the case study area that are influencing management decisions (or those actors or actor groups that are affected by those decisions) was operationalized by applying three different methodological approaches typically used for the analysis of social networks. The **interactional approach** was applied in order to gain a first understanding and at the same time a visualization of the social interactions of the actors in the assessed policy network. Therewith, it became possible to identify actors or actor groups that were central or marginalized in interaction and communication processes (cf. Chapter 3.1.5.1). From a **positional approach** (cf. Chapter 2.3.2.1 and Chapter 3.1.5.2), power is inherent in an actor's individual position in the network (Cook, 1977, p. 72; J. Scott, 2013, p. 45). By occupying a central position in the network, actors may be superiorly empowered to exert influence over others in the network and may, at the same time, have better access to important resources or information which can put them at an advantage compared to actors that are more peripheral in the network (Brass, 1984, p. 520; Burt, 1976, p. 93; 1992, p. 57; Degenne & Forsé, 1999, p. 29; Ibarra & Andrews, 1993). The specific positions of actors and actor groups – and thus the potential power of these actors - will be analyzed in Chapter 6.2. The **reputational approach** rather takes an actor's perspective to explain the distribution of power in human relationships and puts a strong focus on mutual perception and influence reputation. In social (or policy) networks, influence reputation can be defined as the 'collective perception' of network members who are asked to evaluate other network members' relative capacity to steer policy processes and to affect policy outcomes. A high reputation may provide an actor with favorable opportunities to access resources that contribute to the actors' success to shape policy decisions advantageously to their interests. Therefore, influence reputation reflects social status relationships among actors in a social system (Knoke, 1998, pp. 508-509) and is further seen as a recurring concept of mutual relevance (Fischer & Sciarini, 2013, p. 1; J. Scott, 2013, pp. 44-45). Influence reputation may further be applied to identify patterns of perceived power distribution and power asymmetries (cf. Chapter 3.1.5.3).

The interview guideline contained varying questions in order to analyze different aspects of the respondents' influence perception. In a first question, I asked the respondents to identify all actors they estimated to be important with respect to the use and the protection of the Greifswald Bay and its coastal areas. Thereafter, the respondents were asked to evaluate their own actor group's influence and the influence of other actor groups involved in natural resource management in the case study area. They should further specify the reasons for their assessment of their own and other actor groups' influence (cf. Chapter 3.1.2.2). The results of the first question are summarized in the following figure. The answers were assigned to the respondents' group affiliation.

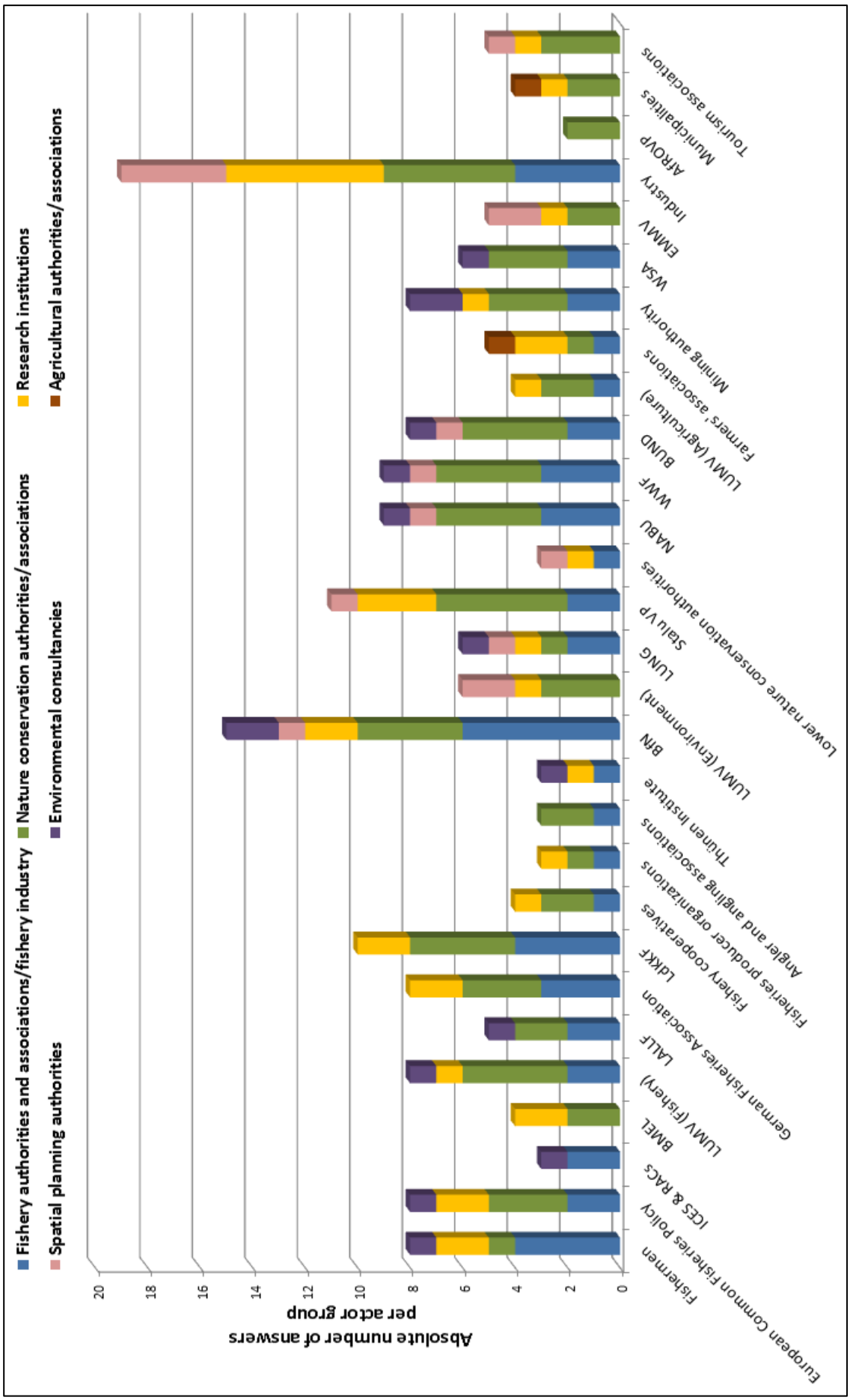


Figure 12: Reputational judgements of interview respondents. They were asked to name all important actors with respect to the use and the protection of the GWB and its coastal areas.

As figure 12 on the previous page shows, most of the respondents perceive economic and industrial actors to be of crucial importance in terms of influencing management decisions with respect to the use and the protection of natural resources in the case study area. Some of them argued that economic interests are prioritized in policy making by providing incentives to business, therefore intentionally lowering environmental standards. Nature conservation authorities and associations, including the BfN, the Stalu VP, WWF, NABU, and BUND were identified as crucial actors with respect to maintain and implement protection objectives in the case study area. Agricultural land use, tourism, and fishery activities were identified as major usage forms in the case study area. Thus, also farmers' and tourism associations were repeatedly mentioned as crucial actors in the region. Moreover, fishery authorities and associations (e.g. the LUMV (Fishery), the LALLF, the German Fisheries Associations, and the LdKKF) are considered important actors in the resource management process in the case study.

Mutual influence perception is considered to essentially shape actor relationships with respect to the perceived and factual distribution of power. This is judged to have considerable impacts on policy making and thus the implementation of a sustainable natural resource management and the realization of conjoint and coordinated actions. Each of the following five subchapters is divided into two parts. The first part provides an overview of how respondents judge their own influence regarding natural resource management processes in the case study area. In comparison, the second part concentrates on how other actor groups perceive this focal actor group's influence.

6.1.1 Fishery Actors

In total, I conducted nine interviews with representatives from fishery authorities and associations. The following table summarizes the results on how large they perceive their own influence in the resource management network to be. The table is followed by the textual part that is providing a more detailed compilation.

Table 28: Influence judgement of fishery representatives regarding their own influence

Actor group	Own influence perception	Explanations
Fishery authorities	Low to medium	▪ Scientific advice got stronger recognition in policy making on EU and federal level whereas fishery's lobby interests were less considered ▪ Relatively weak regulatory framework to emphasize fishery interests ▪ Declining fishery sector and lack of competent staff ▪ Low incentives for politicians to support fishery sector ▪ Pressure on fishery activities due to environmental restrictions ▪ Prejudgment of fishery activities ▪ Lack of proof that there is no ecosystem harm caused by fishery activities
Fishery associations	Very low to medium	

All these findings summarized above reflect different conflicts and difficulties that shape a kind of common identity. This identity is based upon the perception of being weak and unfairly treated. Almost all fishery representatives agreed that the influence of the fishery lobby has constantly decreased during the last twenty years [F2, F3, F4, F5, F6]. They reasoned that instead, scientific advice on quotas and TACs gained broader recognition among responsible decision makers [F3, F7].

Several fishery representatives stated that the regulatory framework to enforce fishery claims is relatively weak and that fishery interests are often neglected in policy or decision making [F1, F2, F5, F6]. They complained that even if fishermen are the first to be affected by new regulative (environmental) provisions, they are seldom involved in policy making, which leads to a feeling of powerlessness [F1, F4]. Fishery policies are negotiated on the European level. Many fishermen and fishery representatives criticized this policy process for neglecting local needs and appropriate participatory opportunities. Also, a lack of competent staff who knows how to strategically integrate fishery claims into policy making and how to organize an efficient interest representation is seen as having contributed to the decline of fishery associations' influence on the local level [F6, F7]. The number of fishermen has steadily decreased during the last years as livelihood conditions have worsened. Thus, there is a constant lack of young fishermen who could support the renewal of the fishery sector [F1, F2, F3, F4, F6]. Another factor in the decrease of the influence of the fishery is seen in the bad media image and a lack of scientific proof that there is no ecosystem harm caused by fishery activities [F1, F4, F5].

The following table presents an overview of how the fishery actor group's influence was judged by other actor groups in the network. The text below briefly summarizes these findings.

Table 29: Perception of the fishery's influence from the perspective of other actors. The first column states the considered actor group while the second column names the group evaluating the influence of the considered group. The last column provides explanations.

Considered actor group	Actor group	Influence perception	Explanations
Fishery authorities/ associations	Science	Low to high	▪ Scientific advice on quotas and TACs has been given a higher priority in policy making ▪ Shrinking number of coastal fishermen ▪ Lack of a common vision and strategy ▪ Insistence on maximal demands ▪ High influence due to a fishery-friendly policy making on state and regional level
	Nature conservation authorities and associations	Low to high	▪ Strong pro-fishery perspective in ministries dealing with fishery issues ▪ Poor interest representation ▪ Shrinking number of active fishermen ▪ Rising public awareness of the consequences of fishing activities and their potential harm ▪ Poor cooperation and communication structures with respect to other actors ▪ Insistence on maximal demands
	Spatial planning/ Environmental consulting	Low to medium	▪ Declining number of active coastal fishermen ▪ Low medial presence ▪ No legal institutionalization of fishery rights in spatial plans ▪ Lack of cooperation with spatial planning authorities
	Environmental consulting	Low to medium	▪ Low medial presence
	Agriculture	Low to medium	▪ Low capacity to exert influence and to enforce fishery's interests ▪ Shrinking number of fishermen

Many respondents agreed that the influence of the fishery lobby, especially on higher political levels, has steadily decreased during the last years and that, instead, scientific advice on quotas and TACs has been given a higher priority in policy making [S1, S2, S4]. Several respondents feel that the fishery sector has lost its influence due to a lack of visions and common strategies. Thus, the sector has not been able to adapt to environmental and policy changes. Fishery associations are perceived to be weak in their capacity to strategically influence decision making [S3, N1, N7, SP1, SP3, E3, A2, A3]. The insistence on maximal demands is seen as having led to a marginalization of the fishery sector. Important cooperation partners (e.g. from environmental or spatial planning authorities etc.) were rather disappointed with previous experiences of cooperation. A more cooperative approach could strengthen the fishery's position within the bulk of different actors and their interests [S2, S4, N7, N8, N9, SP2, SP3]. Especially representatives from spatial planning argued that fishery rights are still not legally institutionalized in spatial planning. The access of fishermen to fishing grounds could be legally ensured and defended against other usage claims, if these areas had the status of 'reserved areas' [SP2, SP3]. The declining influence of the fishery sector is also related to a rising public awareness of the consequences of fishing activities and their potential harm to the marine environment and the depletion of fish stocks [N1, E3]. Many respondents stated that the shrinking number of coastal fishermen in Mecklenburg-Western Pomerania has led to a further marginalization of fishery interests in the policy-making process [S1, N1, N7, A3].

However, many respondents from different actor groups estimated the fishery lobby to be still influential due to a strong traditional pro-fishery perspective in the respective ministries dealing with fishery issues on the federal and state level. Those politicians are rated as less critical in regard to fishery claims, supporting them in policy making. The influence of fishery associations on different political scales is considered as being high compared to the generated income, which has steadily declined during the last years [S3, S4, N1, N3, N8, N9].

6.1.2 Nature Conservation Actors

In total, I conducted interviews with nine representatives from nature conservation authorities and associations. The following table summarizes the results of the influence level that they would ascribe to their own capacity to steer natural resource management in the case study area.

Table 30: Influence judgement of nature conservation representatives regarding their own influence

Actor group	Own influence perception	Explanations
Nature conservation authorities	Low to high	▪ Strong legal framework for environmental protection ▪ Promotion of higher environmental standards ▪ Difficulties to enforce nature conservation goals against the resistance of strong interest groups ▪ Infeasible compensation measures particularly in marine areas ▪ Strong cooperation between state and non-state actors to strengthen environmental goals ▪ Serious lack of financial, material, and personal resources
Nature conservation associations	Medium to high	▪ Active cooperation with fish industry, purchasers, and research institutions to promote certified fish ▪ Strong and positive medial presence ▪ Enhanced public awareness concerning environmental degradation ▪ Lack of financial, material, and personal resources

Many respondents agreed that the legal framework for environmental protection has been considerably strengthened during the last years, setting higher environmental standards and persistently promoting environmental objectives across different policy sectors [N2, N4, N7, N10, N11]. European environmental policies were highlighted as important guidelines for national states to achieve ambitious, but indispensable environmental objectives. Environmental association representatives said that through a continual exertion of pressure from their side, the quality and the compliance of (industrial) projects with environmental standards has risen. In cases of detrimental effects, projects can be rejected or compelled to pay high compensation fees [N1, N4, N7, N10, N11]. However, it was criticized that compensation and replacement measures could not adequately restore or compensate environmental damage, particularly in marine areas [N3]. Furthermore, many respondents acknowledged that the achievement of environmental goals is difficult, if strong lobby groups (industrial or agricultural interest associations) are resisting.

Environmental association perceived themselves as quite influential with respect to the strengthening of consumer protection goals and the promotion of certified fish. A strong cooperation with the fish industry, purchasers, and research institutes has led to the delisting of fish products from non-certified fisheries in many supermarkets. Public campaigns, press releases, and consumer guides have raised the public awareness for fish stock sustainability and the finite nature of natural resources [N1, N2].

However, many other representatives, particularly from nature conservation authorities, are not convinced that their influence is high. Environmental authorities on the regional and municipal level complained about a lack of sufficient funding and staffing [N1, N3, N10, N11]. This situation has considerably constrained the actual capacity of these authorities to conduct their monitoring tasks [N1, N3, N9, N10, N11]. They explained that they depend on voluntary citizen engagement and the close cooperation with other experts who support the authorities with advice, field work, local knowledge, and information [N9, N10, N11]. The same representatives feel that nature conservation goals are not politically prioritized. Instead, sectoral interests promising economic outcome have a higher priority in decision making [N2, N5, N9, N10, N11]. Other representatives complained that various environmental standards determined in environmental policies are in some cases undermined by other policies' objectives (e.g. a higher agricultural productivity and expansion of agricultural land use etc.). Environmental representatives further criticized that certain aspects, e.g. the effects of fishery activities in Natura 2000 areas or the reduction of the width of riparian buffer strips, are still not sufficiently assessed in order to evaluate their actual ecosystem effects. Such a sectoral management perspective diminishes the influence of environmental objectives [N5, N7, N8].

The following table presents an overview of how the nature conservation actor group's influence was judged by other actor groups in the network. The text below briefly summarizes these findings.

Table 31: The perception of the nature conservation actor group's influence from the perspective of other actor groups

Considered actor group	Actor group	Influence perception	Explanations
Nature conservation authorities/ associations	Fishery authorities/ associations	Very high	▪ Powerful and omnipresent interest representation ▪ Strong medial presence ▪ High influence on policy making and public awareness ▪ High environmental standards and strong environmental laws
	Spatial planning/ environmental consulting	Low (authorities) High (associations)	▪ Very powerful interest representation on different political levels ▪ However, 'real' decisions are made without the consent of environmental associations ▪ Political prioritization of energy and labor market policies
	Agriculture	High	▪ High environmental standards and strong legal framework ▪ High medial presence
	Soil and water association representative	Very high	▪ Very high political priority of environmental issues and discrimination of other user groups ▪ Strong environmental laws
	Mining authority representative	High	▪ Strong environmental laws that ensure high environmental standards and environmental compatibility ▪ Strong environmental premise in decision making
	Scientists	High	▪ Strong environmental law

Especially resource users (e.g. fishermen and farmers) are afraid of further restrictive environmental provisions limiting their access to resources and the scope of their actions. They agreed that environmental actors have a very high influence in determining policy and decision making that is promoted by a constant medial presence and a high public awareness concerning environmental issues [A1, A2, A3, F2, F5, F6].

Most of the other representatives agreed that environmental standards have considerably risen during the last years. The influence of environmental objectives in policy making is estimated to be high due to a strong legal framework [M1, S2, S5, S6, O1]. There are numerous examples where environmental associations succeeded in delaying projects, in improving environmental compatibility, and in enforcing large compensation programs, if environmental harm had to be expected (e.g. during the North Stream gas pipeline approval procedure) [E3].

Nevertheless, there are also respondents who feel that 'real' decisions are finalized without the consent of environmental associations. They perceive the political prioritization of energy and labor market policies [E1, E2, E3].

6.1.3 Agricultural Actors

I conducted three interviews with representatives from agricultural authorities and associations. The following table summarizes the results of the influence level they would ascribe to their own capacity to steer natural resource management in the case study area.

Table 32: Influence judgement of agricultural representatives with respect to their own influence

Actor group	Own influence perception	Explanations
Agricultural authorities/ associations	High	▪ Effective lobbying strategies ▪ Political agenda setting ▪ Pro-active involvement of local and regional politicians ▪ Active involvement in other associations' boards (water and soil associations, environmental associations) ▪ Close and continual contact to decision makers on different political levels ▪ Strong and positive medial presence ▪ High number of association members and high economic profits ▪ Extensive network including many influential politicians

Agricultural representatives estimated their influence to be quite high, in particular through effective lobbying strategies [A1, A2, A3]. They attached great importance to attendance at parliamentary debates and open discussions on issues that might potentially concern agricultural interests. They pro-actively include local and regional politicians to their own meetings and are themselves involved in different other associations' executive boards, such as boards from water and soil associations or environmental associations. Additionally, they constantly promote themselves and their interests through a positive medial presence. There is a couple of examples where agricultural interests have been successfully enforces, despite the opposition of environmental pressure groups. Agricultural representatives explained that they are broadly connected to a range of 'influential' decision makers on different political levels. A strong lobbying work is supported by a high number of association members [A2, A3].

The following table presents an overview of how the agricultural actor group's influence was judged by other actor groups in the network. The text below briefly summarizes these findings.

Table 33: The perception of the agricultural actor group's influence from the perspective of other actors

Considered actor group	Actor group	Influence perception	Explanations
Agricultural authorities/ associations	Fishery authorities/ associations	Very high	▪ High financial subventions and high political support ▪ High capacity to exert influence ▪ Influential connections to political authorities ▪ Better standing and interest representation ▪ Strong medial presence
	Scientists	High	▪ Strong pro-agricultural attitudes in political authorities and policy making ▪ Strong interest representation
	Nature conservation authorities/ associations	High	▪ Strong interest representation and lobbying ▪ Lack of political will to take a clear stance on sustaining and defending environmental standards ▪ Agricultural-friendly attitude of central actors in policy making
	Spatial planning authorities/ environmental consulting	High	▪ Agricultural-friendly decision making and political premises for economic growth and employment ▪ Strategic lobbying work ▪ Cooperation with other actors and maintenance of a very good network including influential actors on different political levels ▪ Spatial institutionalization of agricultural rights through the assignment of reserved or priority areas

Fishery representatives emphasized the advantageous position of the agricultural sector due to high financial subventions and a higher political support [F6]. The agricultural lobby was estimated to have a much higher capacity to exert influence in policy making than other resource user groups. Farmers have a good standing and assert their interests and demands intransigently [F2, F4, F5, F6, F7].

Several respondents worried about a strong pro-agricultural attitude in the Ministry of Agriculture, Nature Conservation and Consumer Protection (LUMV). They complained that agricultural activities and practices seem to be strongly prioritized in policy and decision making [SP2, SP3]. The agricultural lobby and its high influence are made responsible for undermining environmental standards and being indifferent to the nutrient discharge into water bodies [S1, S3, N3, N5, N11].

6.1.4 Marine Scientists and Ecologists

In total, I spoke to seven representatives from scientific research institutions or associations. The following table summarizes the results of the influence level that they would ascribe to their own capacity to shape policy making in the context of natural resource management. The text below briefly summarizes these findings.

Table 34: Influence judgement of marine scientists and ecologists regarding their own influence

Actor group	Own influence perception	Explanations
Research institutions/ associations	Low to high	▪ Scientific advice finds increasing attention in policy making ▪ Crucial role of scientists in policy consultation ▪ Strengthening of sectoral interests in policy making ▪ Lack of an intermediate institution facilitating a science-policy interface ▪ Funding of scientific research is subject to political premises

Some scientists stated that scientific advice has found increasing attention in decision making during the last years, especially with respect to the determination of TACs and fishing quotas. The role of scientists with respect to an evidence-based policy making and the development of sustainable management strategies are estimated to be very crucial [S1, S2]. Those scientists actively involved in policy consultation see themselves as having a relative high influence on policy decisions. However, they admitted that they have also experienced disappointments, when they recognized that decisions were subsequently driven by sectoral lobby interests and not by scientific evidence [S1, S2]. Some scientists asserted that this is the case in most of the current management decisions that have conspicuously strengthened sectoral interests [S3, S7]. These scientists claimed that scientific results are neglected in policy making and thus they do not see themselves as influential in determining the course of decisions. As a major weakness, they pointed out that as of yet there is no intermediate institution facilitating a science-policy interface by translating scientific knowledge into policy-relevant knowledge that could be used as a basis for decision making. They further criticized that research funding is already subject to strong political premises, thus establishing asymmetric relationships. Such a situation is seen as threatening to scientific independency and impact [S3, S7].

The following table concentrates on how other actor groups perceive the influence of marine scientists and ecologists in natural resource management. The text below briefly summarizes these findings.

Table 35: The perception of marine scientists' and ecologists' influence from the perspective of other actors

Considered actor group	Actor group	Influence perception	Explanations
Scientific research institutions	Environmental authorities/ associations	Low to medium	▪ Lack of application-orientated research ▪ Lack of policy-relevant research ▪ Only weak science-policy interface ▪ Science as an end in itself
	Fishery authorities/ associations	Medium to high	▪ High influence of scientific advice
	Agricultural authorities/ associations	High	▪ Support of scientific research and advice in order to develop agricultural activities

Representatives from environmental authorities and associations estimated scientific research to have a relative low influence with respect to policy making due to lack in policy relevance or practical application. A weak science-policy interface was further estimated to have diminished the scope of science to influence decision making. Some representatives feel that scientific research was not aiming to have a policy impact, but was rather carried out as an end in itself [N2, N5].

Fishery representatives acknowledged that the influence of scientific advice has considerably increased especially with respect to the sustainable management of fish stocks [F3, F7]. Also, agricultural representatives estimated scientific research to have a high political impact. They strongly strived to cooperate with scientific research institutions in order to develop innovative agricultural practices [A1, A2].

6.1.5 Spatial Planning Actors

I conducted three interviews with representatives of spatial planning authorities. The following table summarizes the results of the influence level that they would ascribe to their own capacity to coordinate different actor groups' claims in natural resource management in the case study area.

Table 36: Influence judgement of spatial planning authority representatives with respect to their own influence

Actor group	Own influence perception	Explanations
Spatial planning authorities	Medium to high	▪ Prioritization of economic objectives ▪ The assignment of priority or reserved areas provides an institutionalized and legal status to specific usage forms

Representatives from spatial planning understand their primary responsibility in coordinating and balancing spatial claims, applying a holistic, cross-sectoral perspective. Representatives stated that there is a considerable political priority of promoting the economic growth in the case study area. However, representatives from spatial planning emphasized that the spatial determination of reserved or priority uses in defined areas can legally strengthen these usage forms. These spatial assignments are seen as crucial important to institutionalize specific user rights and other users' obligations [SP2, SP3].

The next table provides an overview of how the spatial planning actor group's influence was judged by other actor groups in the network. The text below briefly summarizes these findings.

Table 37: The perception of the spatial planning actor group's influence from the other actors' perspective

Considered actor group	Actor group	Influence perception	Explanations
Spatial planning	Environmental authorities/ associations	Low to high	▪ Spatial plans merely provide basic guidelines ▪ High priority of economic interests
	Fishery authorities/ associations	Low	▪ The assignment of reserved areas for fishing activities are considered to be meaningless with respect to strengthening fishery interests
	Agricultural authorities/ associations	High	▪ Spatial institutionalization of usage rights for agricultural activities through the assignment of reserved areas
	Scientists	High	▪ Institutionalization of usage rights through the assignment of reserved areas or priority areas

Two different environmental representatives noted that the potential influence of spatial planning authorities is lower than often assumed by different actors. They assume that sectoral interests considerably determine the distribution of land use and resource access. Especially economic interests are estimated to have high priority in decision making [N5, N7].

Most of the fishery representatives stated that they do not estimate spatial planning to have a high influence, at least not when it comes to strengthening fishery interests [F2, F4, F5, F6]. On the other side, agricultural representatives estimated the assignment of priority areas for agricultural land use to be highly important in order to ensure agricultural expansions and a competitive production. They acknowledged the high benefits of a legal institutionalization of spatial rights and spatial access, especially in areas of competing land-use forms and scarce resources [A1, A2]. Several scientists agreed with this position [S3, S5].

6.1.6 Industrial Actors and Economic Interests in Policy Making

The following table provides an overview of how the different actor groups involved in natural resource management in the study site perceived economic interests to influence policy and decision making.

Table 38: The perception of the influence of economic interests in policy making

Considered actor group	Actor group	Influence perception	Explanations
Economic interests/ resource extraction etc.	Environmental authorities/ associations	High to very high	▪ Steady shift of power from governmental to economic actors ▪ High prioritization of economic interests in policy making, even if environmental harm cannot be excluded
	Scientists	Medium to high	▪ High political prioritization in regions that are poor in income and economic development
	Environmental consulting offices	High	▪ Downsizing of environmental standards and negligence of the precautionary approach in decision making ▪ Objections in plan approval procedures are not adequately discussed or assessed
	Spatial planning authorities/	High	▪ Obvious political prioritization of economic objectives ▪ Environmental standards are intentionally kept lower to provide incentive for industry
	Fishery authorities/ associations	Very high	▪ Strong political prioritization of economic interests
	Mining authority representative	High	▪ Prioritization of economic interests in policy making to ensure social welfare ▪ Broad participatory processes in plan approval procedures to base decisions on a consensus between different actor groups

Most of the respondents estimated the influence of economic interests in policy making to be quite high [S1, S3, S4], especially in regions with a poor income and employment structure. They see a clear political priority in encouraging economic growth and industrial expansion [S1, S3, S4, S7, SP1, SP2, M1, F2, F6, F7]. Several respondents perceive a steady 'shift of power' from governmental actors to economic actors [N2, N3, N7, N9, N10]. The settlement of industry and business to enhance economic growth is perceived as highly prioritized even if in some cases environmental harm cannot be excluded [N1, N7, E2, E3]. Some representatives feel that objections in plan approval procedures are not adequately discussed or assessed [E2, E3]. In some cases, environmental standards are intentionally kept low in order to provide business incentives [SP3, N9].

6.1.7 Power as a matter of perspective

To roughly summarize the previous results: Fishery associations feel strongly disadvantaged and marginalized in policy making. In general, the influence of nature conservation representatives is estimated to be high. Particular agricultural representatives feel pretty influential when it comes to agenda setting and policy making. There is a general consensus among all respondents that industrial and agricultural interests are prioritized in management decisions.

The following table summarizes the influence perceptions of the different actor groups. The rows reflect the influence perception of a specific actor group that is itself presented in the columns. Fields for which no data are available through the interviews were marked with 'n.a.' (no data available). There have been no direct interviews with representatives from the economic or industrial sector in order to gather data on their own influence perception and data on how they perceived other actors with respect to their influence in the study site.

Table 39: Tabular summary of the results of the questionnaire asking respondents: 'How do you perceive your own influence and the influence of other actors in the natural resource management network?' The rows present the actor groups, while columns present the actor group whose influence is being estimated.

How do you perceive your own influence and the influence of other actors in the policy network?	Fishery authorities	Fishery associations	Nature conservation authorities	Nature conservation Associations	Agriculture authorities & associations	Spatial planning Authorities	Industrial economic interests	Research institutions (Science)	Resource extraction authority
Fishery authorities	Low - Medium	Very low - medium	Very high	Very high	Very high	Low	Very high	Medium - high	Very high
Fishery associations	Medium	Very low - medium	Very high	Very high	High	Low	Very high	Medium - high	Very high
Nature conservation authorities	Medium	Low	Low - high	Medium - high	Very high	Low	High	Low	High
Nature conservation associations	Medium - high	Medium - high	Low - high	Medium - high	Very high	High	Very high	Low - medium	High
Agriculture authorities & associations	medium	Low	High	High	High	High	n.a.	High	n.a.
Spatial planning authorities	Low - medium	Low - medium	Low	High	High	Medium - high	High	n.a.	High
Research institutions (Science)	Medium - high	Low - medium	High	High	High	High	Medium - high	Low - high	High
Resource extraction authority	n.a.	n.a.	High	High	n.a.	n.a.	High	n.a.	High

6.2 The Policy Network of the Greifswald Bay

The policy analysis in this work suggests that the sustainable management of natural resources in the case study area is potentially impeded by a high degree of institutional fragmentation. Policies and administrative responsibilities with respect to different aspects of coastal management are at risk to evoke conflicting issues and to obstruct each other. However, coherent measures or collective action are recognized as crucial in the sustainable management of natural resources in the case study area by many of the interview respondents. The multitude of divergent interests (cf. Chapter 5.2) and perceived power asymmetries in actor group relationships (cf. Chapter 6) are major obstacles with respect to collective action.

Applying social network analysis, this part of the study (quantitatively) assesses whether institutional fragmentation is partially mitigated by cooperative approaches and coordination among all those actors involved in natural resource management in the case study area. Social network analysis provides a range of tools that support the assessment of different actors' (or actor groups') interactions and cooperation. The following subchapters serve to shed light on the question how different actors or actor groups involved in natural resource management interact with each other. It shall further be answered in which way different actors are integrated into natural resource management and whether there are actors or groups that are more marginalized than others. The integration of an actor group into interaction and communication structures is assumed to be crucial information with respect to the actor group's capacity to steer policy or decision making. Thus, it may serve as an indicator for an actor group's power. Therewith, the distribution of power among different actor groups is analyzed as a function of the actor's/ the actor group's individual position in the policy network. Social network analysis offers different measures to determine the position and thus the centrality of individual actors or actor groups within the network. The centrality of an actor (or an actor group) was taken as an indicator of an actor's (or an actor group's) power to implement own interests in policy making and to access valuable resources (e.g. information, advice, financial support) within the network. This positional approach in quantitative social network analysis complements the results of the reputational approach that is analyzing power asymmetries on the base of perceived power relationships as it was described in the previous subchapters.

The network actors were progressively identified during the interviews by asking the respondents to mention all actors they estimated crucially important with respect to the management of the GWB (cf. Chapter 6.1). Respondents should further name all actors with whom they regularly maintained professional contact regarding issues related to the management of the GWB and its coastal areas. Many (but, not all) of these identified actors were also interviewed if they had been mentioned at least twice. The following table provides a compilation of all those actors. Actor groups were defined on the basis of shared interests and/or formal responsibility. This way, a total of eight different actor groups could be identified. The first figure behind each actor group gives the total number of actors in the policy network that have been mentioned at least twice by the respondents as being important contacts regarding issues related to the management of the GWB. The second figure specifies the number of interview respondents from *different* organizations, associations, or institutions. Individual respondents from the same organization, association, or institution were summarized and visualized as a 'single' actor node in the respective network to avoid redundancy. For the visualization of the network map, each actor group was assigned a specific color which is depicted in the last column of the table.

Table 40: Identified actor groups within the assessed policy network

	Attribute (actor group)	Total number of mentioned actors in the network	Number of respondents from *different* organizations	Color in the visualized network map
1.	Fishery authorities and associations, fishing industry	14	6	Blue
2.	Spatial planning authorities	6	3	Pink
3.	Nature conservation authorities and associations	18	9	Green
4.	Mining authority	1	1	Grey
5.	Municipalities and others	8	1	Red
6.	Environmental consulting offices	1	2	Purple
7.	Research institutions	7	4	Yellow
8.	Agricultural authorities and associations	4	3	Brown
Total number of actors:		**59**	**29**	

The following network map displays the total number of actors in the policy network. Nodes represent the different actors, whereas the links between the nodes indicate the presence of a contact. The colors of a node indicate the node's actor group. The abbreviations are explained on the pages following the network map.

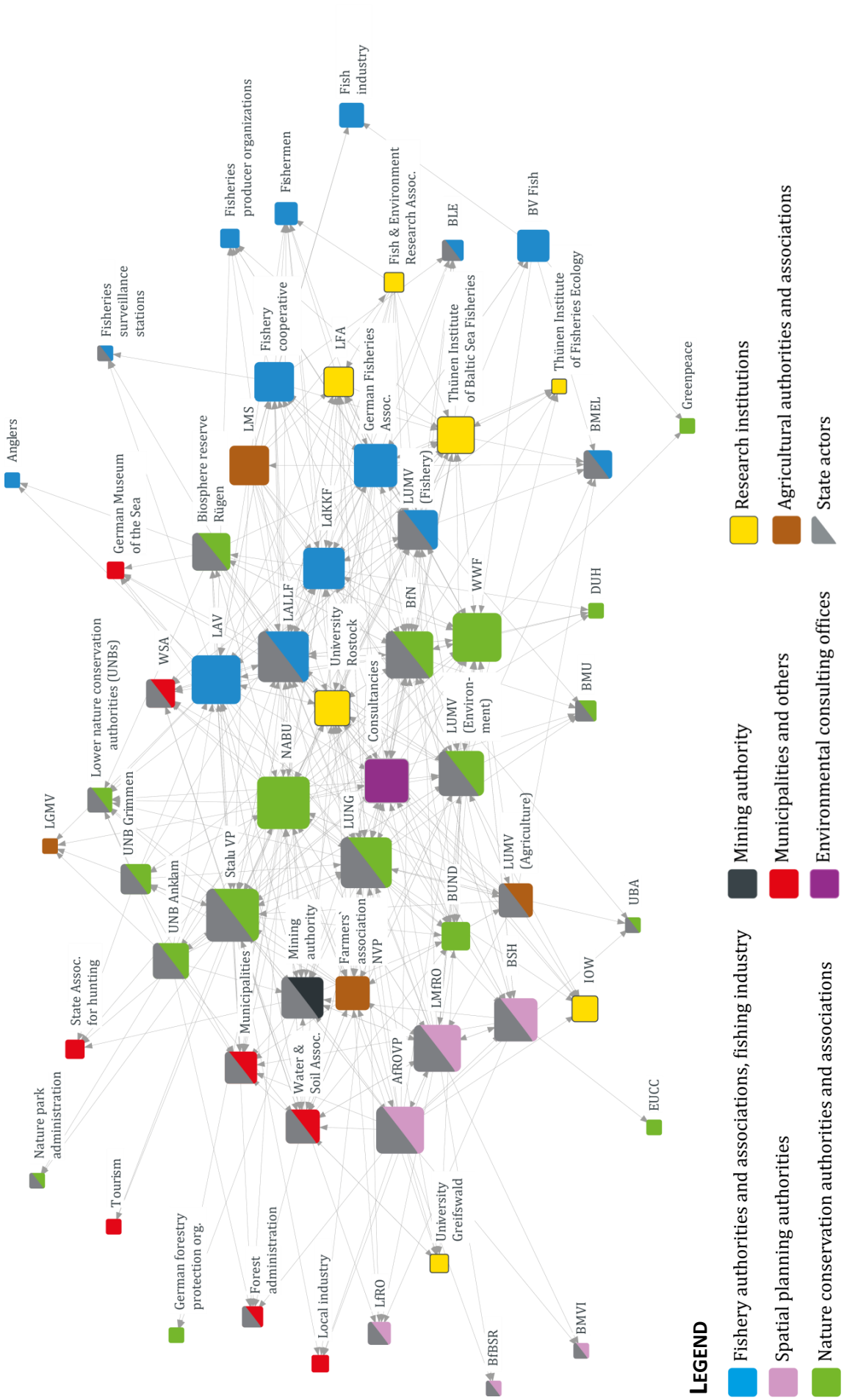


Figure 13: Visualized policy network map of the GWB and its coastal areas

Table 41: Names and abbreviations used in the network map, the corresponding English translations, and the respective German names. The asterisk in the last column indicates whether an interview was conducted with representatives of this organization or association. The number behind the asterisk indicates the number of respondents.

Full name or abbreviation used in the network map	Corresponding English translation	Corresponding German names	Interviews
AfROVP	Office of Spatial Planning and Regional Development Western Pomerania	Amt für Raumordnung und Landesplanung Vorpommern	*
Anglers	Anglers	Angler	
BfBSR	Federal Institute for Research on Building, Urban Affairs and Spatial Development	Bundesinstitut für Bau-, Stadt- und Raumforschung	
BfN	Federal Agency for Nature Conservation	Bundesamt für Naturschutz	*
Biosphere reserve Rügen	Southeast Rügen Biosphere Reserve	Biosphärenreservat Südost-Rügen	*
BLE	Federal Office for Agriculture and Food	Bundesinstitut für Landwirtschaft und Ernährung	
BMEL	Federal Ministry of Food and Agriculture	Bundesministerium für Landwirtschaft und Ernährung	
BMU	Federal Ministry of Environment, Nature Conservation, Building and Nuclear Safety	Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit	
BMVI	Federal Ministry of Transport and Digital Infrastructure	Bundesministerium für Verkehr und digitale Sicherheit	
BSH	Federal Institute for Shipping and Hydrography	Bundesinstitut für Schifffahrt und Hydrographie	*
BUND	Association for the Protection of the Nature, Germany	Bund für Umwelt und Naturschutz Deutschland	
BV Fish	Federal Association of the German Fish Industry and Fish Wholesale	Bundesverband der deutschen Fischindustrie und des Fischgroßhandels e.V.	*
Consultancies	Offices for environmental consulting and engineering	Gutachter- und Ingenieurbüros	* (3)
DUH	German Environmental Relief Association	Deutsche Umwelthilfe e.V.	
EUCC	The Coastal Union Germany	EUCC - Die Küsten Union Deutschland e.V.	
Farmer association NVP	Farmer Association of Northern-Pomerania	Bauernverband Nordvorpommern	*
Fish and Environment Research Assoc.	Fish and Environment Research Association	Fisch und Umwelt e.V.	*
Fish industry	Fish industry	Fischverarbeitungsindustrie	
Fisheries producer organizations	Fisheries producer organizations	Fischereiliche Erzeugerorganisationen	
Fisheries surveillance stations	Fisheries surveillance stations	Fischereiaufsichtsstationen	
Fishermen	Fishermen	Fischer	
Fishery cooperative	Fishery cooperative Freest	Fischereigenossenschaft Freest	*
Forest administration	Forest administration	Forstämter und Forstverwaltung	
German Fisheries Assoc.	German Fisheries Association	Deutscher Fischerei-Verband e.V.	* (2)
German forestry protection org.	German forestry protection organization	Schutzgemeinschaft Deutscher Wald e.V.	
German Museum of the Sea	German Museum of the Sea in Stralsund	Deutsches Meeresmuseum Stralsund	
Greenpeace	Greenpeace	Greenpeace	
IOW	Leibniz Institute for Baltic Sea Research Warnemünde	Leibniz-Institut für Ostseeforschung	
LALLF	State Office for Agriculture, Food Safety and Fishery in MV	Staatliches Amt für Landwirtschaft, Lebensmittelsicherheit und Fischerei, M-V	* (2)
LAV	State Association for Angling in M-V	Landesanglerverband M-V e.V.	*
LdKKF	Fishery Association of the Cutter and Small Scale Fisheries in M-V	Landesverband der Kutter- und Küstenfischer M-V e.V.	*
LFA	State Research Institute of Agriculture and Fisheries in M-V	Landesforschungsanstalt für Landwirtschaft und Fischerei M-V	*
LfRO	State Offices for Spatial Planning in M-V	Landesämter für Raumordnung in M-V	
LGMV	Landgesellschaft MV	Landgesellschaft MV mbH	

Full name or abbreviation used in the network map	Corresponding English translation	Corresponding German names	Interviews
LJV	State Association for Hunting	Landesjagdverband M-V e.V.	
LMfRO	State Ministry of Energy, Infrastructure and Regional Planning M-V (Department of Spatial Planning)	Landesministerium für Energie, Infrastruktur und Landesentwicklung in M-V	*
LMS	LMS - Agricultural Advice Service	LMS-Agrarberatung	*
Local industry	Companies and industry in the area of the GWB	Wirtschaftsunternehmen/Industrie im GWB	
Lower nature conservation authorities (UNBs)	Lower nature conservation authorities	Untere Naturschutzbehörden	
LUMV (Agriculture)	State Ministry of Agriculture, Environment and Consumer Protection M-V (Department of Agriculture)	Landesministerium für Landwirtschaft, Umwelt und Verbraucherschutz M-V (Abteilung Landwirtschaft)	*
LUMV (Environment)	State Ministry of Agriculture, Environment and Consumer Protection M-V (Department of Water and Soil)	Landesministerium für Landwirtschaft, Umwelt und Verbraucherschutz M-V (Abteilung Wasser- und Boden)	*
LUMV (Fishery)	State Ministry of Agriculture, Environment and Consumer Protection M-V (Department of fishery and fishing industry)	Landesministerium für Landwirtschaft, Umwelt und Verbraucherschutz M-V (Abteilung Fischerei)	*
LUNG	State Office of Agriculture, Nature Conservation and Geology in M-V	Landesamt für Umwelt, Naturschutz und Geologie, Güstrow	* (2)
Mining authority	Mining authority Stralsund	Bergamt Stralsund	*
Municipalities	Municipalities and county boroughs	Gemeinden und kreisfreie Städte	
NABU	Nature Conservation Association Germany	Naturschutzverband Deutschland e.V. (Interview mit NABU M-V)	*
Nature park administration	Nature park administration	Naturparkverwaltungen	
Stalu VP	Regional Agency for Agriculture and Environment in Western Pomerania	Staatliches Amt für Landwirtschaft und Umwelt in Vorpommern	*
Thünen Institute of Baltic Sea Fisheries	Thünen Institute of Baltic Sea Fisheries	Thünen-Institut für Ostseefischerei, Rostock	* (4)
Thünen Institute of Fisheries Ecology	Thünen Institute of Fisheries Ecology	Thünen-Institut für Fischereiökologie	
Tourism	Tourism associations etc.	Tourismusverbände etc.	
UBA	Federal Environmental Agency	Umweltbundesamt	
UNB Anklam	Lower nature conservation authority in Anklam	Untere Naturschutzbehörde in Anklam	*
UNB Grimmen	Lower nature conservation authority in Grimmen	Untere Naturschutzbehörde in Grimmen	* (2)
University Greifswald	Ernst-Moritz-Arndt University Greifswald	Ernst-Moritz-Arndt-Universität Greifswald	
University Rostock	University of Rostock	Universität Rostock	*
Water & Soil Assoc.	Water and Soil Association 'Barthe/Küste' in Stralsund	Wasser- und Bodenverband 'Barthe/Küste' in Stralsund	*
WSA	Office for Water and Shipping in Stralsund	Wasser- und Schifffahrtsamt Stralsund	
WWF	World Wide Fund For Nature	World Wide Fund For Nature	* (2)

The statistical analysis was conducted with UCINET 6. The results of the different analysis steps are given in the following subchapters, while the underlying concepts have already been presented in the conceptual and methodological part of this thesis (cf. Chapter 2.3.2 and Chapter 3.1.5.2). The following table summarizes the consecutive assessment steps.

Table 42: Overview of the statistical assessment and analysis steps in the following subchapters

Chapter	Assessment and analysis steps	Concepts & methodological approach
6.2.1	Interaction and cooperation between state and non-state actors	▪ Homophily & density
6.2.2 – 6.2.6	Integration of different actor groups considering the overall network & network fragmentation	▪ Homophily & density
6.2.7	Centrality on individual level Distribution of centrality among different individuals	▪ Different centrality measures ▪ Network centralization
6.2.8 **6.2.8.1** **6.2.8.2**	Centrality and power on subgroup level Distribution of centrality among different actor groups	▪ Different centrality measures ▪ Kruskal-Wallis *H* test ▪ Descriptive statistics ▪ Mann-Whitney *U* test
6.2.8.1	Comparison of power perceptions and quantitative network analysis data (centrality values)	▪ Comparative analysis

6.2.1 Interaction and Cooperation between State and Non-state Actors

In the following analysis, the interaction and cooperation between state and non-state actors in natural resource management in the case study area was assessed. This aim was combined with the question whether the political process is somehow reserved for state actors, or whether it is open to the integration of non-state actors and their interests. The integration of non-state actors into policy making can provide those with a better position to exert influence and to implement their interests.

For the purpose of statistical analysis, all state actors, across the different identified policy fields who have a formal political responsibility or mandate were summed up in one group, while all the other actors were summed up as non-state actors in the other group. The following table provides an overview of these groups.

Table 43: State and non-state actors within the assessed policy network

	Attribute (actor group)	Total number of actors in the network
1.	State actors	32
2.	Non-state actors	27
Total number of actors:		**59**

To analyze the interaction (defined as tie frequency) within and between different actor groups, I applied the statistical test for 'homophily' (c.f. Chapter 3.1.5.2.9) Homophily assumes that actors who belong to the same actor group and share certain attributes are more likely to have ties to each other than actors who have no common attributes (McPherson et al., 2001, p. 415). The null hypothesis H_0 of the test that was applied states that the observed tie frequency within the group of state actors and within the group of non-state actors (but also between both of these groups) does

not significantly differ from the tie frequency in random groups of the same size that are not defined by specific attributes. To test H_0, the observed number of tie frequencies within and between the defined actor groups was compared to the expected frequency value in random groups of the same size. The principle of this statistical test resembles the Pearson's Chi-square test of independence. To test the inferential significance of the results, a high number of random graphs (10,000) was calculated. The following table provides the quantitative results of this statistical test.

Table 44: The table compares the observed and expected tie frequencies within and between the group of state and non-state actors. The last two columns of the table show the probability that a random graph (with the same tie frequency and same number of actors in each group) has at least the stated difference (5th column) or at most the stated differences (6th column).

Relational ties	Expected	Observed	Difference	P >=Diff	P <=Diff
Non-state actors to non-state actors	73.44	58	-15.44	0.836	0.180
State actors to non-state actors	180.78	174	- 6.78	0.840	0.190
State actors to state actors	103.78	126	22.22	0.133	0.879

The test did not show any statistical significance. Therefore, H_0 was confirmed. There is no proof for any statistical significant differences between the tie frequencies within and between the defined groups and random groups.

Density is another important statistical tool to analyze the cooperation and interaction structure between different actor groups. Density is described as the ratio of the number of ties that are present within a network, or a partition thereof, and the number of all possible dyadic (bipartite) connections that could actually be present (e.g. J. Scott, 2000, p. 69; 2013, p. 70). Compared to the previous test on homophily, density does not determine probabilities of interactions within and between groups, but rather describes the actual connectivity within the network and/or within different subgroups (cf. Chapter 3.1.5.2.7) UCINET 6 provides an easy way to calculate the overall network density and the density within different subgroups. The overall density of the assessed policy network is 0.132, revealing that 13.2% of all possible network ties are being realized. The table below shows the density within the group of state actors and non-state actors and between both of these actor groups.

Table 45: Density of ties between state actors and non-state actors

Density of ties among state and non-state actors	State actors (32)	Non-state actors (27)
State actors (32)	**0.161**	0.148
Non-state actors (27)	0.106	**0.099**

The density of ties within the group of state actors amounts to 16.1%, which is slightly above the average network density. The analysis further reveals that the tie density within the group of non-state actors is relatively low at 9.9%. There cannot be made any assertions on the basis of these

percentages with respect to the inclusion of non-state actors into policy making as the previous results were proven to be statistically insignificant.

6.2.2 The Integration of Fishery Actors in Natural Resource Management

Now, I cover the first of several analysis steps aiming to answer the question whether interaction rather takes place within single actor groups (through bonding ties) or across the boundaries of different actor groups (through bridging ties). These steps may help to analyze whether (institutional) fragmentation in natural resource management is mitigated by bridging ties among actors of different actor groups. The integration of an actor group into natural resource management processes is further seen as crucial important with respect to the actor group's capacity to steer policy or decision making. Thus, it may serve as an indicator for an actor group's power.

In the following analysis step, I applied the same statistical procedure already described in the previous example above, when analyzing the network with respect to patterns of homophily. In this subchapter, I aim to answer the question to which extent state actors with a formal responsibility for fishery (supporting) issues and non-state actors who share a particular interest in fishery development and maintenance are interacting within their own group, as well as with other actors in the same network. The null hypothesis H_0 states that actors' group affiliation attributes ('non-fishery actor' or 'fishery actor') are independent from the frequency of ties within and between these actor groups. The network includes a total of 45 non-fishery actors and 14 fishery actors. The following table shows the results of this analysis.

Table 46: Comparison of observed and expected tie frequencies within and between fishery actors and non-fishery actors. The last two columns of the table show the probability that a random graph (with the same tie frequency and same number of actors in each group) has at least the stated difference (5th column) or at most the stated difference (6th column).

Relational ties	Expected	Observed	Difference	P >=Diff	P <=Diff
Non-fishery actors to non-fishery actors	207.14	219	11.86	0.318	0.698
Non-fishery actor to fishery actors	131.82	101	-30.82	0.963	0.042
Fishery actors to fishery actors	19.04	38	18.96	0.011	0.992

There is no statistical significance regarding the tie frequency within the group of non-fishery actors, indicated in the first row. Thus, in this part of the analysis, H_0 was confirmed. However, both of the other test results are statistically significant.

The second row indicates that there is a significant lack ($p < 0.05$) of (bridging) ties between fishery actors and non-fishery actors in the network. This result shows a high deviation between the observed (101) and the expected frequency of ties (131.82) that occurred in comparative network graphs where ties between actors were randomly distributed, not taking into account an actor's group affiliation attribute. Thus, the interaction between fishery actors and non-fishery actors has been statistically proven to be significantly lower than in random groups. Thus, fishery actors did not interact that much with non-fishery actors and therefore lacked bridging ties to other actor groups.

The third row in the table considers the tie frequency *within* the group of fishery actors. The results reveal that the observed tie frequency within the group of fishery actors (38 ties observed) was almost twice that of the expected tie frequency (19.04 ties) in comparative networks with random distribution of ties. This result is highly significant ($p < 0.01$) and supplies strong evidence of homophily within the fishery actor group. Thus, fishery actors in the network seem to maintain the majority of contacts to other fishery actors (bonding ties) rather than to other actors in the same network (bridging ties).

6.2.3 The Integration of Nature Conservation Actors in Natural Resource Management

The same statistical procedure as described above was applied to analyze the integration of nature conservation authorities and associations in natural resource management. Again, the null hypothesis H_0 states that actors' group affiliation attributes ('nature conservation actors' or 'non-nature conservation actors') do not influence the tie frequency distribution within the policy network of the Greifswald Bay. The category of 'nature conservation actors' subsumed all actors who are formally working within authorities specifically related to nature or environmental conservation issues. Moreover, this group included all those actors who are somehow engaged in associations dealing with environmental problems and supporting ecological sustainability. The assessed policy network included a total of 18 nature conservation actors and 41 non-nature conservation actors.

The following table displays the observed number of tie frequencies within and between the different defined groups in the assessed network. It further shows the number of ties that would have been expected if all ties had just been randomly distributed in a same-sized network, ignoring group affiliations (10,000 iterations).

Table 47: Comparison of observed and expected tie frequencies within and between nature conservation actors and non-nature conservation actors. The last two columns of the table show the probability that a random graph (with the same tie frequency and same number of actors in each group) has at least the stated difference (5th column) or at most the stated difference (6th column).

Relational ties	Expected	Observed	Difference	P >=Diff	P <=Diff
Non-nature conservation actors to non-nature conservation actors	171.57	159	-12.57	0.710	0.306
Non-nature conservation actors to nature conservation actors	154.42	147	-7.42	0.709	0.314
Nature conservation actors to nature conservation actors	32.01	52	19.99	0.038	0.967

The results show no statistical significance with respect to the tie frequency within the group of non-nature conservation actors (first row). The same can be said for the tie frequency between non-nature conservation actors and nature conservation actors (second row). Thus, for both of these analyses, H_0 was confirmed.

However, the test proved that the tie frequency *within* the group of nature conservation actors (row 3) is statistically significantly ($p < 0.05$) higher than the expected tie frequency in random graphs.

There are 52 ties within this group, while only 32.01 would have been expected. This result attests homophily and a predominance of bonding ties within the group of nature conservation actors.

6.2.4 The Integration of Spatial Planning Authorities in Natural Resource Management

The same statistical procedure as described in the previous subchapters was applied to explore the occurrence of (interaction and contact) ties among the different spatial planning authorities that constitute a distinctive actor group in this research. Additionally, the tie frequency between actors from spatial planning and other actor groups in the policy network was assessed. Spatial planning actors were defined as all authorities on different political levels that are provided with the political mandate to design and implement spatial plans regulating and coordinating land use forms on different scales. Six of these authorities were included into the analysis. There are 53 non-spatial planning actors. Again, the null hypothesis H_0 states that actors' group affiliation attributes ('spatial planning actors' or 'non-spatial planning actors') do not influence the frequency of ties within these actor groups and between them. The following table displays the statistical findings.

Table 48: Comparison of observed and expected tie frequencies within and between spatial planning actors and non-spatial planning actors. The last two columns of the table show the probability that a random graph (with the same tie frequency and same number of actors in each group) has at least the stated difference (5th column) or at most the stated difference (6th column).

Relational ties	Expected	Observed	Difference	P >=Diff	P <=Diff
Non-spatial planning actors to non-spatial planning actors	288.33	307	18.68	0.182	0.832
Non spatial planning actors to spatial planning actors	66.54	42	-24.54	0.919	0.091
Spatial planning actors to spatial planning actors	3.14	9	5.86	0.021	0.991

The results did not prove statistical significance with respect to the tie frequency within the group of non-spatial planning actors (first row). The same can be said for the tie frequency between non-spatial planning actors and spatial planning actors (second row). Thus, for both of the analysis results, H_0 was confirmed.

However, the test proved that the result considering the tie frequency *within* the group of spatial planning actors (row 3) is statistically significant ($p < 0.05$). The tie frequency within the group of spatial planning actors is almost three times higher than it would have been expected in random groups of the same size, ignoring group affiliation attributes. This can be taken as evidence for homophily. Thus, spatial planning authorities rather seem to maintain contacts within their own group (bonding ties). In contrast, the contact to other actor groups in the same policy network (bridging ties) is rarer. These results are interesting with respect to the original tasks of spatial planning authorities. Its major tasks are the development of a holistic approach towards a balanced regional development (EEC, 1983, p. 13) and further the replacement of sectoral management perspectives in favor of a holistic management involving all relevant actors, societal groups, policy departments, and administrative units on different political levels. It can be critically questioned

whether spatial planning authorities can meet these challenges, if they do not bridge different actor groups who pursue important and divergent management objectives within the case study area.

However, in all the three previous cases, homophily should not be overemphasized, because political authorities dealing with the same issues on different political levels are inevitably obliged to work together due to a functional division of labor and competencies. Nevertheless, patterns of homophily provide indications that policy making takes place in separate policy subsystems that follow their own laws and interests. Cooperative approaches and coordination between different actor groups seem to be relatively marginal in the study site with respect to natural resource management. This is particularly significant for the fishery actor group, which maintains the majority of ties within their own group (bonding ties) with a statistically significant lower tie frequency to non-fishery actors (bridging ties). However, there is also a high difference between the observed and the expected tie frequency considering the interaction between spatial planning actors and non-spatial planning actors (second row). Even if this result is not statistically significant, it may show the tendency that spatial planning actors do not share many ties to other actor groups and therefore are not well integrated in the resource management network.

Institutional fragmentation is apparently still shaping parts of the policy-making process and actor relationships in resource management. This may potentially impede coherent management practices with respect to the management of natural resources in the case study area.

6.2.5 The Integration of Agricultural Actors in Natural Resource Management

The following analysis assessed the interactions of agricultural authorities and associations in natural resource management applying the same statistical procedures as in the previous analysis steps. The defined actor group encompasses one agricultural authority, a farmers' association, and an agricultural consulting office that strongly supports agricultural (and also fishery) interests.

Again, the null hypothesis H_0 states that the frequency of ties within the group of agricultural actors and the tie frequency with other actors in the network are not dependent on the actors' group affiliation attributes ('agricultural actor' or 'non-agricultural actor'). The policy network included a total of four agricultural actors and 55 non-agricultural actors. The results are displayed in the next table.

Table 49: Comparison of observed and expected tie frequencies within and between agricultural actors and non-agricultural actors. The last two columns of the table show the probability that a random graph (with the same tie frequency and same number of actors in each group) has at least the stated difference (5th column) or at most the stated difference (6th column).

Relational ties	Expected	Observed	Difference	P >=Diff	P <=Diff
Non-agricultural actors to non-agricultural actors	312.45	311	-1.45	0.57	0.46
Non-agricultural actors to agricultural actors	46.29	46	-0.29	0.50	0.52
Agricultural actors to agricultural actors	1.26	3	1.74	0.16	0.94

None of the individual results show statistical significance. Therefore, H_0 was confirmed. Deviating from the other actor groups' examples, homophily could not be verified within the agricultural actor group. Instead, there is a rather equal distribution of ties connecting members of the agricultural group with each other (bonding ties) and ties connecting agricultural actors with actors from other groups (bridging ties).

6.2.6 Cooperation within and between different Actor Groups

Density is another important statistical measure to analyze the cooperation and interaction structure between different actor groups that are integral parts of the policy network related to coastal management issues in the case study area. The following table displays the tie density within and between these different actor groups. To ensure accuracy of the analysis, only ties of the interview respondents were considered. Thus, all contacts that had only been mentioned in the interviews, but were not chosen as interviewees, were not included in this step of statistical analysis. Furthermore, actor groups with less than three interview respondents had to be omitted. Such a low sample size is not feasible. However, the following density values and percentages have to be cautiously interpreted, bearing in mind that the total sample size per group is still not high. There cannot be made any assertion about whether these results are statistically significant or not.

Considering only interview respondents, the overall network density increased to 37.1%. The rows of the following table show the density *between* and *within* the different actor subgroups.

Table 50: Density of ties within and between different actor subgroups. The number behind the actor group indicates the number of respondents. Rows indicate the calculated density values related to the actor group in the column.

	Density within different actor groups	Fishery authorities & associations/ fishing industry	Spatial planning authorities	Nature conservation authorities and associations	Research institutions	Agricultural authorities and associations
INTERVIEW RESPONDENTS	Fishery authorities and associations, fishing industry (7)	0.690	0.048	0.333	0.464	0.143
	Spatial planning authorities (3)	0.143	0.833	0.407	0.167	0.222
	Nature conservation authorities and associations (9)	0.397	0.296	0.625	0.278	0.222
	Research institutions (4)	0.464	0.000	0.306	0.417	0.000
	Agricultural authorities and associations (3)	0.190	0.333	0.444	0.500	0.333

It could be observed that the tie density within several actor groups is higher than the network's average density. This is especially the case for the fishery actor group (69%), the spatial planning actor group (83.3%) and the nature conservation actor group (62.5%). The cohesiveness among the actors of these groups is therefore suggested to be much higher than within other actor groups. The results may also confirm the previously discovered, statistically significant patterns of homophily within these three groups.

The tie density among actors from different research institutions (41.7%) is slightly above the average tie density of the overall network. Actors from research institutions tend to interact more frequently with actors from the fishery sector than within their own subgroup. One reason for that may be the specific selection of the research institutions for the purpose of this thesis. All chosen research institutions strongly deal with fishery issues or are even provided with the task to support state fishery authorities with scientific data or knowledge. This fact may explain the higher tie density (46.4%) between research institutions and the fishery sector.

The previous analysis showed that patterns of homophily are not statistically significant within the agricultural sector. Considering the tie density, the agricultural sector tends to maintain more links (bridging ties) to authorities and associations from nature conservation (44.4%) and research institutions (50%). It is apparent that these contacts are more often emanating from the agricultural sector, whereas comparatively, scientific institutions (0%) and nature conservation actors (22.2%) are not seeking contact to the agricultural sector that often. The close cooperation between the agricultural sector and scientific institutions may again potentially be attributed to the specific selection of research institutions for the purpose of this research. There is at least one governmental research institution with a strong focus on agricultural issues in the list of respondents. Both the agricultural and the fishery sector showed an interest in maintaining a high tie/contact density to certain research institutions. Some respondents from these actor groups see an important need to enhance scientific knowledge to improve the sustainable management of natural resources in the case study area.

It was further revealed that the contact between spatial planning authorities and fishery representatives is relatively low (14.3%). Already in the interviews, representatives from spatial planning stated that they personally found it difficult to approach representatives from the fishery sector in order to gain information on important fishing grounds that are also subject in spatial plans. In contrast, most fishery representatives claimed that they do not see a benefit in integrating fishery concerns in spatial plans. Instead they believe that, e.g. the assignment of reserved areas for fishery activities, would not help to implement fishery interests. Thus, their contact to representatives from spatial planning is relatively low with only 4.8%.

Spatial planning maintains most of its contacts to representatives from nature conservation authorities and associations (40.4%). The contact to other actor groups, e.g. research institutions (16.7%) or agricultural authorities/associations (22.2%), is relatively low.

6.2.7 Power of Individual Actors in Natural Resource Management

In this subchapter, I am coming back to the question who the powerful actors within natural resource management in the case study area are. After having analyzed influence judgements and mutual relevance, as well as the integration of different actor groups into communication and interaction structures, I analyzed the position and thus the specific centrality of individual actors in natural resource management. Following this approach, power is determined by an actor's position in the network and expressed by higher or lower centrality values. The different centrality measures have already been explained in the conceptual and methodological parts of this thesis (chapter 3.1.5.2). By occupying a central position in the network, actors may be superiorly empowered to exert influence over others and may, at the same time, have better access to valuable resources or information, which can put them at an advantage compared to actors that are situated more peripherally (Brass,

1984, p. 520; Burt, 1976, p. 93; 1992, p. 57; Degenne & Forsé, 1999, p. 29; Ibarra & Andrews, 1993). Thus, a favorable network position and a high centrality may provide an actor with power.

Precise sociometric data were gathered from a total of 29 respondents during the interviews. Respondents from the same organization or association were subsumed as a 'single' actor node in the network analysis. Centrality values are considerably dependent on the network size. Later in this work, I will compare differently sized subnetworks with each other. That is why I decided to calculate 'normalized' centrality values instead of absolute values. The following table shows the list of the different centrality values of all the actors identified as belonging to the policy network concerned with management issues in the Greifswald Bay and its coastal areas. These values were descriptively analyzed in the lower part of the table.

Table 51: Individual centrality values of the different respondents in the policy network concerned with management issues in the GWB (OutDeg = Outdegree centrality, InDeg = Indegree centrality, nDeg = normalized degree centrality, nBetweenness = normalized betweenness centrality, nCloseness = normalized closeness centrality, nEigenv = normalized eigenvector centrality)

Actors	OutDeg	InDeg	nDeg	nBetweenness	nCloseness	nEigenv
NABU	30	15	38.79	5.25	0.54	33.36
Stalu VP	24	20	37.93	6.30	0.56	35.04
LALLF	23	20	37.07	3.56	0.56	37.30
LUNG	25	17	36.21	2.99	0.57	36.31
BfN	23	18	35.35	3.26	0.56	33.26
LUMV (Environment)	22	12	29.31	2.30	0.57	29.84
WWF	14	19	28.45	3.51	0.59	26.86
LAV	21	11	27.59	2.60	0.58	28.45
LdKKF	17	15	27.59	1.56	0.58	29.63
Consultancies	15	16	27.00	1.84	0.60	30.76
German Fisheries Assoc.	21	9	25.86	3.64	0.59	23.18
LMfRO	19	9	24.14	2.58	0.58	23.82
Thünen Institute of Baltic Sea Fisheries	11	14	24.14	2.63	0.61	22.61
LUMV (Fishery)	14	13	23.28	1.52	0.60	22.09
University Rostock	10	16	22.41	0.83	0.61	27.86
Water & Soil Assoc.	14	10	20.69	2.19	0.60	20.01
Mining authority	10	16	19.81	1.15	0.61	22.99
AfROVP	19	3	18.97	0.79	0.59	19.56
Farmers' association NVP	12	10	18.97	2.49	0.61	21.78
Fishery cooperative	12	9	18.10	1.33	0.62	18.37
LFA	9	10	16.38	0.59	0.63	19.58

Actors	OutDeg	InDeg	nDeg	nBetweenness	nCloseness	nEigenv
Biosphere reserve Rügen	12	5	14.66	0.43	0.62	19.07
BSH	8	8	13.80	1.18	0.64	15.69
LUMV (Agriculture)	12	4	13.79	0.19	0.62	16.25
LMS	14	1	12.93	0.98	0.61	20.63
UNB Anklam	13	2	12.93	0.04	0.62	17.25
UNB Grimmen	9	3	10.35	0.11	0.63	13.68
Fish and Environment Research Assoc.	9	1	8.62	0.009	0.67	13.93
BV Fish	5	2	6.04	0.15	0.67	4.53

Descriptive analysis on individual level

	Outdeg	Indeg	nDeg	nBetweeness	nCloseness	nEigenv
Average	15.41	10.62	22.45	1.93	0.60	23.58
Standard deviation	6.03	5.95	8.98	1.54	0.03	7.59
Variance	36.31	35.41	80.67	2.38	0.00	57.55
Variation coefficient	0.39	0.56	0.40	0.80	0.05	0.32
Minimum value	5.00	1.00	6.04	0.01	0.54	4.53
Maximum value	30.00	20.00	38.79	6.30	0.67	37.30

While indegree centrality in a positive relationship, such as mutual contact or advice, is interpreted as a form of popularity or prominence, outdegree centrality is rather a characteristic feature for active gregariousness (Wasserman & Faust, 1994, p. 43) and influence exertion. The latter table highlights that the 'top'-ranked positions for indegree and outdegree centrality are exclusively occupied by environmental authorities and associations. With high values for indegree and outdegree centrality, the LALLF (State Office of Agriculture, Food Safety and Fishery in M-V) constitutes an exception and ranges between the values for nature conservation actors. Additionally, all these actors have high values in degree centrality.

The Regional Agency of Agriculture and Environment (Stalu VP) has both a very high indegree centrality and a very high degree centrality. These values may reflect the Agency's particular importance with respect to the regional management of the GWB and its coastal areas. The Stalu VP bears responsibility for all environmental and agricultural issues in the research area on the regional level. Furthermore, it acts as an intermediary institution between the state and the municipal level of policy making. In many different projects on the regional scale, the Stalu VP acts as approval authority with the responsibility to ensure the coordination of different usage claims. In these cases, it has to establish and maintain a continual communication flow between all state and non-state actors that are involved in specific management issues in the case study area. The intermediary position of the Stalu VP within the network is further shown when considering the betweenness centrality values. By far, the Stalu VP has the highest value and outreaches all other actors. The following map displays the egocentric network of the Stalu VP. It displays that it has a central position within the network and further maintains numerous bridging ties to all the different actor groups in the case study area, including state actors on different political levels and a variety of non-state actors.

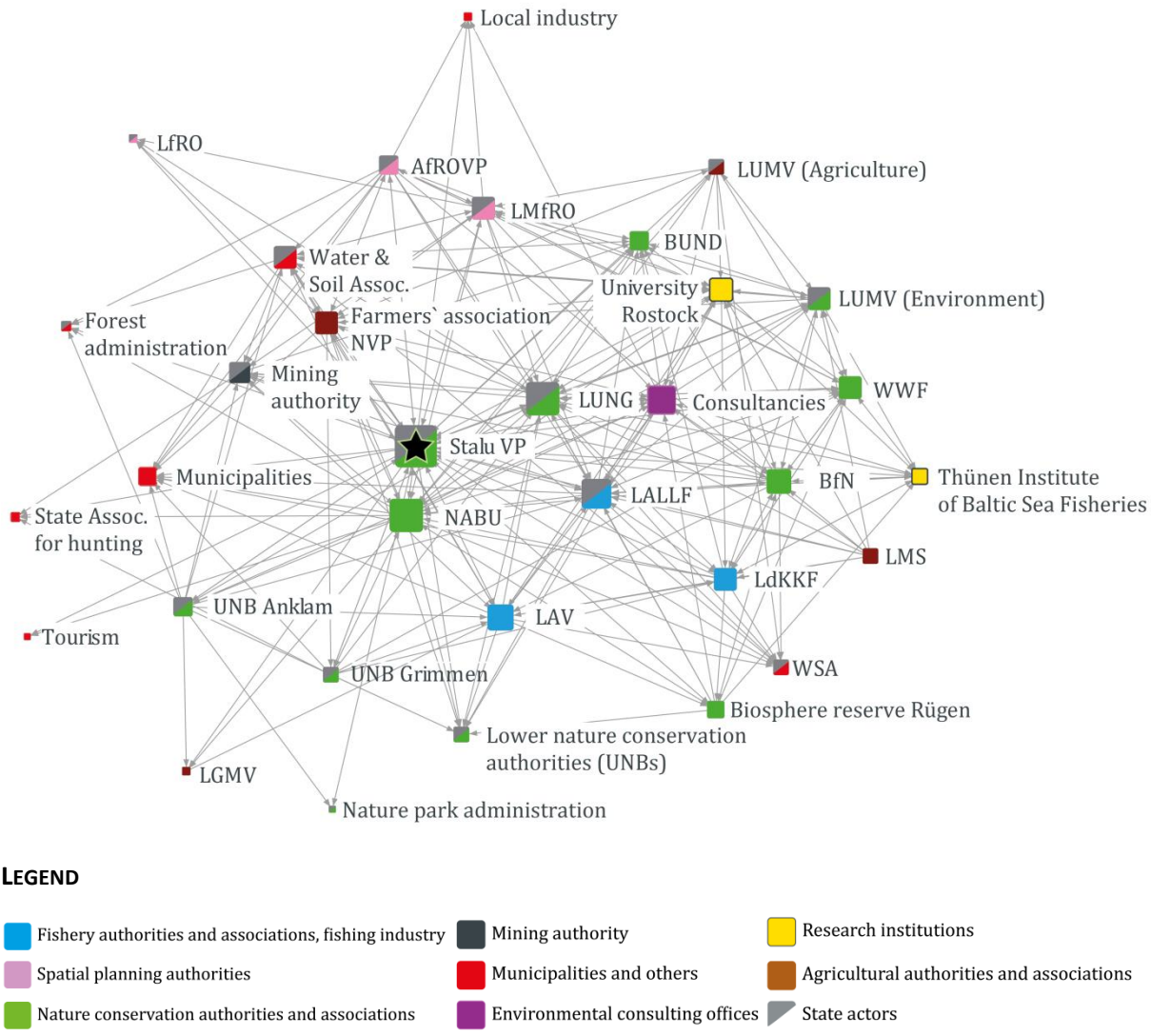


Figure 14: Egocentric network of the Regional Agency for Agriculture and Environment in Western Pomerania (Stalu VP). Node size is set by degree centrality.

Also, environmental associations such as the NABU and the WWF had high indegree and outdegree centrality values. It is obvious that the NABU is very proactive in establishing and maintaining contacts and cooperations with a large number of different state and non-state actors in the assessed policy network (outdegree= 30). Both environmental associations have high eigenvector centrality values, suggesting that they actively seek to maintain contacts with influential and central actors in the policy network. A close connection to influential actors may strengthen the own position within the network. This may further improve the access to valuable resources and the decision-making process. There are also representatives from fishery associations that have relatively high degree centrality values (LAV = 27.59, LdKKF = 27.59, DFV = 25.86). The eigenvector centrality values of the LAV (nEigenv = 28.45) and the LdKKF (nEigenv = 29.63) are much higher than the averaged eigenvector centrality (23.58). High eigenvector centrality values may disclose the effort of these fishery associations to stay connected to influential actors in the region.

Having a further look on the quantitative network data, it is revealed that environmental consulting offices (consultancies) have a high eigenvector centrality value. While their betweenness centrality is particularly low, their eigenvector centrality (nEigenv = 30.76) by far surpassed most of the other

actor's values. This result suggests that environmental consulting offices are not acting from an intermediary position, linking different actors to each other, but rather are purposefully proactive in establishing and maintaining contacts to influential actors in the network.

When considering the spatial planning authorities, there are discrepancies between the indegree and the outdegree values. The AfROVP (Office of Spatial Planning and Regional Development Western Pomerania) and the LMfRO (State Ministry of Energy, Infrastructure and Spatial Planning M-V/ Department of Spatial Planning) maintain a lot of contacts to other actors in the network (both had an outdegree value of 19). In contrast, their indegree values are much lower than compared to the average. Only three respondents mentioned the AfROVP as a regular contact organization, while the LMfRO was mentioned by nine respondents. However, most of the respondents stated that they have no regular contact to any of the spatial planning authorities. Especially the majority of the fishery representatives are convinced that spatial plans would not help to ensure fishery interests. Instead they see a threat in assigning special areas for fishing activities (cf. Chapter 5.5.2). On the other hand, agricultural association representatives perceive the assignment of priority areas for agricultural usages as a large advantage, ensuring unrestricted agricultural land use in these areas. The following map displays the egocentric networks of the three respondents from spatial planning authorities, which are highlighted with a black asterisk. The network map reveals that spatial planning authorities are rather on the periphery of this network. While they are located closely together, their distance to other actors in the network is long.

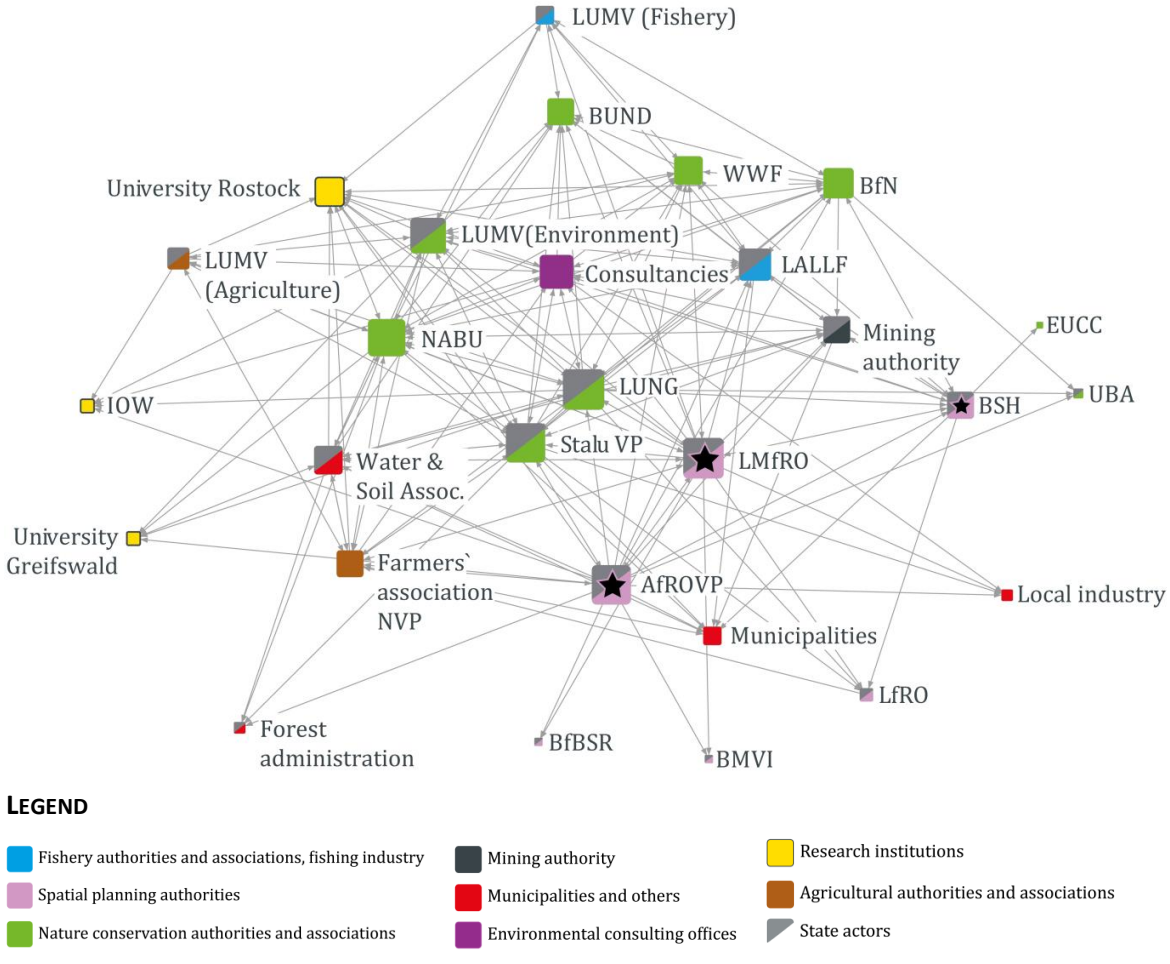


Figure 15: Egocentric network of all respondents from spatial planning authorities (a) BSH: Federal Institute for Shipping and Hydrography; (b) LMfRO: State Ministry of Energy, Infrastructure and Regional Planning M-V (Department of Spatial Planning); (c) AfROVP: Office of Spatial Planning and Regional Development Western Pomerania)

There are many other important issues revealed by the quantitative analysis of the network data. For instance, all environmental authorities on the municipal level (UNB Anklam, UNB Grimmen) and the Southeast Rügen Biosphere reserve have low centrality values. High values for closeness centrality (inverse scores) suggested that they are marginal within the policy network. Their individual distance to other actors in the network is larger than compared to the average distance values of other actor nodes. This fact implies that their connectedness to other actors in the network is much weaker, which may impair constant exchange or coordination flows with other actors. The results suggest that environmental authorities on lower political levels are less integrated in natural resource management processes than environmental authorities on higher political levels, which have central positions in the network. Thus, lower nature conservation authorities are not benefiting from the central position of their respective superior authorities. The interviews revealed that representatives from lower nature conservation authorities feel constantly marginalized and limited in their actual scope of action. They stated that, during the last years, their formal tasks and their respective area of responsibility have considerably increased, while they lack in adequate staffing and sufficient financial resources.

In the case study area's policy network, centralization is relatively low, with a value of 0.254. Network centralization describes the degree of variability in centrality amongst the network members (L. C. Freeman, 1979, p. 227; Wasserman & Faust, 1994, p. 6) and thus, measures the extent to which only one or a few actors in a network maintain all of the ties (Prell, 2013, p. 169). Therefore, it can be assumed that high and low centrality values are relatively equally dispersed among the individual network members.

6.2.8 Power of Actor Groups in Natural Resource Management

In this thesis, the concepts of individual centrality were expanded to support the analysis of subgroups. There is empirical evidence that centrality is very much 'relevant to the way groups get organized to solve at least some kinds of problems' (L. C. Freeman, 1979, p. 215). The following analysis provides descriptive and inferential statistics about the distribution of centrality, and thus power, among the different actor groups involved in natural resource management in the case study area. The focus of the first subchapter is on the comparison of power between the different actor groups that have been defined earlier in this study by their common interests or formal responsibilities. The subsequent chapter deals with the comparison of the distribution of power between state and non-state actors.

6.2.8.1 Comparing the Power of different Actor Groups

First, the non-parametric Kruskal-Wallis *H* test was applied to determine whether there are significant differences in the median centrality values between the actor groups. In order to better comply with the test's requirements on sample size, fishery authorities and fishery associations were pooled into a single actor group. The same was done for the nature conservation group, resulting in five groups that were used for the analysis. As there were still two actor groups with n = 3 and n = 4, respectively, so called 'Monte Carlo' p-values (that are more appropriate for sample sizes ≤ 5) (SigmaXL, 2015) have additionally been calculated. For the purpose of this test, all values were ranked. The tested null hypothesis H_0 states that the medians of the centrality measures among the different actor groups are equal. Thus, if H_0 is true, there are no statistically significant differences

between the median centrality values of the different actor groups. The test was calculated with SigmaXL Version 7.0. In total, six different centrality measures were tested, including indegree and outdegree centrality, degree and betweenness centrality, eigenvector and closeness centrality. None of the Kruskal-Wallis *H* tests showed a significant difference of the median centrality measures between the actor groups.

However, descriptive statistics still revealed interesting patterns and tendencies in the data regarding the distribution of power among the different actor groups. Caution should be exercised when interpreting these patterns and tendencies as they are statistically insignificant, which may be caused by the low sample size ($n < 5$) in some groups. It should further be taken into account that the different centrality measures are proven to significantly ($p < 0.05$) correlate with each other.

For the descriptive analysis, actor groups were again distinguished according to their formal responsibilities and their interests. In total, seven different actor groups could be differentiated. The following table provides an overview of the actor groups and their normalized degree centralities.

Table 52: Normalized indegree, outdegree and degree centrality for different actor groups and descriptive statistic
(nInDeg = normalized indegree centrality, nOutDeg = normalized outdegree centrality, nDeg = normalized degree centrality)

Indegree and outdegree centrality within different actor groups	**nOutDeg**	**nInDeg**	**nDeg**
Fishery authorities (2)	31.90	28.45	30.17
Fishery associations and fishing industry (5)	26.21	15.86	21.04
Nature conservation authorities (7)	31.56	18.97	25.25
Nature conservation associations (2)	37.93	29.31	33.62
Spatial planning authorities (3)	26.43	11.49	19.00
Research institutions (4)	16.81	17.67	17.89
Agricultural authorities and associations (3)	21.83	8.62	15.23
	Descriptive statistics (for all groups together)		
Average	27.52	18.63	23.17
Standard deviation	6.48	7.27	6.27
Variance	41.96	52.90	39.34
Variation coefficient	0.23	0.39	0.27
Minimum value	16.81	8.62	15.23
Maximum value	37.93	29.31	33.62

The normalized indegree values are high, especially for nature conservation associations (nInDeg = 29.31), fishery authorities (nInDeg = 28.45), and nature conservation authorities (nInDeg = 18.97). This result may indicate that these groups are particularly often addressed by other actors. Therefore, they are well integrated in contact and/or communication flows in natural resource management processes in the case study area. In general, a good integration reduces the risk of an actor group to get marginalized within a network. However, as was shown in the previous analysis

steps, high indegree values may potentially be attributed to homophily effects, especially in the actor groups including fishery and nature conservation representatives. The same caution has to be applied when interpreting the outdegree values, as these values may also potentially be traced back to homophily effects. Thus, there is a high number of ties among actors of the same group (bonding ties), whereas the number of ties breaching the boundaries of one actor group to connect with other actor groups (bridging ties) are rather low.

However, patterns of homophily have not been proven for the agricultural group. In this actor group, there is a noticeable discrepancy between the indegree (nInDeg = 8.62) and outdegree (nOutDeg = 21.83) centrality values. The low indegree value may suggest that representatives from the agricultural actor group are not actively involved in communication flows and contact structures with other actors in the same network. On the other hand, high outdegree values show that agricultural representatives proactively seek to establish and maintain contact with representatives from other actor groups in the network. In the interviews, agricultural representatives stated that the maintenance of a wide contact network is essential with respect to efficient influence exertion in policy making.

The normalized degree centrality of an actor group was computed as the averaged sum of the normalized indegree and outdegree centrality. Nature conservation associations have the highest normalized degree centrality value (nDeg = 33.62). Fishery authorities and nature conservation authorities follow in second and third place. The following table presents the statistical results for the normalized betweenness, closeness, and eigenvector centrality of the different actor groups. For these, the averaged values were calculated for each group.

Table 53: Normalized betweenness, closeness, and eigenvector centrality for different actor groups and descriptive statistics (nBetweenness = normalized betweenness centrality, nCloseness = normalized closeness centrality, nEigenv = normalized eigenvector centrality)

Centrality measures	nBetweenness	nCloseness	nEigenv
Fishery authorities (2)	2.54	0.58	29.69
Fishery associations and fishing industry (5)	2.28	0.61	20.83
Nature conservation authorities (7)	2.20	0.59	26.35
Nature conservation associations (2)	4.38	0.57	30.11
Spatial planning authorities (3)	1.52	0.60	19.69
Research institutions (4)	1.01	0.63	20.99
Agricultural authorities and associations (3)	1.22	0.61	19.55
	Descriptive statistics (for all groups together)		
Average	2.16	0.60	23.89
Standard deviation	1.05	0.02	4.35
Variance	1.1	0.0004	18.95
Variation coefficient	0.48	0.031	0.18
Minimum value	1.01	0.57	30.11
Maximum value	6.298	0.63	19.55

Considering the average values for the different centrality measures in the last two tables, it becomes obvious that the highest values are bundled up within single actor groups. For each centrality measure, nature conservation associations have the highest values, followed in second place by fishery authorities. What is interesting here, is that, in general, nature conservation associations tend to have higher centrality values than the respective nature conservation authorities. This is different in the fishery sector, where, in general, fishery authorities have higher centrality values than the fishery associations.

It becomes obvious that the actor group including all respondents from different research institutions has the lowest values for the normalized betweenness and the highest values (inverse scores) for the normalized closeness centrality. These results indicate that the majority of these group actors are not occupying intermediary positions within the network. However, the standard deviation (sd) and variation coefficient (vc) within this group are high (sd = 0.98; vc = 0.97). Especially the TI-OF (Thünen Institute of Baltic Sea Fisheries) has a normalized betweenness centrality value 73.5% above the arithmetic mean. However, the three other research institutions have much lower normalized betweenness centrality values. High values in closeness centrality suggest that research institutions are less easily reached by other actors in the network. Thus, they are more vulnerable to become marginalized or to be excluded from information and resource flows within the network. Many interview respondents complained about a weak science-policy interface. These results support this perception.

I have found discrepancies between the level of influence perceived by the actors to best characterize their own capacity to exert influence and to implement their interests in natural resource management (cf. Chapter 6.1.7) and the quantitative network centrality values (cf. Chapter 6.2.8). To facilitate the comparison between qualitative and quantitative data, a threshold value was calculated for each of the influence levels with each interval covering 25%.

Table 54: Influence levels and threshold values for the normalized degree centrality

Influence level	Percentage	Threshold value for the normalized degree centrality
Very high	100%	38.793 (highest normalized degree centrality value)
High	75%	29.085
Medium	50%	19.39
Low	25%	9.695
Very low	0%	0 (lowest normalized degree centrality value)

After having identified the threshold values, the average normalized degree centrality for each actor group was assigned to the adequate interval. This way, it became possible to assign an influence level to each actor group on the basis of the quantitative network data.

This influence level could further be compared to the self-perceived influence level of each actor group derived from the interview data (tabular summary in Chapter 6.1.7). The following table summarizes these results.

Table 55: Comparing the influence level based on quantitative network data to the self-perception of the influence level based on the interviews

Actor group	Average nDegree centrality	Influence level for each actor group based on quantitative network data	Self-perception of the own influence level based on the interviews
Fishery authorities	30.17	High to very high	Low to medium
Fishery associations	21.04	Medium to high	Very low to medium
Nature conservation authorities	25.25	Medium to high	Low to high
Nature conservation associations	33.62	High to very high	Medium to high
Agricultural authorities and associations	15.23	Low to medium	High
Spatial planning authorities	19.00	Low to medium	Medium to high
Research institutions	17.89	Low to medium	Low to high

It becomes apparent that there are discrepancies between the averaged influence level derived from the network analysis data and the averaged influence level perceived by the interview respondents to best describe their own capacity to exert influence. Fishery and nature conservation representatives, both from authorities and associations, perceive their level of influence to be much lower than compared to the level of influence that is suggested by the data of the network analysis. These results potentially reflect an under-estimation of the own influence within these actor groups.

In contrast, agricultural authorities and associations are more confident with respect to their own influence. They perceive their collective influence to be on a much higher level than the quantitative network analysis data support.

According to their structural position and their averaged normalized degree centrality within the assessed policy network, spatial planning authorities are assigned an average level of influence (low to medium). They themselves however estimate their influence span to range between medium and high.

The averaged influence level perceived by scientists from research institutions ranges from low to high, while the degree centrality of research institutions within the policy network was quantitatively determined to range in a low to medium interval.

6.2.8.2 Comparing the Power between State and Non-state Actors

The non-parametric Mann-Whitney *U* test was applied to find out whether there are significant differences in the median centrality values between state and non-state actors – or in other words: whether power is equally or rather unequally distributed among state and non-state actors. The null hypothesis H_0 of the test states that there are no significant differences among the defined groups related to the median of their centrality values. The test required an ordinal ranking of the results assigning one rank to each of the groups' members. Afterwards, the empirical U-value and the empirical U'-value were calculated. These values determine how often one group member surpasses

(or falls below) the rank of a member from the other group. The empirical U-values have to be compared with a critical U-value that is predetermined by and conditional on the sample size. An U-value or U'-value smaller than the critical U-value indicates that the result is significant (Rasch, Friese, Hofmann, & Naumann, 2012, p. 154). In this thesis, the empirical U-values and U'-values were calculated in order to assess whether there is an unequal distribution of centrality values between state and non-state actors. The analysis did not show any statistically significant median differences with respect to the distribution of centrality values of state and non-state actors. Therefore, H_0 was confirmed. Thus, centrality is equally distributed between state and non-state actors. Differences in centrality are not significant. However, considering the averaged group values for different centrality measures (cf. Table 52), interesting patterns and tendencies are revealed. These will be subject of a broader discussion in Chapter 7.6, including also the results of other analysis steps.

7 NATURAL RESOURCE MANAGEMENT IN COASTAL AREAS

7.1 Natural Resource Management as the Heart of the Analysis

The juxtaposition of protection needs to ensure ecological sustainability in the area of the Greifswald Bay and, on the other hand, the diversity of divergent human usage claims evinces the need for the implementation of a coherent and effective natural resource management. The research realized in the course of this study suggests that policy making with respect to the management of natural resources in the case study area is substantially fragmented. Management decisions are made in separate sectoral policy subsystems that follow their own separate laws and interests, in many cases neglecting a holistic management perspective. A few policies, however, such as the State Development Program for M-V (LEP), the National Strategy for an Integrated Coastal Zone Management (ICZM) or the Marine Strategy Framework Directive (2008/56/EC) emphasize the need for coherent management practices to sustain natural resources in coastal areas in the long term. These policies promote cooperative and holistic management approaches as important means to replace sectoral management perspectives (AMMV, 2005, p. 16 and 67; EC, 2002: Chapter 2 (f)-(h)).

There is a plethora of environmental policies on different political levels that document the efforts to protect and maintain natural resources in the Greifswald Bay and its coastal areas. Nevertheless, major environmental problems have not been tackled as of yet. There are still huge amounts of nutrients discharged into the water body of the Greifswald Bay, affecting biodiversity and the distribution of macrophytes (Bachor & Weber, 2008, p. 3; Munkes, 2005, p. 22), which serve as major spawning substrate for herring and other fish species.

The study has identified a variety of different state and non-state actors pursing divergent interests with respect to natural resource management in the Greifswald Bay and its coastal areas. Tensions and conflicts between different actor groups became manifest during the interviews and roundtable discussions and were found to impede coordination and cooperative approaches to natural resource management in the case study area. However, an effective natural resource management considerably depends on the collective agreement of different actor groups on prospective management goals and strategies, thereby initiating cooperative approaches to manage respective resources (Rydin & Matar, 2006, p. 45).

The central aim of this research was to answer how actors involved in natural resource management in the Greifswald Bay succeeded in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation and whether this contributed to an improvement of the ecological conditions in this area. The assessment based on a mixed method research design (cf. Chapter 3.1).

The following chapters are thought to contextualize and discuss the previous findings. The first subchapter (Chapter 7.2) discusses to which extent cooperative approaches are realized among the different actor groups that are involved in natural resource management in the case study area. Based on the analysis of chapter 6.2 in this thesis, a second subchapter (Chapter 7.3) focuses on the question in which way different actor groups are integrated into the natural resource management processes and whether there are groups that are more marginalized than others. The subsequent chapter (Chapter 7.4) discusses issues that are impeding a mutual conflict resolution and thus

collective actions towards a sustainable development within the case study area. The following chapter (Chapter 7.5) suggests that the improvement of the ecological conditions in the Greifswald Bay and the maintenance of ecological sustainability are considerably impeded by conflicting policy objectives. There, it is discussed in how far conflicts between different actor groups are institutionalized through a management that was found to be inconsistent in itself and a product of sectoral interest representation. The subsequent chapter (Chapter 7.6) focuses on the distribution of power among different actor groups. Chapter 7.7 discusses the specific relationship and interaction between scientists and policy makers in natural resource management. It further discusses a decision-making process under conditions of uncertainty and the inclusion of local knowledge. A last chapter discusses the methodological constraints inherent in the different methodological approaches that were applied in this study (Chapter 7.8).

7.2 Fragmentation in Natural Resource Management and Cooperative Management Approaches

The multitude of policies and administrative responsibilities with respect to different management aspects as well as the analysis of actor relationships and specific network constellations provided evidence of a considerably fragmented management system. Thus, policy and decision making was found to take place in more or less independent and autonomous sectoral policy subsystems. Fragmentation related to the management of natural resources may have adverse effects on the establishment of cooperative management approaches (Steel & Weber, 2001, p. 120). However, cooperative approaches are assumed to be crucial in order to facilitate a coherent management practice and to ensure the sustainable ecological development of a region (Falleth, 2006, p. 65). In this context, the following chapter discusses to which extent cooperative management approaches were established among the different actor groups that are involved in natural resource management. Cooperation among different actor groups was assessed by analyzing their mutual interactions.

A study of Granovetter (1973) is my first anchor to start the discussion. He differentiated between ‘strong’ and ‘weak’ ties (also known as ‘bonding’ and ‘bridging’ ties) that have different essential functions in a network. Briefly summarized: strong ties (or bonding ties) are robust and create tight network structures among similar individuals, e.g. between family members, friends, or members of an interest group. Strong ties are typical characteristics of homophily in actor groups (cf. Chapter 2.3.2.2). These ties enhance trust, but may also impose social constraints that discourage experimentation and limit the acceptable scope of actions and opinions. Weak ties (or bridging ties), on the other hand, reach across diverse actor groups and thereby connect otherwise disconnected segments of the network. Weak ties facilitate the access to new knowledge and resources, thus enhancing an actor’s or actor group’s opportunities outside the own group network. However, weak ties are more fragile and less likely to produce trust between actors (L. Newman & Dale, 2005). Strong ties lead to local cohesion in a network, creating dense network clusters that, as a result, provoke overall fragmentation (Granovetter, 1973, p. 1378).

This thesis bases on the assumption that weak ties between different actor groups contribute to the mitigation of adverse effects of institutional fragmentation and the creation of a basis for collective actions towards the sustainable management of natural resources in the case study area. The statistical analysis, however, showed that bonding ties dominated actor relationships, mainly linking

actors of the same group to each other. These so called patterns of homophily were uncovered within three different actor groups, namely the groups including representatives from fishery, nature conservation, and spatial planning. Ties which bridge the different actor groups were much rarer (cf. Chapter 6.2.2 to Chapter 6.2.4). These results suggest that similar interests (or related political responsibilities) determine interpersonal contact and communication networks. Thus, interaction and cooperation is more likely to occur between similar individuals of the same actor group than between members of different groups. This also implies that new information and knowledge primarily circulate within a like-minded subsection of an otherwise heterogeneous population without reaching other, dissimilar actors or groups in other parts of the network (Granovetter, 1973, p. 1366).

Through inferential statistics, it could be evidenced that power in form of centrality values is relative equally distributed among the different assessed actor groups. Additionally, network centralization was determined to be relatively low (cf. Chapter 6.2.7 and Chapter 6.2.8.1). These findings suggest a fragmented management system, in which decisions are made within sectoral policy subsystems that are all provided with their own competencies and powers.

Sandström (2008) elucidated that a network structure of high centralization positively correlates with collective actions in a natural resource management setting, as central actors' ability to coordinate and prioritize problems rises (Sandström, 2008, p. 65). However, highly centralized networks are increasingly vulnerable to the 'removal' or dysfunctionality of the few central actors, since in such a case the network is likely to break apart (Bodin & Crona, 2009, p. 371). Several authors emphasized that the most favorable degree of network centralization for effective natural resource management varies, depending on the phases of the management process. High network centralization may be beneficial for the responsible persons who mobilize and coordinate actors at the beginning of a process in order to initiate collective actions and cooperation. The engagement and inclusion of various actors to find common strategies towards the management of complex ecosystem processes may, however, be facilitated by less centralized networks (Bodin, Crona, & Ernstson, 2006; Bodin & Crona, 2009, p. 371; Leavitt, 1951, p. 86).

A neglect of cooperative approaches to the management of natural resources in the case study area was further said to be a consequence of financial constraints and a lack of adequate staffing. State representatives from all actor groups emphasized that their daily working routines and their internal administrative organization do not provide adequate scope for coordination beyond the own sphere of responsibility. Even the consultation with members of other departments that are located in the same ministry was, by some respondents, characterized as an exhausting and time-consuming process, especially when treating conflictual policy issues. Several actors admitted that they deliberately try to avoid confrontations with other actors by skipping or reducing consultation. However, the same actors explained that they themselves are sometimes not involved in consultation processes, even if, at the end, they feel that their statements would have been important, or that their field of responsibility is touched upon. Thus, cooperative approaches are refused or circumvented causing uncoordinated management situations and sectoral policy making. These results support the assumption that policy and decision making in the case study area takes place in sectoral policy subsystems that exclusively obey their own system of rules and concurrently promote their own separate strategies and interests. From their experiences in coordinating different policy objectives on a spatial scale, representatives from spatial planning feel that collective approaches among different actor groups are difficult to achieve as all actor groups struggle to gain

the highest benefits with respect to the implementation of their own political objectives. The insistence on maximal advantages and a lack of mutual trust in the actors' relationships have further been identified as reasons increasing the emotional 'distance' between the different actor groups and hence reinforcing fragmentation.

7.3 Actor Groups in Fragmented Resource Management Systems

A continual separation of an actor group through neglecting bridging ties to other actor groups may lead to this group's marginalization or to a loss of the group's internal diversity, as group members exclusively refer to the same sources of knowledge and thoughts (L. Newman & Dale, 2007, p. 80). The following subchapter focuses on the question in which way different actors, but particularly actor groups, are integrated into the natural resource management process and whether there are actor groups that are more marginalized than others.

Several researchers studying social influence processes found that individuals who are tied to one another influence one another's perceptions and behavior, thus producing more similarities over time (Friedkin, 1998; L. Newman & Dale, 2007, p. 81; Robins, Elliott, & Pattison, 2001, p. 2). During the interviews, it was revealed that respondents belonging to a defined actor group are similar in their perceptions on conflict issues, but also in their individual ideas on management practices in coastal areas. These actor groups are rather homogeneous with respect to their interests, their fears, and their needs. Many actors occupying rather subordinated positions within their own group referred in their opinion to superordinate members, in some cases even using the same wording. This was especially the case when speaking to fishermen or representatives from fishery associations. In this way, it could be shown that there are key individuals having a kind of guiding role within this group. It further became apparent that these individuals have high centrality values within the policy network. In the case of the fishery group, there are two individuals from the State Office of Agriculture, Food Safety and Fishery (LALLF) that seem to have such a leadership function. When considering their personal network, it is disclosed that they act from an intermediary position, bridging the fishery sector and all the other actor groups within the network.

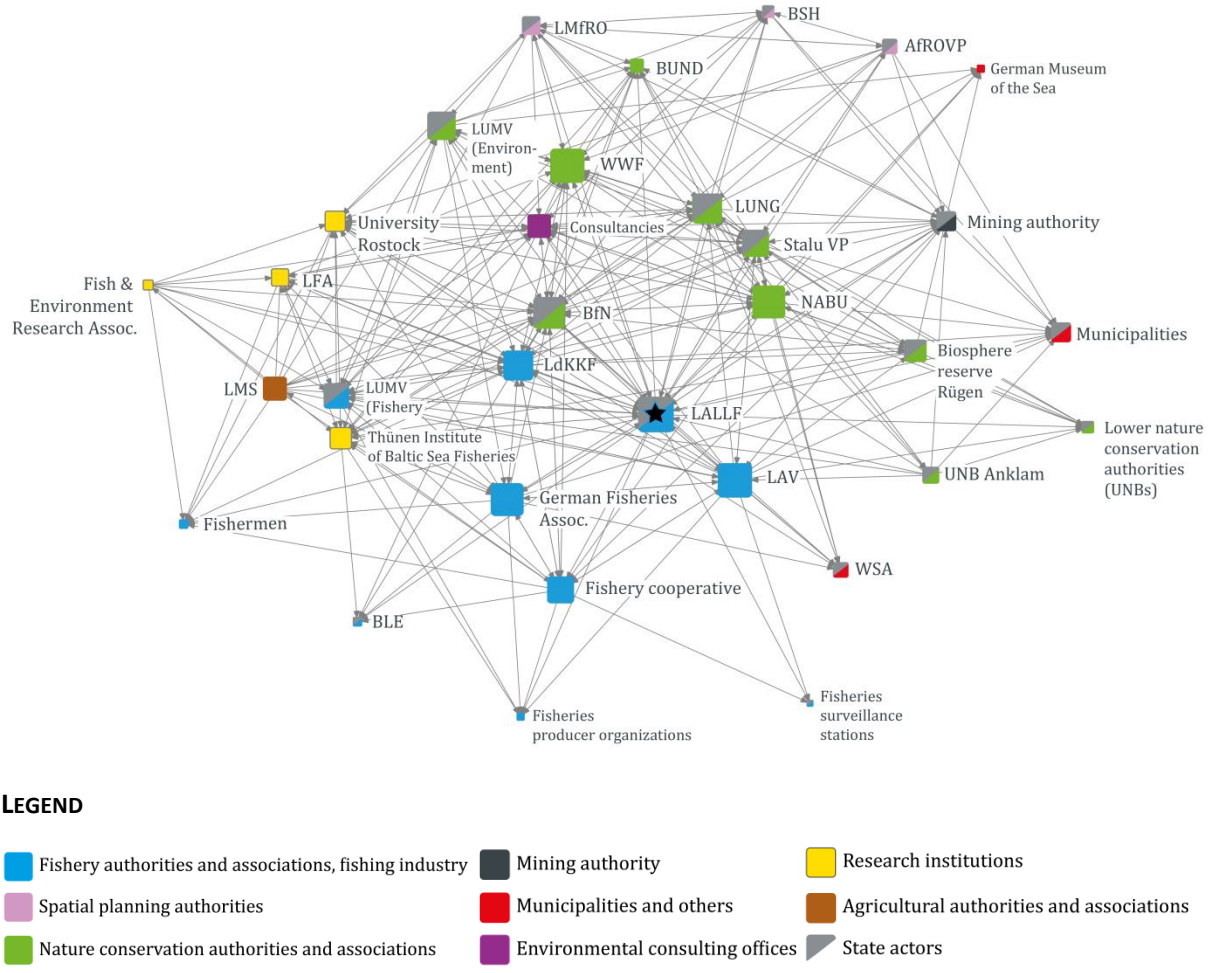


Figure 16: Egocentric network of the State Office of Agriculture, Food Safety and Fishery in Mecklenburg-Western Pomerania (LALLF). Node size is set by betweenness centrality.

In three of the assessed actor groups, bonding ties within the group outweighed bridging ties connecting these groups to other actor groups in the network (cf. Chapter 6.2.1 to Chapter 6.2.4). Newman and Dale (2007) and Frank et al. (2009) found that an actor group's agency is strengthened through a diverse set of bridging ties that reaches across the boundaries of a group's internal network. The authors believe that a balanced mixture of strong and weak ties enhances diversity within a group and therefore at the same time consolidates a group's capacity to adapt to (unexpected) changes (Frank, Mueller, Krause, Taylor, & Leonard, 2009, p. 393; L. Newman & Dale, 2005; 2007, p. 80). In their case study on a rural coastal fishing village in Kenya, Bodin and Crona (2008) found that homogeneity among key individuals with respect to their perceptions considerably diminishes a group's collective ability to adjust to new circumstances or to respond to environmental changes and disturbances. An actor group's adaptive capacity is influenced by a certain degree of 'intellectual leap' within this group, allowing the intrusion of new knowledge, innovative ideas and perceptions (Bodin & Crona, 2008, p. 2776). The results of my research suggest that especially representatives from the fishery actor group, but also from the nature conservation actor group both of which maintain strong ties mainly to members of their own group, did not feel prepared to manage prospective challenges – may these challenges arise through policy or environmental changes, or through internal or economic changes. Meetings with different fishery representatives gave the impression that there is not a large scope of potential visions regarding the future of the fishery sector. They themselves see the fishery sector in a rather weak position (cf. Chapter 6.1.1).

New knowledge or ideas (e.g. alternative fishing gears, electronic monitoring systems) are in most cases subject of suspicion as any changes are considered to be a potential threat. Bodin and Crona (2008) suggested that the success and the acceptance of new management initiatives is not solely determined by the number of people perceiving a (resource) problem or a need for change, but instead considerably relies on the support from influential actors (Bodin & Crona, 2008, p. 2776). In this context, homogeneity within a group was found to considerably impede a group's capacity to resolve management conflicts, since those require the integration of diverse forms of knowledge and perspectives (Crona & Bodin, 2006; L. Newman & Dale, 2005; 2007, p. 81; Prell, Hubacek, & Reed, 2009, p. 514).

In contrast to the previously discussed cases, the group of agricultural representatives maintains a lot of bridging ties to other actor groups in the assessed policy network (cf. Chapter 6.1.3). Agricultural representatives see a considerable need for their group to maintain contact with various actors, especially from environmental authorities and associations as well as with scientists from research institutions. Close relations to other actor groups and the obvious willingness to cooperate with others are estimated to be particularly favorable in situations of conflicting demands or opposing land use claims. The maintenance of a dense network of relational ties, even to opponent actors pursuing different spatial targets, is considered to be a political strategy enhancing options for influence exertion. Respondents from the agricultural sector estimate their influence to be pretty high regarding the implementation of their interests with respect to natural resource management in the case study area. They feel well integrated into processes of policy making and are themselves actively involved in different political parties on the local and regional level, in environmental associations (e.g. the NABU), and water and soil associations. A high public presence of agricultural representatives is estimated to strengthen agricultural objectives in decision making and to provide the possibility of an immediate response to potential threats rising through opponent interests. That is why they are regularly participating in parliamentary committees on different political levels. Agricultural representatives are further quite interested in maintaining a broad cooperation with scientific institutions to support the development of efficient and environmental-friendly technology.

When comparing the behavior of actors from the agricultural and the fishery group, it becomes apparent that agricultural representatives seem to be much more proactive in their actions. They rather try to avoid the eruption of prevailing conflict issues and have much more bridging ties to other actor groups to ensure that their interests are not constrained. In contrast, fishery representatives feel rather marginalized and powerless within the policy network managing the use and the protection of the Greifswald Bay and its coastal areas. They feel that their interests are neglected in decision making and complained about a lack of adequate access to financial and personal resources in order to ensure the fishery's sector existence in the long term.

The previous findings support the assumption that a diverse set of bridging ties that reaches across the boundaries of an actor group's internal network strengthens an actor group's agency (L. Newman & Dale, 2007, p. 80). Bridging ties may further contribute to the mitigation of institutional fragmentation, facilitating coherent management practices.

7.4 Interest Antagonism, existential Fears, mutual Trust and Mediation

Chapter 5.5 in this thesis was dedicated to uncover different management conflicts in the case study. Conflicts in natural resource management are suggested to impede collective actions and delay joint solutions towards the sustainable development within a region (Falleth, 2006, p. 65). Conflicts in the case study area have evolved mainly between different actor groups pursuing divergent interests with respect to the protection or the use of natural resources in the Greifswald Bay and its coastal areas. These conflicts are apparently burdening the actor groups' mutual relationships. The following subchapter discusses some of the specific conflict characteristics that are important for a comprehensive understanding of the course of conflict.

During the interviews, many of the respondents strongly emphasized the antagonism between their own interests and the interests of other actor groups. These interests were most commonly presented in a non-negotiable way, at the same time negating other actor groups' interests or expectations. Especially the fishery and the agricultural sector strongly defended their interests and openly revealed their existential fears and needs. During the last decades, both actor groups have been subject to structural changes and have faced several difficulties, e.g. the adaption to new regulative provisions and the maintenance of economic profitability. Especially in protracted conflicts over issues perceived as non-negotiable, fears often become existential in nature, rendering 'the conflict into a struggle over group survival' (Kelman, 2007, p. 64). The highest conflict intensity was revealed to be between environmental representatives and representatives from the fishery (cf. Chapter 5.5.1). Actors in both groups emphasized that their objectives are of an existential nature and, therefore could not be subject of negotiations or compromises. These strong feelings of needs and fears were causing a tense situation among the conflict parties, rendering concessions in order to mitigate or resolve the conflicts much more difficult.

The steady intensification of the conflict might also have been a result of previous reconciliation attempts. Several times, different actor group representatives have met for joint discussions to initiate a prospective basis for cooperation and dialogue. After some meetings, the discussions were cancelled. In press releases, both sides complained about a lack of understanding and a lack of constructive discussion and goodwill. Especially fishery representatives feel that their interests are not taken seriously. They feel threatened in their existence and complained that the entire fishery sector is being criminalized (cf. Chapter 6.1.1). Negotiated conflict resolutions are further complicated by the fact that conflict parties fear that making concessions could constrain or compromise their existential needs (Kelman, 2007, pp. 64-65). My study showed that especially resource users who are dependent on the access to sufficient agricultural land or fishing grounds are not willing to accept any further usage restrictions. Thus, a genuine conflict resolution in the case study area would have to address the fundamental needs and fears of all the different conflict parties concerned. A solution could be facilitated, if no conflict party was required to sacrifice what they consider a vital need (Kelman, 2007, p. 67).

The study further revealed that actor relations considerably lacked trust. A lack of trust may be attributed to a breach of expectations (Lewicki & Tomlinson 2015). However, trust is proven to be one of the most important assets, facilitating interaction and cooperation among different actors (Beratan, 2008; Berkes & Seixas, 2005, p. 971; Folke et al., 2005, p. 444; Ostrom, 1990, p. 183). Actor relationships in the case study are overshadowed by mutual preconceptions and a certain fatigue regarding further attempts to interact with each other. Most actors within the assessed policy network know each other from previous occasions and have made different experiences with each

other through more or less regular contacts. With respect to the prevailing conflicts in the case study area, many interview respondents disclosed the names of at least four key persons and/or organizations who are perceived to be driving forces in stirring up the conflict. The insistence on maximal demands and a lack of goodwill were stated to impede a conjoint and harmonized management approach in the Greifswald Bay. An effective conflict resolution was further said to be complicated by a lack of what is in literature referred to as 'realistic empathy' (R. K. White, 1984). Realistic empathy describes the (individual) capacity to perceive another person's motives and perceptions through that person's eyes and to appreciate that person's emotional reactions without demonizing the opponent (Schwebel, 2006, pp. 195-196). This concept further emphasizes the importance of learning about and questioning the own attitudes and perceptions in order to potentially find the reasons for the opponents' distrust, fear, or anger (R. K. White, 1984, pp. 160-161).

There is no intermediary instance in the case study area that could contribute to the mediation of prevailing management conflicts, which have burdened actors' relationships for a long time period. Such an instance might take on the task to objectively define common goals for natural resource management in the region of the Greifswald Bay and its coastal areas, recognizing actor groups' needs and fears and rebuilding trust between different actor groups. An example of such a process was described by Stokke (2006), who showed that the establishment of mutual trust among different resource users and state actors on different political levels was crucial in order to overcome incoherent management practices regarding the implementation of the Water Framework Directive in the Morsa River Basin in eastern Norway. The author emphasized that collective action towards the reduction of nutrient discharges, which considerably diminished the water quality of the river, was impeded by highly fragmented management structures and by a variety of conflicting interests. As a consequence, a project was initiated that created an arena suitable for mediation, allowing for a common discussion of possible prospective strategies and measures between all concerned parties. An independent key person was appointed to guide the process and to bridge the different actor groups. This person served as a general motivator and information disseminator. During the time of the project, actor relations were vastly improved and confidence was strengthened (Stokke, 2006, p. 134). The author concluded, however, that the problems with respect to the management of the assessed river basin were too complicated and that therefore a more active central government involvement would have been necessary (Stokke, 2006, p. 138).

7.5 The Institutionalization of Management Conflicts

The research in this thesis suggests that the improvement of the ecological conditions in the Greifswald Bay and the maintenance of ecological sustainability are considerably impeded by conflicting policy objectives. Conflicts between different actor groups are institutionalized by a management that seems to be inconsistent in itself and a product of sectoral interest representation. Some interests are supposed to be of much higher priority in policy and decision making. Even if there are policies, such as the State Development Program for M-V (LEP) and the National Strategy for an Integrated Coastal Zone Management (ICZM) that emphasize the need for coherent management practices to sustain natural resources in coastal areas, a coherent and holistic management approach has not been implemented yet. An institutional setting that is substantially fragmented and suggested to rather serve sectoral interests is seen as a possible explanation for these deficiencies. Three management conflicts in the case study area are discussed within the following subchapters.

7.5.1 A competitive Agriculture vs. Water and Nature Conservation

The Water Framework Directive (2000/60/EC) defines that all water bodies ought to achieve a good chemical and ecological status until 2015. Groundwater bodies should reach a good chemical and a good quantitative status. In 2012, the LUNG M-V (State Office of Agriculture, Nature Conservation and Geology in M-V) concluded that almost all surface water bodies, including coastal waters, in M-V will fail the criterion 'good ecological status' within the foreseen timeframe due to various pollutions. A good chemical status, however, can probably be achieved in many of the water bodies (LUNG, 2012b, p. 5). Action programs, particularly during the last years, have focused on the improvement of passages for migrating fish and other aquatic organisms, on the development and sustainable management of floodplains, and the restoration of a natural flow regime. Another big emphasis was put on the reduction of infiltrating substances from various emission sources harming aquatic ecosystems. These action programs include measures to diminish nitrogen and phosphorus, which is primarily discharged from agricultural land. This aim is supported by the implementation of measures to improve the backing of nutrients in agricultural soils and to improve the self-purification capacity of water bodies through the restoration of genuine, characteristic riverine ecosystems and landscape elements (LUNG, 2012b, p. 8). However, the high eutrophication of water bodies is still the major cause for failing the criteria of the Water Framework Directive.

The compliance of agricultural practices with standards related to health, environmental, and soil conservation, as well as animal welfare is strictly monitored and condition for financial subventions. Found infringements are sanctioned according to criteria such as frequency, degree, severity, and duration. In 2010, there was a slight increase of 4.1% of infringements compared to 2008 in Mecklenburg-Western Pomerania. Also, farmers who did not receive any financial subventions were included in regular controls. In 1152 on-site controls, a total of 205 infringements were determined, accounting for 17.4% (LUMV, 2011, p. 28). Considering only those agricultural businesses that are recipients of direct payments and financial support, the percentage of non-compliance was only 5.98% and thereby much lower. In total, 736 on-site controls took place and 44 infringements were noticed. Thus, direct payments in the form of subsidies can be considered as an incentive to comply with health, environmental, soil, and animal welfare standards. Most infringements were related to the registration of animals. The compliance with the European Groundwater Directive (2006/118/EC) and the Nitrates Directive (1991/676 EEC) however was high. On-site controls in 49 agricultural businesses did not find any infringements of the Groundwater Directive and only one case of non-compliance with the Nitrates Directives (LUMV, 2011, p. 30). This is surprising, considering the unsatisfying status of surface water bodies in M-V.

Even if the surface water quality has improved since the 1990s, nutrient discharges from agricultural land are still very high and thwart marine and riverine ecosystems. There is a plethora of environmental provisions on the European, national and state level concerning the protection of the environment as well as of groundwater, surface and coastal water bodies. However, the actual contribution of these regulatory provisions to the improvement of water bodies and natural habitats has to be discussed as they often lag behind their ambiguous goals. A report from 2008 on the water quality of the GWB attested that the GWB and most of its inflows and the Strelasund are still in an unsatisfying status not complying with the requirements of the Water Framework Directive. The high load of discharged nutrients leading to the eutrophication of the entire water body is estimated to be the major threat with respect to the marine ecosystems and the spawning areas of the Greifswald Bay. A continual reduction of diffuse and selective nutrient sources in the appropriate river

catchment areas is seen as a substantive measure to improve the ecological status of the coastal waters and marine ecosystems (Bachor & Weber, 2008, p. 30).

However, at the same time, vast areas around the GWB are used for both intensive and extensive agricultural practices. Despite efforts from the agricultural sector to reduce the application of fertilizer and to cooperate with representatives from nature conservation authorities or associations, a significant improvement of the water body quality during the last years could not be achieved. The nitrogen load in coastal waters is exclusively affected by the adjacent river catchment areas. Biological assessments from 2003 to 2006 showed that especially through the Peene, the Ryck, and the Ostziese rivers high amounts of nutrients enter the Greifswald Bay. The total amounts vary across the years without showing a trend that would indicate a continual reduction (Bachor & Weber, 2008, p. 3). A high nutrient load is particularly detrimental to a variety of macrophytes that serve as spawning and nursery substrate for fish and zooplankton, especially in the inner coastal waters. High eutrophication correlates with an intensified growth of phytoplankton, leading to an increased turbidity of the water column (BLMP, 2008). Turbidity is considerably limiting the growth of macrophytes and aquatic flowering plants, especially in deeper water regions where submerged vegetation has considerably declined during the last decades (Porsche et al., 2008, p. 109; Selig, Schories, & Schubert, 2006, p. 4). Especially *Zostera marina* and *Fucus vesiculosus* have disappeared from deeper water regions (Selig et al., 2006, p. 60ff). The high concentration of various filamentous algae, such as *Pylaiella littoralis, Ceramium sp.,* or *Polysiphonia sp.,* settling between and on the seaweed is a further result of the permanent eutrophication. They bring about fast-growing, extensive algae mats causing anoxic situations. Macrophytes and seaweed as essential parts of coastal habitats are protected as valuable habitat types by the annex I of the European Habitats Directive (1992/43/EEC). However, the ecological conditions in almost all coastal water bodies are still classified as unsatisfying. My study showed that there is no shared opinion among actors with respect to the detrimental consequences of eutrophication. While especially representatives from the nature conservation and the science sector emphasized the negative impacts of nutrient discharges from agricultural land on coastal ecosystems, most of the fishery and agricultural representatives negated these adverse impacts. Instead, they underlined potential positive effects of nutrients considering them a source of food for fish and zooplankton. Representatives from the agricultural sector took quite a defensive position and argued that untreated soils would also contribute to a natural nutrient discharge via precipitation run-off. They further claimed that they are required to remain economically competitive with other agricultural producers not only on a regional, but also on a global scale.

Economic competitiveness was stated as a reason for having no alternative choice than to cultivate and fertilize as much arable land as possible. In 2007, under the pressure of agricultural associations, the width of the riparian buffer strips was legally reduced from initially seven to three meters in M-V. In cases where the spreading width of agricultural machinery is adjusted and controllable, fertilization and application of pesticides is allowed within a riparian distance of one meter (LUMV, 2008c: Sixth part §81 (3)). Riparian buffer strips largely serve to regulate water run-off and to reduce discharges of substances from diffuse sources (BMJV, 2009 §38(1)). Especially representatives from nature conservation authorities and associations strongly criticized that this provision contradicts the successful implementation of the Water Framework Directive and the Marine Strategy Framework Directive, which both aim at restoring a good ecological status and a balanced physiochemical condition of water bodies. This example shows that different management objectives within the case study were adversely contradicting each other. Respective policies seem incoherent and

uncoordinated with respect to a holistic and sustainable development in the case study area. Therefore, conflicts between representatives striving to strengthen nature conservation objectives and representatives trying to establish the basis for a competitive agriculture are already institutionalized in the regulatory framework. While there is a huge body of environmental regulations, there are, on the other hand, regulations that seem to diminish the prospects of success of environmental objectives. Thus, even if there are many efforts to improve environmental quality, agricultural interests are prioritized by reducing the width of the riparian buffer strips for competitive reasons.

In 2010, various environmental associations and foundations signed a report that emphasizes the need for a fundamental reform of the EU Agricultural Policy. Within this report signatories called for

> 'a farming sector the function of which it is not to solely produce cheap raw materials for the food industry and the energy sector in an industrial fashion, but a sector that produces food, shapes ecological intact cultural landscapes throughout, creates employment, respects animal welfare, and is serious about global development issues as well as climate protection' (German Platform, 2010, p. 5).

Farmers and representatives from farmers' associations stressed that environmental legislation could lead to competitive disadvantages with respect to their productivity and respective income. On the other hand, there are several studies assessing the additional costs arising from environmental legislation. Those studies suggest that the costs induced by environmental legislation, in general, have a low impact on the total production costs. In Germany, other cost components (e.g. higher costs for labor, arable land, and equipment) tend to have a higher impact on the full costs of agricultural production (Plankl et al., 2010, p. 173). Similarly, another study found that the costs of compliance and its impact on the competitiveness of a sector differed, depending on the agricultural products and countries. This study suggests that the hypothetical absence of environmental legislation would not lead to considerable improvements in terms of cost competitiveness. Competitiveness in terms of production costs is estimated to depend more on other drivers such as productivity, labor costs, feed prices, and other input prices (Menghi et al., 2014, p. 265ff). The existing scientific literature does not cover potential competitive disadvantages for farmers in Mecklenburg-Western Pomerania with respect to the width of riparian buffer strips. As competitive disadvantages were the major reasons to politically justify the reduction of the buffer strips from seven to three meters, it would be interesting to initiate a scientific assessment i) of the actual competitive disadvantages for farmers arising from broader buffer strips and ii) of the (adverse) environmental impacts for surface water bodies arising from a buffer strip reduction. Actually, these assessments should have been carried out before policy making and policy implementation took place.

7.5.2 The Management of Cormorants

Another example where legal provisions contributed to the intensification of conflicts between two different actor groups is the Cormorant Ordinance of M-V, which was passed in 2012. Similar ordinances were passed in the Federal States of Schleswig-Holstein and Lower Saxony. Representatives from nature conservation associations argued that the Cormorant Ordinance does not comply with legal provisions concerning existing species and animal protection laws, since cormorants could be chased in the immediate vicinity of fish ponds (300 m), which is considered a 'campaign of eradication' against this bird species (NABU, 2010). From the 1st of August until the 31st March, cormorants can be legally chased and killed. Environmental representatives strongly criticized

that this time span overlaps with breeding and rearing time. They further argued that, as of yet, there is no scientific proof of the actual damage from cormorants to fishery businesses (NABU, 2006, 2010).

On the other side, representatives from angling and fishery associations wish for a much broader range of options for a continual reduction of the population size, particular in coastal regions, in order to prevent further financial disadvantages for local fishermen. They strongly argued for options to chase cormorants in nature reserves and national parks and a general ease of existing prohibitions (LAV, 2012, p. 9). The conflict between fisheries and bird protection is prevalent in different European nations. Jepsen and Olesen published a study on the cormorant management in Denmark. They emphasized the different problems pound-net fishermen face and revealed deficiencies in the current management reality. The study showed that the actual effects of cormorants on the marine ecosystem are broadly context-specific, and cannot be classified as just black and white. Thus, there is still considerable uncertainty about the actual diet of cormorants. While some empirical studies provided evidence of significant impacts of cormorants on natural local fish populations, other studies from other areas have not found similar significant effects (Jepsen & Olesen, 2013, p. 170). Engström (2001) monitored a fish community composition/abundance before and after a cormorant colony was established. His study area was the Lake Ymsen (South central Sweden) that is known as a very important breeding and foraging area for cormorants. He found that, despite considerable fish withdrawal by cormorants, fish populations did not change in number or biomass, even if the number of breeding cormorants around the lake was high (Engström, 2001, p. 127).

Jepsen and Olesen (2013) found that there is a considerable gap between scientific and experience-based knowledge that further fuels frustration among fishermen, who feel that their concerns are being ignored in policy making (Jepsen & Olesen, 2013, p. 176). Excluding certain actors' knowledge is estimated to undermine the legitimacy of management actions (Renn & Schweizer, 2009, p. 178). Furthermore, a better scientific basis is crucial with respect to the reconciliation of the conflict. Especially fishermen report to be dependent on scientific results in order to back their claims politically and to exert political pressure to strengthen the management of cormorants (Jepsen & Olesen, 2013, p. 176). Also in my study, fishery representatives regretted that the discourse on the actual effects of cormorants on fish populations is primarily based on assumptions and that local knowledge is not taken into account, reinforcing the perception of an arbitrary decision making. Fishermen complained that their existential problems are not taken politically serious and that there are no measures of financial compensation regarding their damages due to cormorants. Jepsen and Olesen (2013) further found that there is a strong need for the development of effective deterrence instruments to prevent damage. Therefore, management plans should be flexible and adaptive, describing the purpose of the protection, while at the same time incorporating exit strategies from the protection plan when a specific population level is reached and a protective status is no longer necessary or desirable. In this context, the authors further argued for a regular evaluation of existing mitigation measures in order to ensure their effectiveness (Jepsen & Olesen, 2013, p. 177). In my study, fishermen strongly feel ignored with respect to problems they attribute to a high density of cormorants in the coastal area of the Greifswald Bay. For them, a reconciliation of the conflict is not just a question of downsizing the cormorant population. They rather requested the acknowledgement of their personal (existential) fears and livelihood conditions, which have to withstand a range of different external threats, like the growing cormorant or seal population size.

Similar to the conclusions of Jepsen and Olesen (2013), I conclude that the drivers of the conflict are much more complex than the damages caused by cormorants. Also, in the example of the Greifswald

Bay, the conflict is rather driven by conflicting perceptions of nature use and resource dependency. It is a struggle for acknowledgement – both for genuine fishery interests, but also for nature conservation interests. The steady gap between scientific knowledge and local, experience-based knowledge contributes to the conflict intensification. The conflict is institutionalized in regulatory provisions, which are perceived as unsatisfying, both from the point of view of nature conservationists, but also from the point of view of fishery and angling representatives.

7.5.3 The Management of Grey Seals

Another conflict, picked up in many of my interviews is the conflict between attempts to resettle grey seals *(Halichoerus grypus)* and harbor porpoises *(Phocoena phocooena)* in the Baltic Sea. Both species are listed in the Annex II of the Habitats Directive (1992/43/EEC). Especially small-scale coastal fishermen perceive grey seals as a huge menace to fishing activities, competing for fish, taking fish from fishing gears, and in some cases even destroying gears and fishermen's catches. On the other side, environmental conservationists aim to restore natural habitat conditions for those species. They further strive to (legally) prevent all human impacts (such as fishing activities) that are supposed to have negative consequences for both mammals. This conflict occurs in many countries bordering the Baltic Sea. Bruckmeier et al. (2013) conducted a comparative study on this conflict in Sweden and Finland and showed two different political attempts to reconcile the conflict, applying specific mitigation measures. In both case studies, especially professional small-scale coastal fishermen were shown to be exposed to financial damages due to an increasing number of grey seals.

In 2001, the Swedish government adopted a Grey Seal Management Plan to resolve the seal conflict. This management plan was the result of a long negotiation process involving different actor groups and their specific interests. It was perceived as a consensus, knowing that, in a last instance, not all actor groups could insist on their formulated demands. The management plan allowed the protective hunting to diminish the conflict between coastal fishery and seals, but limited the number to 180 kills. Hunting has been emphasized as a damage-reducing action (Bruckmeier, Westerberg, & Varjopuro, 2013, p. 32). In 2007, the Finish government also adopted a Grey Seal Management Plan, introducing mitigation measures such as protective hunting, compensation in cases of lost catches and subsidies to new trap-net models (MAF, 2007). The hunting quota is adapted each year and amounted to 685 grey seals in 2007/2008. Hunters have to have a general hunting license and an additional license for each seal they shoot (Bruckmeier et al., 2013, p. 34). Interview data in both case studies revealed a variety of different perspectives and needs among actors involved in the grey seal management. Again, fishermen were frustrated as they felt their local knowledge to be ignored in decision making, while their economical and livelihood needs were not taken politically serious. Responsible administrative units strived to reconcile the tensions between the increasing seal population and the small-scale fishery. Representatives from environmental associations had the most cautious view about seal hunting, although none of them were completely opposed (Bruckmeier et al., 2013, p. 37).

The elaboration of the grey seal management plans in Sweden and Finland was based on the involvement of different interest groups and political organizations, explicitly attempting to reconcile the tensions between the small-scale fishery and the increasing grey seal population. During the conflict it became clear that also the society as a whole benefited from mitigating the losses of fishermen, since these costs (e.g. for compensation measures) are mainly a burden to the administrative system. It was further revealed that the development of mitigation instruments is

strongly dependent on finding compromises among the different actor groups. The study showed that, in the Swedish case, nearly all actors accepted the proposed mitigation measures as necessary, even when those measures were not meeting the actors' direct interests and when knowledge about their effectiveness and cost-effectiveness was limited. The actors acknowledged that mainly coastal fishermen needed to be supported and compensated in this conflict (Bruckmeier et al., 2013, p. 41).

The grey seal population along the German coast is still moderate compared to the Swedish and Finish cases. However, the German small-scale fishery is aware of the steadily increase of the grey seal population and fears for their catches and their livelihood basis. Fishery representatives stated that they refrained from physically harming grey seals, but that they would, in no way, support their resettlement in the GWB (Nordkurier, 2014). Until now, the development of a grey seal management plan is particularly and unilaterally emphasized by environmental representatives, who strive to ensure the long-term resettlement of grey seals in their natural habitats of the Baltic. They favor alternative fishing gears and compensation measures as major policy instruments. Fishermen react skeptical as, according to their viewpoint, there are no adequate alternative fishing gears, yet, which would allow for an economically efficient fishery. The German case reveals the difficulties for finding mitigation measures in this conflict.

According to some of my interview respondents, reconciliation has failed in previous attempts to resolve the conflict, due to mutual accusations and a lack of goodwill both from the side of environmental representatives but also from the side of the fishery [N5, N9, F2]. During the first discussions with fishery representatives in 2001, nature conservation representatives acknowledged that the resettlement of the grey seals could not be realized against the resistance of the fishery and tried to encourage a mutual basis for cooperation. As a concession, nature conservation organizations claimed to refrain from promoting marine areas in which fishery was entirely excluded (BfN, 2001). The acceptance by the fishery was however low as they strongly feared their user rights to be prospectively constrained. The interests of both actor groups were presented in a non-negotiable way. Until today, the approach towards a management plan has been pushed mainly by environmentalists, without the support of fishery representatives. Furthermore, there is no political ambition from the part of the respective state ministry (State Ministry of Agriculture, Nature Conservation and Consumer Protection of M-V, LUMV) to establish a management plan for grey seals (NDR.de, 2015) or to promote artificial habitats. A petition launched via the platform change.org accused the current state minister of agriculture, environment and consumer protection in M-V to unilaterally support economic and fishery interests while neglecting environmental conservation objectives for grey seals, though they are subject to international conventions (Karlowski, 2014b).

As the Swedish and Finish examples showed, a bottom-up process that fairly involves all actor groups from the beginning of policy formulation would have had better chances to find possible options for the reconciliation of the conflict and a collective approach to the management. A mutual and fair dialogue between the various concerned actor groups and the acknowledgement of specific actor groups' needs have considerably contributed to the success of this negotiation process. As the conflict about grey seals and harbor porpoises fuels existential fears (cf. Chapter 5.5.1) within the fishery sector, power asymmetries should be mitigated right before entering into discussions. Compensation measures in Sweden and Finland were legally institutionalized and centralized within one responsible department. This could help fishermen to exercise their rights and to enhance transparency with respect to compensation measures.

7.6 Power of Actor Groups in Natural Resource Management

In this work, power has been defined as the relative capacity of network members to steer policy processes and to affect policy outcomes. Who is powerful and who is not within natural resource management was one of the guiding questions leading through different parts of this study. Different methodological approaches served to assess power from different analysis perspectives. One perspective based on the understanding of power as being inherent in an actor's individual position in the assessed policy network, therefore applying quantitative measures of social network analysis (cf. Chapter 6.2.7). The other perspective rather focused on the influence reputation – and thus the perceived power of actors or actor groups (cf. Chapter 6.1). The results of both approaches are comparatively discussed within the following subchapter to provide answers on how power is actually distributed among different actor groups in natural resource management.

The non-parametric Mann-Whitney *U* test showed that power in form of centrality values was relatively equally distributed among the group of state and non-state actors (cf. Chapter 6.2.8.2). However, considering the averaged group values for different centrality measures, interesting patterns and tendencies were revealed. In general, nature conservation associations tend to have higher centrality values than respective nature conservation authorities (cf. Chapter 6.2.8.1). This is particularly interesting as in this case the provision with formal political authority does not necessarily seem to support higher centrality values within the assessed policy network. Instead, the contrary seems to be the case in this example. This kind of asymmetry already revealed during the interviews. Most of the respondents from nature conservation authorities explained that they are heavily constrained in fulfilling their actual responsibilities due to a lack of financial and personal resources. They feel that nature conservation objectives are not politically prioritized and in some cases even cut down by adverse regulative provisions counteracting environmental goals. Nature conservation associations are, on the other hand, estimated to have a much broader scope of possibilities to act publicly and push a discourse on essential environmental objectives and respective threats by other usage claims. Representatives from nature conservation authorities estimated their influence capacities, related to natural resource management in the case study area, to be much lower than the influence capacity of nature conservation associations. Also, nature conservation associations assumed that their influence had considerably increased during the last decades, while they recognized the constraints with which environmental authorities on different political levels have to deal on a regular basis (cf. Chapter 6.1.2). The perceived differences of influence coincided with the averaged degree centrality values derived from quantitative network analysis, but negatively correlated with holding formal authority (cf. Table 52). Thus, in the case of the environmental sector, formal authorities perceived their own influence to be lower than the influence of environmental associations. However, nature conservation actors, both from associations and authorities, have, in general, more favorable positions in the natural resource management network than other actor groups. Nature conservation authorities on the municipal level have however much lower centrality values than respective authorities on higher political levels.

For the fishery sector, the situation is different. According to the averaged network centrality values, fishery authorities possess much higher scores than fishery associations (cf. Table 52). This difference is in line with the perception of representatives from both fishery authorities and fishery associations (cf. Table 39). Fishery associations have much lower centrality values than fishery authorities and at the same time perceive their average influence with respect to natural resource management in the case study area to be very low. Nevertheless, it has to be said that there are also fishery association representatives acting on the federal or European level who are much more optimistic with respect

to their capacity to influence policy making. However, fishery association representatives on the local level tend to see themselves in a rather unfavorable, powerless position. Compared to network centrality measures, both fishery authorities and associations underestimate their level of influence (cf. Table 55).

When considering the group results of nature conservation and fishery representatives, there is no evidence that higher centrality values, and thereby more favorable network positions, are interrelated with holding formal authority and the perceived influence level. In general, actors of both groups tend to perceive a lower level of influence than network analysis data suggest (cf. Table 55). In his study, King (2000) assessed livelihood strategies and natural resource access in a Kenyan coastal community dependent on income from small-scale fishery. In contrast to my previous findings, he showed that the level of formal authority *and* a favorable network position (degree centrality) coincided with the perceived level of influence in the management process. Thus, individuals that could not refer to both were ranked lower in terms of their perceived influence (King, 2000, p. 158). This interlinkage could not be fully proven within my study. Holding a formal authority is not necessarily interrelated with having favorable network positions or with a higher perceived influence level. Most of the interview respondents assigned a high level of influence to the agricultural sector, industrial usage claims, and resource extraction interests (cf. Table 55).

In my study, I have found considerable discrepancies between the averaged level of influence derived from social network analysis data and an actor group's self-perceived level of influence (cf. Chapter 6.2.8.1 and Table 55). Johnson and Orbach (2002) examined ego biases in social perceptions among actors of an issue-oriented political network, developing a management reform package for North Carolina fisheries. Including a range of political actors (legislators) and private actors, the authors found that there are considerable variations in the type of biases observed across different actor groups. While especially legislators were on average more likely to overestimate their network centrality, in contrast, private actors tended to underestimate their centrality (Johnson & Orbach, 2002, p. 306). This kind of generalized patterns could not be shown in my study. Rather, actor groups differed in their perceptions. Fishery and nature conservation representatives, both from authorities and associations, perceive their level of influence to be much lower than the expected network analysis data predict. These results may reflect an underestimation of the own influence within these actor groups. Especially fishermen and representatives from local fishery associations tended to repeat that their influence is very low and that they feel powerless with respect to policy making, which is perceives as 'authoritarian' and as a threat to their prospective existence (cf. Chapter 6.1.1). Hartung (1988) hypothesized that people use self-deception to lower their self-esteem, especially if this is to their own advantage in order to be satisfied with a position that they would otherwise perceive as unfair (Hartung, 1988, p. 2). Especially in situations where individuals have little hope of (social) advancement and conceive disparities between their actual and their desired status, they will reconcile these differences through self-deception by lowering their self-image. A downward adjustment in perception mitigates the tensions between superiors and subordinates, potentially leading to better outcomes (e.g. more willingness of the superior to support the subordinate; more emotional and social security etc.) (Hartung, 1988, p. 1; Johnson & Orbach, 2002, pp. 308-309). Thus, occupying a subordinate position and/or claiming a dependency may promise advantages that more than recoup the manipulated loss of self-assertion or self-esteem (Hartung, 1988, p. 4). Following the last argumentations, an adaptive self-perception is an unconscious process. However, Johnson and Orbach (2002) argued that deceptions may also be intentionally and consciously applied, especially in the political arena of decision making, where political actors tend to enhance their reputation. The effectiveness of non-state actors to influence policy outcomes, on the other side, may be pretty

much dependent on their capacity to convince political actors that their particular interests are legitimate and politically expedient. This relationship is similar to that described by Hartung (1988) between individuals of higher and lower status. Thus, if individuals of a lower status convincingly approach a higher status person with a lower self-perception, the higher status person may react with concessions and better outcomes in terms of more willingness to help or to support the lobbyist (Johnson & Orbach, 2002, p. 309). In my study, fishery association representatives said that they try to maintain constant contact to political decision makers and various parties on different political levels and that they hope to raise awareness for the needs and fears the fishery sector currently faces.

In contrast, agricultural authorities and associations perceive themselves to have a much higher level of influence than can be concluded from quantitative network data. Their influence level is also perceived to be quite high by almost all of the other interview respondents (cf. Table 39). Thus, 'the simple fact that an ego believes that its alter is powerful will lead it to behave as if alter was powerful, which in the end will render alter powerful anyway' (Fischer & Sciarini, 2013, p. 4). Fischer and Sciarini (2013), Brewer (2000) and Krebs and Denton (1997) argued that biases in social perception of the upward kind may increase fitness by fostering self-fulfilling prophecies. Thus, an individual's inflated view may contribute to an adaptive behavior that falls in line with the individual's perception. In most cases, individuals are not aware of their biased self-perception while their illusions about themselves may contribute to the conviction of others that their biased self-perceptions are indeed accurate (Brewer, 2011, p. 1; Fischer & Sciarini, 2013, p. 4; Krebs & Denton, 1997, p. 28).

Also, representatives from spatial planning authorities perceived their own influence to range between a medium and high level, while network analysis data rather suggest that their influence is on a low to medium level since they occupy rather unfavorable network positions (cf. Table 55). The opinions of scientists regarding their influence level are quite dispersed (cf. Chapter 6.2.8.1). The self-perceived level of influence ranges between a low and high level. This opinion is apparently influenced by the 'position' or the prior 'career' of the scientist. Scientists in high positions tend to assume a much higher influence of science in policy making than scientists in the early stages of their career.

7.7 The Science-Policy Interface, Decision making under Conditions of Uncertainty and the Inclusion of local Knowledge

Science-policy interfaces are critical in shaping environmental policy making (Koetz et al., 2009; UNEP, 2015). They reflect the relationship between scientists and other actors in the policy process and 'allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision making' (van den Hove, 2007, p. 824). This thesis assessed the interaction between different actors or actor groups involved in natural resource management (cf. Chapters 6.2.1 to Chapter 6.2.6 and Chapter 7.2). One particular analysis focus that is treated in this chapter is the specific interaction between scientists and policy makers that are either engaged in research on natural resources or in context-specific decision making. In several of my interviews, various decision makers, involved in environmental management processes on different political levels, emphasized that there is an obvious gap between policy or decision making and science. On the other side, scientists feel that there is no translation of scientific knowledge into policy-relevant knowledge and policy knowledge into science-relevant knowledge.

In their study on the role of scientific representatives and research institutions in the policy process, Ingold and Gschwend (2013) found that scientific experts may have very different positions, depending on how conflictive or consensus-oriented the relations among actors and coalitions are within a policy-subsystem. They compared Swiss energy, climate adaption, and regional natural park policies and showed subsystem-specific factors impacting whether scientific representatives act at the periphery of the process or as policy brokers seeking stability and feasible policy solutions. Unitary subsystems with a high level of agreement among actors on certain policy issues led to a rather peripheral importance of science. The more conflictive the subsystem, the more crucial was the role of scientists and the better was their embeddedness into the policy network, marked by high betweenness centrality values (Ingold & Gschwend, 2013, p. 22). These findings could not be verified in this thesis. The betweenness centrality values of scientific institutions and associations are much lower than compared to the other actor groups' values (cf. Table 53). Scientific institutions are rather peripheral within the policy network, even if there are various serious conflictive issues among different actor groups impeding mutual cooperation. However, the betweenness centrality values are highly dispersed among the different research institutions. One fishery research institute (the TI-OF; Thünen Institute of Baltic Sea Fisheries) with a high individual betweenness centrality has a quite intermediary position, especially between the fishery and the nature conservation sector (cf. Table 51). This institute seems to be an important bridge between current scientific research and policy making.

Environmental decision making has to cope with an immense complexity of socio-ecological systems. As of yet, many ecosystem relations cannot be fully, scientifically explained while divergent human dependencies and anthropogenic pressures on specific ecosystem services require an adequate management of natural resources to avoid environmental harm. Scientific uncertainties lead to situations where traditional quality-control mechanisms are replaced by extended peer communities (Ravetz, 2006, p. 276). The sustainable management of various fish stocks and impacts of human uses on marine ecosystems contain considerable uncertainties. In the interviews of this thesis, many (fishery) scientists stated that it is difficult to provide a single easy scientific answer explaining highly complex ecosystem interdependencies. On the other side, many policy makers require exactly this, but realized that they have to search for ways of making decisions under conditions of uncertainty. Van den Hove (2007) addressed several theoretical problems at the science-policy intersection and normative requirements for the interfaces. Thus, one normative requirement is the acknowledgement of the current limits and the imperfection of scientific knowledge. Furthermore, a larger openness is needed with respect to many different kinds of knowledge such as scientific, local, indigenous, political, moral and institutional knowledge. Additionally, there should be more room for transparent and fair negotiation processes among standpoints (van den Hove, 2007, p. 815). During my research, it was revealed that especially representatives from regional fishery associations and fishermen feel excluded from scientific discourses. They complained that their local knowledge is not taken adequately into account when preparing management advice. They fear that fishing activities could be restricted on a precautionary basis, even if there is no scientific proof of the actual harm of these activities. In this study, the communication between scientists and fishermen was described as being difficult by many of my respondents. Fishermen feared that scientific results would result in huge disadvantages for fishing activities (e.g. fishing quota reduction, limited access to fishing grounds etc.) (cf. Chapter 5.5.3).

Another point that is important in this context is the question of guilt. Fishermen feel that they have to bear the burden of quota reduction, even if the fishing pressure is not the cause for the depletion of fish stocks. This situation is perceived as unfair (OAR, 2010). The bureaucratic manifestation of

fishery policies is another major reason for the suspicion of fishermen with respect to science and policy making. Similar results were found in a study of Dedual et al. (2013), assessing the communication between scientists, fishery managers, and recreation fishers (Dedual et al., 2013, p. 239). In many U.S. fisheries, the communication between scientists, managers, and fishermen is characterized by adversarial relationships. It was found that communication is hampered particularly by i) the disparity in how data are perceived, ii) the difference in the language used to communicate the issues, and iii) the existing preconceptions among scientists and fishermen. Even in cases where scientists, fishermen, and policy makers agree on the available data, they may potentially disagree about interpretations, hypotheses, and implications. Fishermen are particularly concerned about the survey data, especially when TACs are lower than they expect them to be. Survey data are the ones that fishermen can most closely relate to their own fishing activities. Thus, these data are compared with personal observations regarding a certain fish population status. Co-management arrangements and a closer collaboration and exchange are some of the proposed ideas to possibly improve communication structures (NRC, 2000, pp. 109-110).

Also in my study, some fishermen and regional fishery association representatives critically questioned the accuracy of scientific data as they perceived another picture from their daily working experiences, for instance with respect to the abundance of fish. This was especially the case in 2010 when the European Commission reduced the fishing quotas for herring in the western Baltic Sea by 30 percent for the following year. Fishermen strongly opposed this reduction and argued that the abundance of herring in the Greifswald Bay and its coastal areas was enormously high. However, this specific area is a natural spawning area and hence attracting huge schools of mature herring each spring and autumn. Thus, the perception of fishermen was due to certain seasonal concentration effects and did not take into account the overall fish stock conditions. Nevertheless, during the last years, fishery scientists have not been sensitive with respect to the inclusion of local knowledge into fishery advice on cod in parts of the eastern and western Baltic Sea. While fishermen reported that they have caught only very few adult cods and could not even complete their quota, some fishery scientists insisted on their fish stock models that showed a good ecological status of cod. Vedsmand and Nielsen (1995) argued that for a long time, the system of fishery and fish stock management has been ‘based on the assumption of the infallibility of scientific knowledge, creating conflict among fishermen and biologists, as fishermen’s indigenous knowledge is generally not used in assessing the size of the fish stocks’ (Vedsmand & Nielsen, 1995, p. 2). During the last two years, it has become clear, however, that the cod stock is outside the range that would allow for a sustainable stock reproduction. Therefore, the International Council for the Exploration of the Sea (ICES) has proposed a considerable reduction of fishery catches (TI-OF, 2014). The fishery sector publicly disapproved this recommendations (VDKK, 2014).

7.8 Methodological Limitations of the Study

There are several methodological constraints inherent in the different methodological approaches chosen in this study. These may have also impacts on the current study results.

One major constraint is related to the general nature of network analysis datasets. These datasets primarily provide a snapshot of the policy network structure at a single given moment. They do not reflect dynamic developments or prompt changes, as a time series of network data would be required for this. Also, the policy network in this study is a snapshot and includes mainly network

data from 2013. During that year, the major part of the empirical research has been conducted. However, politics and policy making may change rapidly. Also, actor relations are subject to fast changes. So far, major approaches to social network analysis have been predominantly of a static nature, putting emphasis on the descriptive characterization of structural network features or a particular defined moment. Network dynamics over a longer time period cannot be explained by means of conventional analysis methods, but by cross-sectional data, enabling comparisons through a series of fixed snapshots (J. Scott, 2013, p. 139). The research proposed in this thesis did not aim to present the dynamic development of a policy network, but instead aimed to explain actor constellations at a given moment and implications for a sustainable, coherent management of natural resources in the case study area.

Furthermore, it has to be taken into account that network analysis constitutes an exclusively quantitative approach to measure interaction between actors of a network. However, quantitative network analysis alone does not specify qualitative aspects of actors and their personal role or motivation within a network. Thus, e.g. a high betweenness centrality, does not indicate whether an actor acts out of altruistic reasons, linking other actors with each other and facilitating resource flows within the network, or whether the actor uses his position to manipulate or distort resource flows by selective dissemination (Hauck, 2010, p. 24). Knowledge about the quality of a link between two actors is not automatically captured by network data retrieval as long as there are no simultaneous qualitative data gathered during the interviews. Therefore, it is necessary to look at the actors themselves and to study their motivations as active (or non-active) agents (Bierschenk, de Sardan, & Chauveau, 2002, p. 20). In my study, a mixed-method research design was applied. Thus, quantitative network data were complemented with qualitative interview data to allow meaningful interpretations with respect to the role of individual actors in the network. Therefore, actors were asked to explain their linkages to other actors in the network – specifying i) the frequency of the contact, ii) the reasons for the contact, and iii) their personal appraisal of the focused contact partner. These questions are sensitive, particular in cases where the relationships among actors are characterized by conflictive issues. In many cases, respondents also talked about missing linkages that, in their eyes, would have been desirable. Through the application of a multi-method research design and a continual methodological triangulation, the validity of the results could be enhanced. What remained critical, however, especially with respect to the application of inferential statistics, are the low total sample sizes. Thus, e.g. when testing for median variability in actor groups, results are likely to be distorted by low sample sizes. It is clearly indicated, if such distortions have to be assumed for certain results in this work.

Another problem I encountered during this research is inherent in the gathering of sociometric data in face-to-face interviews. In my interviews, respondents had to spontaneously list all their professional regular contacts. However, in general, there are some contacts that are more salient than others. Especially retrospective network data are decreasing in reliability, dependent on the length of time that has passed between the interview and the queried event or interaction. It is harder for respondents to accurately remember contacts and interactions distant in the past, as these memories diminish exponentially with time (Bernard, Killworth, Kronenfeld, & Sailer, 1984, p. 509; Bradburn, Sudman, & Wansink, 2004, p. 67). Hence, ‘forgetting proceeds as a simple power function of time’ (Wixted & Ebbesen, 1991, p. 413). Furthermore, the tendency of forgetting increases with an increasing network size (Bell et al., 2007, p. 289). In my study, I explicitly asked for *regular*, and hence salient, contacts on issues related to the GWB and its coastal areas. Thus, I can proceed from the assumption that contacts that were not recalled are weaker in their essence than

those that were remembered by the respondent spontaneously. The quality and accuracy of network data is comparatively higher for close and strong ties than for distal and weak ones because informants are more likely to forget weak ties than strong ties (Brewer, 2000, p. 29; Campbell & Lee, 1991, p. 215; K. White & Watkins, 2000, p. 341). There is a higher probability that interactions that are characteristically less salient or absorbing tend to be accidentally omitted or forgotten by respondents, such as telephone calls or day-to-day communications (Bell et al., 2007, p. 283). In this study, the focus was on the stronger relations as they reflect long-term behavior among the network actors and thus, provide more reliable data on actual interaction. With this in mind, forgotten contacts do not play such a big role for the reliability of network data in this study.

Especially during the interviews and the roundtable discussions, I faced the challenge that there are many obvious and latent conflict issues shaping actor relationships. This fact complicated different research steps, e.g. the invitation of actors from different actor groups to roundtable discussions that were part of the empirical research in this thesis. The conjoint formulation of recommendations was a highly sensitive process, and it was a struggle to avoid an actor group's suspicions or mistrust.

The assessment of power structures within actor relationships was another potential source of constraint that may have had impacts on this study's findings. Thus, the meaning of 'power' or 'influence' may differ in the perceptions or understandings of the respondents. Therefore, it is not guaranteed, and even unlikely, that researcher and respondents share the same definition of power (Wolfinger, 1960, p. 638), if no precise and clear definition is provided to the respondents, explaining what is actually meant with the terms power and influence in the context of the research. Also, Knoke (1998) stated that analysts should take into account that respondents might apply divergent standards and multiple scaling dimensions for rating the most or least influential actors in the network (Knoke, 1998, p. 508). He emphasized that actors, who are similar with respect to their interests and who share similar information flows, will more likely refer to similar evaluation criteria. Thus, the fewer the common recurrent connections and experiences among social actors, the more respondents will differ in their perceptions and evaluation criteria (Knoke, 1998, pp. 514-515). To avoid different understandings of what power or influence actual meant, comprehensive explanatory definitions were provided in the interviews by the researcher. Nevertheless, other aspects might have played an important role, influencing the adopted evaluation criteria for influence reputation. The respondents' psychological dispositions, ideological beliefs, and interpersonal socialization, for instance, may have led to an underestimation or exaggeration of another actor's/actor group's influence. Thus, respondents who are more deferential to authority probably exaggerate an authority's influence, while those who are inclined to dispute authority and its steering capacity are more likely to emphasize the influence of marginalized actors (Knoke, 1998, p. 528). These effects could not be considered in this study.

Using 'snowball sampling' to define network boundaries may raise another problem, since the sample is distorted by the persons the researcher initially approaches (J. Scott, 2013, p. 46). Had the researcher initially chosen another set of respondents, the subsequent composition of the sample could have looked very different (Prell, 2013, p. 67). Whole subsets of actors might be missed, if they are not somehow connected to the starting point of the researcher. During the research for this thesis, I passed through several initial phases of snowball sampling, asking different sets of actors to designate people who should be included in this research.

Furthermore, it should be kept in mind that a researcher's own background and personal experiences considerably shape the researcher's interpretations of the research phenomenon. The data and the subsequent analytical process are substantially influenced by the theoretical lens the researcher choses to explore the research questions and the strategies that are applied in order to gather or construct data. Furthermore, data analysis and results are to a huge extent dependent on the researcher's appraisal on what may count as pertinent or important data with respect to the research questions (Thorne, 2000, p. 68). Thus, assumptions and interpretations that are made during the course of a qualitative research 'cannot be separated from [the respective researcher's, F.L.] background, history, context, and prior understandings' (Creswell, 2007, p. 39).

8 SUMMARY AND CONCLUSION

8.1 Fragmented Management and the Institutionalization of Conflicts

The central aim of this research was to answer how actors involved in natural resource management in the Greifswald Bay succeeded in developing (policy) networks and strategies to mitigate negative effects of institutional fragmentation and whether this contributed to the improvement of the ecological conditions in this area. The following chapter summarizes the major findings and provides some general conclusions. Concluding remarks in the last section present some ideas on how a sustainable, coherent natural resource management in the case study area could prospectively be strengthened.

The region of the Greifswald Bay covers highly vulnerable marine and terrestrial ecosystems and habitats for endemic plants and animals. It is one of the major spawning grounds for the western Baltic spring spawning herring, which is at the same time of crucial importance for the regional coastal small-scale fishery. Moreover, the region is distinctively shaped by a long tradition of anthropogenic uses and dominated by agricultural land use. The juxtaposition of protection needs to ensure ecological sustainability in the case study area on the one hand, and the diversity of divergent human usage claims on the other hand, evinces the need for the implementation of a coherent and effective natural resource management.

The research in this thesis suggests that the institutional framework for policy making with respect to natural resource management is substantially fragmented. Management decisions are made in separate sectoral policy subsystems that follow their own separate laws and interests, but in most cases neglect a holistic management perspective. A variety of different environmental policies on different political levels document the efforts to preserve natural resources in the case study area and to establish ecological sustainability. However, major environmental problems have not been tackled as of yet. There are still huge amounts of nutrients being discharged into the water body, affecting biodiversity and damaging marine ecosystems in the Greifswald Bay. Furthermore, many different state and non-state actors have been identified, who pursue divergent interest with respect to the protection and the use of the Greifswald Bay and its coastal areas. This situation of competing usage claims has led to conflicts between different actor groups that were found to considerably impede cooperative approaches to the natural resource management in the case study area.

To summarize: The policy analysis revealed that the improvement of the ecological conditions in the Greifswald Bay and the support of ecological sustainability are considerably impeded by conflicting policy objectives. Several environmental policies, such as the Nitrates Directive (1991/676/EEC), the Water Framework Directive (2000/60/EC), or the Marine Strategy Framework Directive (2008/56/EC) emphasize the need to reduce detrimental discharges into surface water and groundwater bodies as well as coastal waters. All of these policies problematize the persistent high discharge of nutrients from agricultural land as one of the major causes threatening marine ecosystems. Instead of taking concerted action to mutually develop an effective strategy to diminish these discharges into the water bodies, the width of the riparian buffer strips was legally reduced from initially seven to three meters in 2007, giving into the pressure of the agricultural lobby, which argued to suffer considerable competitive disadvantages otherwise. However, studies showed that, in general, environmental regulations have only a low impact on the actual cost competitiveness of farmers in M-V, which

rather depends on other cost components (e.g. higher costs for labor, arable land, or equipment) (cf. Chapter 7.5.1). This example suggests that some interests are politically more powerful and prioritized according to their potential economic outcome. In this specific case, it seems as if sectoral interests – namely the interests of the agricultural lobby - determine policy making. Therefore, the conclusions of Hessing et al. (2005) in their study on environmental management in Canada can be supported: 'The institutional and economic advantage of actors with financial interests in resource activities typically exceeds that of those representing non-financial interests' (Hessing et al., 2005, p. 113). In this work, several other examples were analyzed, providing evidence that different policies adversely constrained each other. Thus, management conflicts are institutionalized by a management that is inconsistent in itself and a product of sectoral interest representation (cf. Chapter 7.5).

All of the environmental policies that were mentioned above emphasize the need for a transparent and harmonized legislative framework contributing to the coherence of policies. Moreover, they promote a better integration of environmental concerns into other policies, such as the Common Fisheries Policy, the Common Agricultural Policy, and other relevant Community policies. The policy analysis in this work showed that environmental concerns are actually already integrated in most of these policies. The compliance of agricultural practices with environmental standards is financially rewarded by subsidies. Financial losses arising from the implementation of agri-environmental measures are partly or fully compensated. Comparative studies showed that direct payments in the form of subsidies are an effective incentive for farmers to comply with health, environmental, soil, and animal welfare standards. In general, there is a high compliance with the European Groundwater Directive and the Nitrates Directive. Nevertheless, high nutrient discharges from agricultural land are still found to be the major reasons for an unsatisfying quality status of surface water bodies. This example suggests that even a huge body of environmental provisions and the steady integration of environmental concerns into other policies and policy fields remain ineffective regarding the proclaimed ambitions to improve marine and coastal ecosystems. Therefore, environmental regulations seem to be inadequate and insufficient in their scope in terms of an effective management that is able to tackle the existing environmental problems in the case study area.

Only a reasonable cross-sectoral coordination of policies can facilitate a coherent management practice, enhancing environmental sustainability and at the same time social and economic conditions. Coordination requires a genuine communication and cooperation between the different actor groups. However, network analysis revealed that communication and cooperation primarily takes place *within* an actor group but seldom *between* different actor groups. Thus, there is no permanent intergroup dialogue that could strengthen the basis for conjoint and coherent management practices in the case study area. Several actor groups feel marginalized and ignored in policy making. They explained that their existential fears and needs are not adequately acknowledged. A continual dialogue between the different actor groups is further impeded by a lack of mutual trust. Trust, however, is an essential asset facilitating interaction and cooperation among different actors. Actor relationships are overshadowed by mutual preconceptions and a certain fatigue regarding a further cooperation. The insistence on maximal demands, a lack of sympathy, and a steady collision in meetings were further identified as reasons for an insufficiently conjoint and harmonized management approach in the Greifswald Bay.

To answer the central question having been in the focus of this thesis: Yes, actors involved in natural resource management in the case study area have developed network structures. However, these

structures do not contribute to the mitigation of adverse effects of institutional fragmentation. Instead, they are rather a reflection of this fragmentation. Several of the most pressuring environmental problems in the case study area have not been tackled as of yet.

The reasons for this have already been discussed above but are briefly summarized in the following list:

- Sectoral policy making and conflicting policies
- High transaction costs through a large number of actors impeding holistic coordination
- Financial constraints and a lack of adequate staffing
- Variety of divergent actor groups' interests regarding prospective management strategies
- Lack of coordination and cooperation between different actor groups
- Conflicts and (perceived) power asymmetries characterizing different actor groups' relationships
- Rigid management plans, which are not regularly (re-)evaluated
- Existential fears and needs impede options for finding compromises
- Insistence on maximal demands, lack of mutual trust and willingness to cooperate
- Personal hostilities
- Lack of (central) coordination mechanisms supporting coherent management practices
- Lack of professional mediation
- Conflicting perceptions of nature use and resource dependency
- No shared understanding of the problem
- Struggle over acknowledgement
- Gap between scientific knowledge and local, experienced-based knowledge
- Weak science-policy interface
- Prioritization of interests promising economic outcomes

8.2 Strengthening sustainable Management Practices

There are several policies that try to effectively strengthen the coordination among different policy fields and actor groups. The State Development Program for M-V (LEP) from 2005 and the National Strategy for an Integrated Coastal Zone Management (ICZM) from 2006 are two examples. Both emphasize the need for policy tools that facilitate coherence between sectoral policy objectives and that particularly pay attention to prevent the enforcement of individual or partial actor groups' interests. This goal implies the replacement of a sectoral management perspective in favor of a holistic management approach. Both policies support a strong stakeholder participation, coordination, and transparent communication to unbureaucratically integrate conflicting interests into (marine) spatial planning and coastal management. These measures are supposed to help achieve conjoint agreements and a shared responsibility among the different actor groups. In 2014, the revision of the LEP has started and is not yet finally concluded. Several hundred statements from different individual actors and actor groups were brought forward to be taken into consideration in the upcoming LEP. An evaluation of the actual capacity of this policy document to solve prevailing usage conflicts cannot be given in this thesis, as the procedure is still in progress. The Voluntary Agreement on Nature Conservation, Water sports, and Angling in the GWB and Strelasund established in 2004 is another policy approach in place that strives to build consensus between different resource users, primarily aiming to combine nature conservation goals with the sustainable and thus temporarily restricted use of certain areas.

The research in this work found that the effective implementation of coherent management practices depends considerably on the support of all actors involved in natural resource management. Trust-building efforts can help reestablish a basis for respectful and constructive dialogue between different actor groups. Professional mediation is therefore seen as an important mean to initiate the reconciliation of different actor groups and to facilitate their rapprochement and prospective cooperation. During this research, it was revealed that such an approach must consider the different fears and needs that actors connect with possible management options or prospective changes. A lack of acknowledgement and an ostracizing policy-making process driven by sectoral interests may result in an actor group's opposition, hampering the implementation of the policy decisions. The sustainable and coherent management of natural resources depends on the elaboration of a shared compromise and a mutual agreement on prospective goals. This also has to be considered with respect to the implementation of environmental objectives in order to achieve ecological sustainability. The insistence on maximal demands will very likely provoke the failure of those negotiations. This was convincingly shown in the Finish and Swedish examples of the development of a grey seal management plan. The development of mitigation instruments was strongly dependent on finding compromises among different actor groups, who accepted the proposed measures as necessary, even when these measures did not meet the actors' direct interests. In the context of negotiations, it should be recognized that there might exist power asymmetries that disadvantage certain actor groups and marginalize their interests in policy or decision making. In most cases, the perceived disadvantageous access to resources or the policy-making process hinders collective management approaches.

Policy and decision making that intends to implement sustainable approaches to the management of natural resources has to cope with the high complexity of socio-ecological systems. However, many ecosystem interrelations cannot be fully explained; neither can human impacts on these ecosystems. To avoid the further degradation of natural resources and to prevent environmental harm, management decision should take these uncertainties into account. A greater openness towards the integration of different kinds of knowledge, such as scientific, local, political, or moral knowledge into the management process should strengthen the basis for cooperative approaches as actors feel themselves recognized in their position as resource users or managers. This may further lead to an improved policy-science interface, which was found to be relatively weak in the case study area. The genuine involvement of actors in management decisions may create a shared responsibility among the different actor groups, which, in turn, may support the sustainable development in the region.

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Hiermit versichere ich, dass ich die vorliegende Dissertation selbständig, ohne unerlaubte Hilfe Dritter angefertigt und andere als die in der Dissertation angegebenen Hilfsmittel nicht benutzt habe. Alle Stellen, die wörtlich oder sinngemäß aus veröffentlichten oder unveröffentlichten Schriften entnommen sind, habe ich als solche kenntlich gemacht. Dritte waren an der inhaltlichen Erstellung der Dissertation nicht beteiligt; insbesondere habe ich nicht die Hilfe eines kommerziellen Promotionsberaters in Anspruch genommen. Kein Teil dieser Arbeit ist in einem anderen Promotions- oder Habilitationsverfahren durch mich verwendet worden.

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