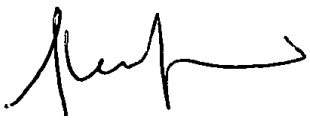
THESIS APPROVAL

[This document must be submitted by the student within the thesis document]

I, ALESSIO SURIAN as supervisor of the student Minea Mäder, hereby APPROVE the thesis entitled "Analysis of the co-production of knowledge in the project “Participatory Modeling for Nature-based Solutions in the WIO-Region”.

Padova, 7TH SEPTEMBER, 2023

Signature 

UNIVERSITÀ DEGLI STUDI DI PADOVA

DIPARTIMENTO DI INGEGNERIA CIVILE, EDILE E AMBIENTALE

Department Of Civil, Environmental and Architectural Engineering

International Master's Degree in Sustainable Territorial Development:
Climate Change, Diversity and Cooperation

Master Thesis

Analysis of the co-production of knowledge in the project "Participatory Modelling for Nature-based Solutions in the WIO-Region"

Supervisor:
PROF. Alessio Surian
Co-supervisor:
PD Dr. Hauke Reuter

Candidate: Minea Susanne Mäder
Registration number: 0021004115

Table of Contents

Abstract

Recent literature suggests that co-production of knowledge is a relevant approach to address the complexity of current sustainability challenges. It aims to transform traditional research into a transdisciplinary and more inclusive process that addresses issues such as power relations, the usability of research findings for local stakeholders, and the incorporation of different epistemological traditions. However, success is not always given, and researchers often face a number of challenges. To examine these challenges, I analysed the co-design phase of the "Participatory Modelling for Nature-Based Solutions in the WIO Region" project conducted by the ZMT (Leibniz Center for Tropical Marine Research) in collaboration with the IMS (Institute of Marine Sciences), the IHSM (Institute of Fisheries and Oceanography), and the Ministry of Fisheries. Using a case study approach, I focused on two workshops and their contexts in Toliara, Madagascar, and to a limited extent Mafia Island, Tanzania. To collect data, I used a mixed methods approach including interviews with organisers and participants, questionnaires, and participant observation with multiple sources of evidence. Applying qualitative content analysis allowed me to elicit the most important themes regarding peoples' perceptions of the PaMo project, co-production of knowledge, and the current state of coastal management as well as the inclusion in decision-making. I also embedded my findings in the broader theoretical discourse on the co-production of knowledge. To embed my findings into a broader theoretical discussion I also conducted a literature review.

Preface

This thesis serves as an analysis of the co-production of knowledge in the PaMo (Participatory Modelling for Nature-based Solutions in the WIO-Region) project and the contexts in which it operates. I explore how different actors, especially organisers of the PaMo project, understand co-production of knowledge, and how it is applied throughout two workshops, one in Toliara, Madagascar, and one in Mafia Island, Tanzania. Furthermore I analyse different perceptions of strengths, weaknesses, opportunities and threats regarding co-production of knowledge in the PaMo project as well as regarding the current state of coastal management and inclusion in decision-making. This also serves as a support and evaluation for the project organisers, helping them to make the process more inclusive and equitable, and to adapt it to the local context. In doing so, I also contribute to filling a gap of empirical examples of projects using a co-production approach and hopefully help other projects by demonstrating how in this case certain obstacles have been or could be overcome and stimulate deeper reflections about various aspects surrounding it.

I've never really found myself in a discipline, as I find it difficult to concentrate on details while ignoring factors surrounding them. My inquisitiveness and desire for understanding things holistically is too great for that. This drew my attention especially to the issue of transdisciplinarity and at some point also to the co-production of knowledge. In my opinion, the creation, application and exchange of knowledge is by far the most powerful thing we have as human beings in this world, and as Sir Francis Bacon (1597, as cited in Azamifrei, 2016, p.1) said: "Knowledge itself is power", but attention must be paid to how this power is handled. It is time for knowledge (as well as science) to become more responsible, inclusive and equitable. And while my contribution to this goal may be limited, I at least appreciate being part of this positive development, and perhaps inspiring others to join it too. And what could be more interesting than understanding people and their ways of navigating in this complex world, their interactions with each other but also with their environment? Reflections about these aspects always also result in self-reflections including questions of how do I want to be in this world? What contribution can I make? How do I want to engage with my surroundings? What can I do better?

Throughout my thesis I did not only learn specific aspects about the local contexts, coastal management and international research collaboration, but also how to use different methods. In particular, doing participatory observation was highly interesting and rewarding for me and challenged me to engage in self-reflections. Furthermore, I learned how to be adaptable, as many of my original plans due to various circumstances didn’t work out and I had to find new ways of approaching certain issues.

This journey of research and writing has been a truly transformative experience for me. Especially my time in Toliara allowed me to immerse myself in a very new and interesting culture and get to know people personally. I was delighted with how much hospitality and openness the local people met me with although I was still what they call a “vazaha”.

Yet, throughout the process I encountered various challenges, from infrastructural issues such as power cuts, lacks of phone connection, practically impassable roads, and a lack of running water, to weather conditions including extreme heat, sometimes above forty degrees celsius, or a cyclone, to language barriers and health issues. In some instances, I also had to adjust my eating habits from vegetarian to pescetarian. However, I have grown incredibly academically and personally throughout these challenges. Experiencing local realities first-hand allowed me to grasp the local context even more.
After all this having been said, I invite readers to join me on this journey and explore the findings and insights I am presenting in the following pages.

Acknowledgements

I would first like to thank my main supervisor Alessio Surian, professor at the University of Padua who guided me through the process of this thesis. I greatly appreciated his availability, his comprehension and empathy when things went wrong, and his interesting theoretical contributions and literature recommendations. My deepest appreciation also goes to Dr. Hauke Reuter, my co-supervisor from ZMT, who accepted me into the PaMo project and made this thesis possible. He greatly helped me fight my way through the bureaucratic and organisational jungle. A special thanks goes to Jane (Fanjanirina Jane Flavienne), my Malagasy roommate, friend and my co-worker at IH.SM who welcomed me with open arms in her home during my stay in Toliara, introduced me to her friends, and brought me closer to the Malagasy culture (especially Tsapiky) food and language (misaotra). She was also there for me, when I fell sick. The same applies to Mihary Rabearison, another Malagasy friend and co-worker at IH.SM. Without him probably more than half of my field work and data collection wouldn't have been possible. He introduced me to interviewees, helped me with translations, made the field trip to Anakao possible and shared a lot of information about the local context with me. I also thank Marcellin Tsihoboto for bringing me into contact with interviewees and Mr. Melan which made my stay in Sarodrano possible. I am further thankful for Nomena Tahiana and her spontaneity to accompany me to Sarodrano to help me with translation (and rowing the Pirogue). Furthermore I want to thank Mr. Melan who hosted me and Nomena in his home in Sarodrano and introduced us to his lovely family and finally the whole town. And lastly, the by far biggest gratitude is due to my mother Bettina Mäder-Schwere, who in the first place discovered this study program and set everything possible in motion so I can realise my dreams. And although we haven't seen each other much in the last two years, she has always been there for me, unconditionally.

1. Introduction

Now more than ever, we are confronted with global social and environmental challenges or the so-called "wicked problems" (Pohl et al., 2010; Malmborg et al., 2022; Djenontin & Meadow, 2018). A transformation towards sustainability isn't merely a choice, but an ethical imperative. To achieve sustainable development, we need new forms of coexistence and cooperation. To find solutions to those complex problems, we need new forms of knowledge production, new ways of doing science (UN Global Sustainable Development Report, 2019, p.113). While traditionally confined to disciplinary boundaries, following universal and standardised procedures, science is now increasingly charged with social and environmental responsibility and we need to ask ourselves, what kind of science is needed and appropriate to meet the challenges of our time (Gibbons et al. 1994, 2-3; Kates et al., 2001, as cited in Schneider et al., 2019, p.1). Given the urgency of these challenges, we cannot longer afford following "business as usual" science which engages in linear knowledge transfer separating knowledge producers and users, and claims for rational objectivity, and thereby ignoring the diversity of realities as well as perpetuating existing power differences and epistemic injustice (Miller & Wyborn, 2020, p.89; Hacking, 1990, p.160-169) .

A relatively new approach having its roots in action research dares to take on these complex challenges. We are talking about co-production of knowledge. Despite the vagueness of the term, there are certain characteristics that differentiate it from more traditional research paradigms. Co-production usually crosses boundaries of different epistemological traditions (Howarth et al., 2022, p.2), enters the world of transdisciplinarity (Bremer & Meisch, 2017; Norström et al., 2020; Godemann, 2008), engages in contextualisation while demanding a greater (self-)reflexivity of the research partners to produce actionable knowledge to address the real-life problems of our time (Norström et al., 2020, p.3; Vincent et al., 2021, p.38; Cunliffe, 2003, p.985). It shouldn't only address questions of power imbalances, but also find ways how existing power structures within the knowledge production process and the context in which it operates could be challenged to achieve greater equality, transparency and legitimacy (Vincent et al., 2021, p.49; Jagannathan et al., 2020, p. 23, Gaventa, 2006, p.23-27) . This has been recognised by many scholars as well as by the UN 2030 agenda for sustainable development (UN Global Sustainable Development Report, 2019, p.113).

However, its context-dependent, dynamic, and transdisciplinary character make a clear definition difficult and there is no perfect recipe to a successful co-production of knowledge. With my thesis, I aim to fill a gap in empirical examples of the practical application of co-production of knowledge, and more specifically in coastal management, and participants' perceptions of it. Deliberately, I restrain from presenting a precise definition of co-production of knowledge in this thesis, but drawing on descriptions of various scholars, I use multiple concepts and analytical lenses to assess a project using a co-production of knowledge approach (Bremer & Meisch, 2017, p.13).

The case study mentioned above relates to PaMo (Participatory Modelling for Nature-based Solutions in the WIO-Region), a collaborative project between a German research institute, ZMT (Leibniz Centre for Tropical Marine Research), a Tanzanian research institute IMS (Insititute of Marine Sciences, University of Dar es Salaam), a Malagasy research institute IH.SM (Institut Halieutique et des Sciences Marines) and MFBE, the local Malagasy Ministry of Fisheries and Blue Economy (*MeerWissen*, n.d.). The project originates from MeerWissen, an African-German initiative aiming at creating multi-stakeholder partnership projects for Marine Conservation and Sustainable Fisheries. The PaMo project was created to address major threats to East African coastal ecosystems and local livelihoods with the provision of a decision-support tool for policy makers, namely participatory modelling for the planning and implementation of nature-based solutions. The models should include the perspectives and outcomes for all relevant actors in the field depending on different management scenarios. For the project, it was relevant to include a process of co-production where different kinds of knowledge should be included outside of traditional scientific knowledge. This was planned to be done with several workshops, where issues, connections between different aspects and actors, and possible solutions should be identified.

For my thesis I didn't form an active part of the project, but I was able to follow the project closely in its co-design phase including preparatory online as well as in-person meetings, two workshops, one in Toliara, Madagascar and one in Mafia Island as well as another project called LeNa Shape about ex-ante impact pathways in which project organisers participated. Also, after the workshops I was able to conduct field research around Toliara. With my work I am aiming to assess what the participants' and especially the organisers perception of the concept of co-production of knowledge is, shed light on the co-production of knowledge's strengths, weaknesses, opportunities and threats in the project, and assess perceptions of the current state of coastal management and inclusion in decision-making in the context of Toliara.

At the core of my research methodology lies the utilisation of a qualitative content analysis within a multiple case-study analysis of the two PaMo workshops and the context of Madagascar. As case study analysis allows for the the in-depth exploration of contemporary events within their real-world context (Yin, 2018, p.46) it is particularly suitable for investigating a concept as complex as co-production of knowledge and its contextualisation including a diverse set of stakeholders, from private companies, NGOs, research institutions and administration, and two very different geographical and cultural contexts.

For the data collection, I used a mixed-methods approach, including a literature review, interviews, questionnaires and participant observation with multiple sources of evidence. While semi-structured interviews with stakeholders from NGOS, private companies, administration, local networks and seaweed/ sea cucumber farmers/ fishermen and organisers allowed them to elaborate in more detail about specific issues they considered important, be it in relation with co-production of knowledge or the current state of coastal management, evaluation questionnaires for researchers and stakeholders after the respective workshops gave a more general overview of perceptions. But especially participant observation living and working in Madagascar, as well as having two field trips to Anakao and Sarodrano helped a lot

with the contextualisation and allowed for a more holistic grasp of the PaMo project as well as its role in the local context. After data collection, I applied a qualitative content analysis to elicit the most important themes, as it allows for the combination of qualitative and quantitative data, and with its human-centeredness does justice to the diversity of perspectives. Themes were then distributed in a SWOT table to highlight strengths, weaknesses, opportunities and threats.

2. Research Questions

This thesis serves as an analysis of the co-production of knowledge in the PaMo (Participatory Modelling for Nature-based Solutions in the WIO-Region) project and the contexts in which it operates. Rather than being guided by a clear hypothesis, it is based on an inductive approach. The thesis is divided into two major sections, and their research questions were as follows:

1) Examine the co-production of knowledge in the PaMo-project
    a) How is the co-production of knowledge understood by the PaMo-team?
    b) What are stakeholders' and organisers' perspectives on the strengths, weaknesses, opportunities and threats for the co-production of knowledge and more concretely within the PaMo project?
    c) To what extent do the perspectives of stakeholders and organisers align or vary?
    d) How is the PaMo project connected to the respective contexts and what are suggestions for the improvement of the co-production process by participants of the project, but also in supporting literature?
2) Explore local perceptions about the current state of coastal management in the study areas.
    a) What are local stakeholders' perspectives on the strengths, weaknesses, opportunities and threats of the current state of local coastal management?
    b) What are local stakeholders' perspectives about the current level of participation in decision-making about coastal issues?

These should not merely generate theoretical insights, but serve as a support and evaluation for the project organisers, helping them to make the process more inclusive and equitable and enhance adaptability to the local context. At the same time, findings should help to address a lack of empirical examples of projects using a co-production methodology. By offering insights into how specific challenges were or could be overcome in this particular case, I hope to support other projects and encourage deeper engagement with the multi-layered aspects of co-production approaches.

3. Literature Review - Co-production of Knowledge

In the following sections I will discuss the origins of co-production of knowledge and its most important characteristics.

3.1. The rise of co-production of knowledge - A historical trajectory

In recent years, the use of co-production of knowledge has gained significant attention in sustainability research. It is seen as a promising approach to achieve sustainable development and hence, address the complex environmental and social challenges of our time. In accordance with the 2030 agenda, the UN Global Sustainable Development Report 2019 clearly emphasises the necessity of co-design and co-production of knowledge in scientific endeavours to "solve wicked problems" (Independent Group of Scientists appointed by the Secretary-General, 2019, p. 113), in other words, the problems arising from the great complexity of socioecolgical dynamics. The report strongly advocates for the discussion of critical matters such as redistribution, an inclusive and fair energy transition and conservation at the cost of livelihoods (Independent Group of Scientists appointed by the Secretary-General, 2019p.113).

However, the concept is not novel. Whilst the actual expression of co-production of knowledge can be traced back to the 1970s and the work of **Elinor and Vincent Ostrom** (Miller & Wyborn, 2020, p. 88), its ideas and practices reach back much further into the past.

Already in the late 1930s, **Kurt Lewin**, a renowned German-American psychologist and social-scientist, introduced the concept of *action research*, a methodological approach to study social phenomena and promote social change. The practice of action research is closely interconnected with the concept of co-production of knowledge, as it emphasises the collaboration and active participation of stakeholders as well as the need to integrate theory and practice.

In "Resolving social conflict", a collection of papers that is seen as a "sourcebook in Lewinian social psychology", Lewin advocates for a novel perspective on the methodology of conducting social research. In his view, the incorporation of practice is indispensable for the relevance and effectiveness of social science: "research that produces nothing but books will not suffice" (Lewin, 1997, p.35). Lewin (1997, p.203 as cited in Rose et al., 2015, p.1) challenged the prevailing notion that prioritises "pure" science over other forms by arguing that the research required for understanding social events is equally scientific and, if anything, of higher significance: "This by no means implies that the research needed is in any respect less scientific or "lower" than what would be required for pure science in the field of social events. I am inclined to hold the opposite to be true." (Lewin, 1997, p.203) Additionally, he brings to attention the relevance of the social context in which social research is being done and questions such as "when, where and by whom" that need to be raised (Lewin, 1997, p.205). "It can be surmised that the extent to which social research is translated into social action depends on the degree to which those who carry out this action are made a part of the fact-finding on which the action is to be based" (Lewin, 1997, p.35).

One of Lewin's notable observations emerged from the Hawthorne studies, a series of experiments conducted in a factory, which indicated that workers' heightened productivity could be attributed, on one hand, to their awareness of being observed and, on the other hand, to their active involvement in the research process rather than external work conditions. Consequently, Lewin advocated for democratic participation as opposed to autocratic coercive leadership styles. According to his perspective, such participation should enhance self-esteem, independence, equality, and cooperation (Adelman, 1993, p.7). Even though the Hawthorne studies have faced criticism in their initial interpretations resulting in the promotion of a positivist research paradigm - i.e. isolating the researcher from his*her subjects in order to identify general social interaction laws - Lewin's reinterpretation from an action research point of view, greatly shaped the field of organisational behaviour and a form of research where "subjects" are called partners and considered essential to a successful outcome of a project (Coombs & Smith, 2003, p. 101, 109). For instance, he emphasised the importance of belongingness within an "in-group," wherein members feel a sense of inclusion despite potential status differences, such as those between teacher and student, researcher and the public, or doctor and patient, for a greater social acceptance of a new system of values and beliefs. Only then, education can be truly transformative (Lewin, 1997, p.67).

Later, in the 1970s, other key figures left their mark in the field of co-production. Amongst them, **Orlando Fals Borda** was one of the earliest proponents of co-production of knowledge. He was a Colombian sociologist who developed the methodology of "*participatory action research*" which was rooted in his support for social movements (Pereira & Rappaport, 2022). Fals Borda's endeavour began after the decade of La Violencia (1948-58) where hundreds of thousands lost their lives due to Colombia's political landscape. He saw social science as a powerful approach to political change and his "participatory action research" aimed at generating the necessary knowledge for it. It emphasises a shift towards a collaboration between researchers and communities to identify and address social issues with the aim of generating knowledge that is relevant and beneficial to the community members themselves. Hence, instead of doing research "about" the victims of violence, researchers should actively participate in social movements to achieve social transformation (Rappaport, 2020, p. 554). He did so, together with other actors, through the creation of La Rosca de Investigación y Acción Social (Circle of Research and Social Action), a collective of researcher-activists and indigenous and peasant grassroots organisations (Pereira & Rappaport, 2022, p.554). In the context of participatory action research, Fals Borda introduced the concept of *systematic devolution* (devolución sistemática), a deliberate and structured process of transferring power, resources and decision-making authority from centralised institutions to local communities and grassroots organisations. His concept of *critical recovery* (recuperación crítica) serves as a revaluation of marginalised knowledge through the restoration of cultural memory. It involves a process of self-reflection, self-determination and collective action (Fals Borda, 1986, p.192). Both concepts are of considerable value for the evolution of the concept of co-production of knowledge as they recognize the importance of local knowledge in shaping research agendas and creating outcomes that are relevant and effective for the local stakeholders.

Self-reflection is also a major aspect of **Paulo Freire**'s work. Freire is a Brazilian educator and practitioner who is known for his groundbreaking work on critical pedagogy which challenged the traditional education systems. In his book "Pedagogy of the Oppressed", Freire introduces the concept of critical consciousness or (in Portuguese) *Conscientização.* In contrast to the traditional banking concept of education, where people are not seen as conscious beings, but merely as empty vessels that need to be filled with knowledge, *Conscientização* aims at introducing people to a critical form of thinking about their world and to question the status quo (Freire, 2000, p.36, 75, 104). It is anchored in a process where people first start to question their living conditions, second, recognize how different their lives could be and third how this increased well-being can be reached through the utilisation of investigative methods and hence, the generation of the necessary knowledge. In this process, researchers should merely act as facilitators, and the transformation should ultimately come from the poor and marginalised people themselves (Freire, 2000 p.137). Instead of accepting their role as victims, they should gain back their agency: "And those who recognize, or begin to recognize, themselves as oppressed must be among the developers of this pedagogy. No pedagogy which is truly liberating can remain distant from the oppressed by treating them as unfortunates and by presenting for their emulation models from among the oppressors. The oppressed must be their own example in the struggle for their redemption." (Freire, 2000, p.54).

Freire's pedagogy further aligns with the principles of *social constructivism* in the way he describes education as dynamic and reciprocal process of co-creation and the meaning-making of the world. He criticises the banking notion of consciousness and its assumption of a "dichotomy between human beings and the world: a person is merely in the world, not with the world or with others; the individual is spectator, not re-creator. In this view, the person is not a conscious being (*corpo consciente*); he or she is rather the possessor of a consciousness: an empty "mind" passively open to the reception of deposits of reality from the world outside…It follows logically from the banking notion of consciousness that the educator's role is to regulate the way the world "enters into" the student…And since people "receive" the world as passive entities, education should make them more passive still, and adapt them to the world." (Freire, 2000, p.75)

At the same time, a similar social constructivist approach driven by the empirical turn was also provided through the disciplinary tradition of *science and technology studies*. Like Freire, it argued against the separation of science from its social context and its assertion of neutrality. Science and technology studies expressed the need to address power relations, especially those within scientific institutions of authority and encouraged a greater reflexivity among researchers towards their own position in the creation of knowledge. This reflexivity was considered equally important for the natural sciences, which are otherwise less concerned with social issues, as for the social sciences: "researchers argued that, if science was socially produced, the social sciences must be, too. Social variables, evidence, and facts - not to mention broader ideas about societies and markets - were as much social products as scientific ideas about nature (Hacking, 1990, as cited in Miller & Wyborn, 2020, p.89). **Hacking** (1990, p.160-169), a Canadian philosopher and historian of science, for example, raised the question of why in the social sciences it is usually the abnormal or pathological in a society that needs to be

explained, when the very definition of what normality is requires explanation. He does so in exploring some of **Durkheim's** explanations of social phenomena such as the division of labour which he deemed normal (Hacking, 1990, p.171).

Another leading figure in science and technology studies is **Sheila Jasanoff**. In "States of Knowledge " for example, she explores how ways of knowing are inseparably connected to the ways in which people seek to organise and control it, in short, the mutual shaping of science and society (Jasanoff, 2006, p.40). Bremer & Meisch (2017, p. 2) describe Jasanoff and other researchers' approach as descriptive in contrast to more normative approaches, because they use the concept of co-production as a method for interpretations.

An insight into a more epistemological approach to the co-production of knowledge is given by **Elinor and Vincent Ostrom** who also became influential figures in the 1970s. Instead of seeing co-production from a social constructivist point of view, they describe it as a de facto reality in their analysis of public administration. Ostrom's research on public service delivery shows that governments cannot deliver these services themselves, but rely on consumers to act as co-producers (Miller & Wyborn, 2020, p.89). One of Elinor Ostrom's main case studies centred around the participation of citizens in policing. She and other co-authors found that policing outcomes, such as the successful arrest of a burglar or the return of stolen property, needs both police and citizen activities to be successful. Without citizens testifying and serving as witnesses, their preservation of the crime scene and creating self-policing-programs, the crime rate couldn't have improved as effectively. Additionally, the citizen's perception of the police greatly affects their inclination to collaborate (Ostrom et al., 1979, p.7-8).

Only later, at the emergence of "*sustainability science*" as a distinct disciplinary field, which can be traced back to the late 20th century, the co-production of knowledge was regarded as an integral part of research and a normative requirement. This is not surprising taking into consideration that the concept itself aligns closely with the interdisciplinary and collaborative nature of the field, which is needed for addressing the complexity of sustainability challenges. Already early seminal works such as the Brundtland Report published in 1987 stressed the need for inclusive and participatory approaches in sustainability research by incorporating local and indigenous knowledge and the collaboration between researchers and decision-makers, but it was not explicitly referred to by the term co-production of knowledge: "Together, we should span the globe, and pull together to formulate an interdisciplinary, integrated approach to global concerns and our common future. We needed broad participation and a clear majority of members from developing countries, to reflect world realities. We needed people with wide experience, and from all political fields, not only from environment or development and political disciplines, but from all areas of vital decision making that influence economic and social progress, nationally and internationally." (Brundtland, 1987, p.2-3). Miller & Wyborn (2020, p.90) state that the exact term first appeared in a working paper from Belfer Center for Science and International Affairs at Harvard's Kennedy School of Government in the year 2000, which said that: "sustainability science must be created through the processes of co-production in which scholars and stakeholders interact to define important questions, relevant

evidence, and convincing forms of argument (Kates et al., 2000; cited in Miller & Wyborn, 2020, p. 90)"

The term was taken up in subsequent projects such as the Harvard's Global Environmental Assessment project which defined scientific assessments in terms of co-production and primarily focused on the relationship between scientists and users of scientific knowledge (GEA Project, 1997).

Early sustainability science followed a largely normative approach. While Ostrom analysed co-production, in sustainability science engaging in co-production approaches was increasingly demanded. For example, Future Earth (2020), a global research platform which was created by UN organisations and other funding agencies, established co-production as a fundamental guiding principle in its endeavour to achieve sustainability transformations, drawing on works from **Norström** and **Cvitanovic** (Future Earth). However, Miller & Wyborn (2020, p.90) warn that only focusing on its normative aspect, may mask power asymmetries. Unlike early sustainability science, co-production shouldn't serve depoliticisation, but highlight aspects of inequality and the relationship between knowledge and governance (Cash et al., 2003, p.8086; Berkes, 2009, p.1695). Nowadays, despite the tension between more normative and descriptive approaches, these are often merged (Bremer & Meisch, 2017, p.6).

Finally, I will highlight some important aspects of co-production which are mentioned among most authors and are important for the understanding of the concept as well as for a better understanding of the PaMo project.

3.2. Co-production of knowledge - a challenging definition

The co-production of knowledge yields substantial advantages in the advancement of sustainability research, as it tackles the intricate nature of modern-day sustainability challenges. Consequently, it has gained growing preference over conventional scientific approaches. However, exactly these inherent interdisciplinary and context-specific characteristics give rise to certain definitional complexities that warrant consideration. One key problem is the lack of a universally accepted definition that encompasses the breadth of perspectives and practices involved. The concept is inherently dynamic and evolves as it is applied in different disciplines and contexts. Additionally, the co-production of knowledge is influenced by power dynamics, diverse cultural and social contexts, and the specific goals and values of different stakeholders. These complexities make it challenging to establish a single, static definition. Instead, it is important to recognize the multiplicity of meanings and perspectives and to engage in critical reflections to refine and adapt the concept to specific research contexts (Bremer & Meisch, 2017, p.13).

Despite the diversity of descriptions of what co-production of knowledge is or should be, I present the denominators which were repeated several times and which seemed important for the analysis of the PaMo project.

3.2.1. Inter- and Transdisciplinarity

No less complex than the concept of co-production of knowledge is that of inter- and transdisciplinarity. Already the difference between inter- and transdisciplinarity as well as their uses are topics of debate. Yet, some of the most cited definitions for multi-, inter- and transdisciplinarity are the ones from **Basarab Nicolescu** (2010, p.22):

- *"Multidisciplinarity* concerns itself with studying a research topic in not just one discipline but in several simultaneously. From this perspective, any topic will ultimately be enriched by incorporating the perspectives of several disciplines. Multidisciplinarity brings a plus to the discipline in question, but this "plus" is always in the exclusive service of the home discipline. In other words, the multidisciplinary approach overflows disciplinary boundaries while its goal remains limited to the framework of disciplinary research.
- *Interdisciplinarity* has a different goal than multidisciplinarity. It concerns the transfer of methods from one discipline to another. Like multidisciplinarity, interdisciplinarity overflows the disciplines, but its goal still remains within the framework of disciplinary research. Interdisciplinarity even has the capacity of generating new disciplines, such as quantum cosmology and chaos theory.
- *Transdisciplinarity* concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines. Its goal is the understanding of the present world, of which one of the imperatives is the unity of knowledge.

In the case of Interdisciplinarity, Julie Thompson Klein raises the concern of how "*borrowing*", that is, taking models or concepts from one discipline and using them in another" can be problematic if the borrowed material isn't understood correctly, distorted or theories are taken out of context or taken as a certainty (Klein, 1990, p.85-88).

Nicolescu himself is a devoted advocate for transdisciplinarity. For him, the traditional, but back in time revolutionary separation of the knowing subject and Reality following an ideology of scientism, was a fatal mistake which might even "pose the potential danger of self-destruction of our species" (Nicolescu, 2010, p.21). As a consequence, he advocates for a paradigm shift that transcends the reductionist and fragmented approaches of traditional disciplines.

Even within transdisciplinarity research there are different perspectives and approaches to what it is and what it should be used for (line between philosophy and practicalities). While Nicolescu's perspectives on transdisciplinarity are of a rather ethical and metaphysical kind with notions of the lived meaning, the Zurich school, named after the International Congress, perceives transdisciplinarity as a tool for tangible solutions to "real world" problems through the linking of science, society and technology (Bernstein, 2015, p.7)

Also Julie Thompson's perspective (while also being considered rather post-modernist), aligns more closely with the Zurich school. First, Thompson places emphasis on the interdisciplinary

collaboration and the creation of collective understanding and action to address complex problems, hence having a more practical and applied underpinning while Nicolescu sees transdisciplinarity as an epistemological framework that goes beyond the limits of disciplinary thinking operating more in the philosophical sphere.

However, in all cases, no matter whether it is multi-, inter, or transdisciplinarity, the connection to co-production of knowledge is quite evident: There are many scholars who see the co-production of knowledge as a requirement for transdisciplinary research: "transdisciplinary knowledge must be socially robust and acceptable, implying co-production of knowledge through cooperation among scientists, politicians, market economists and representatives of civil society" (Thompson Klein et al., 2001, p. 220). Many (Bremer & Meisch, 2017; Norström et al., 2020; Godemann, 2008,) also see transdisciplinarity as an integral and necessary part of co-production. Howarth et al. (2022, p.4) consider the "nature of decision-making as a transdisciplinary process involving multiple people, organisations, sectors and strategies".

Also, when considering the historical development of the term and its usage, it can be observed that, similar to the evolution of co-production of knowledge, the deliberate practical application of transdisciplinarity gained popularity only with the emergence of the discourse on the global environmental crisis, even though its concept and philosophical approach had already been introduced over two decades earlier (Bernstein, 2015, p.5). Especially the United Nations Earth Summit in Rio de Janeiro in 1992 led to a critical awareness of the need for transdisciplinary research (Klein, 2001, p.36)

3.2.2. Crossing boundaries

Since the roles of academic and non-academic actors are often blurred in the co-production of knowledge, self-reflection on the positions of all actors involved in the process is necessary.

The co-production of knowledge raises the question of how to bring together different epistemological traditions and norms associated with the experiences and knowledge of different actors, and who should play what role in the process. There are two major conceptualizations of the co-production of knowledge that attempt to address this question and are linked to Mode 2 knowledge production (Howarth et al., 2022, p.2-3). Mode 2 knowledge production essentially differs from Mode 1 insofar that it shifts to a more applied form of research driven by real world-problems within specific contexts and is not confined to traditional disciplinary boundaries Gibbons et al. (1994, 2-3).

In one conceptualization of co-production of knowledge, authors involve the concept of "boundary organisations" (Pohl et al. 2010, p. 268-269).The concept refers to organisations and actors that operate at the interface between different social realms, especially between science and politics. Because linear, monologic communication of scientific results challenges the decision maker to interpret the information correctly, the roles of boundary actors are seen as mediating, collaborating, integrating scientific findings with societal needs and values, and translating them into policy decisions (Cash et al., 2006, p.465). Particularly in global

environmental governance and the quest for greater sustainability, the importance of "managing" boundaries has grown. The implementation of institutional mechanisms that work as facilitators are seen as capable of addressing complex environmental problems while promoting the production of credible and legitimate knowledge (Howarth et al., 2022, #). While “boundary work”, a concept introduced by Gieryn (1999, as cited in Guston, 2001) described how the boundary between science and non-science is defended, Guston, 2001 (p.400-401) describes how such boundaries are stabilised, contested and re-negotiated at the same time which allows for the creation of space for co-production.

Howarth et al. (2022, p.2) criticise that although the importance of boundary actors in environmental science-policy interactions has been theorised extensively, the focus has been primarily on the boundary actors themselves rather than their agency. Even though Howarth et al. (2022, p.2) analyse existing cultural, political and institutional boundaries, they also stress the need of overcoming these through the process of co-production and hence, overcome the disconnection between producers of knowledge and its users.

For example, in a case study with representatives of the Intergovernmental Panel on Climate Change (IPCC), Haworth et al. (2022, p.6) identified the roles of different actors in co-production, but also how these roles can be combined. They identified roles for policymakers and practitioners as capturing specific needs and policy-relevant areas for practitioners, for practitioners, their knowledge of best practices and requirements for implementing solutions, while scientists should contribute their expertise in methods, systems thinking, and transdisciplinary knowledge. Therefore, stakeholders should take an active role in research, rather than being passive recipients of scientific knowledge, and participate in the production of knowledge and its continuous monitoring.

A second conceptualisation of co-production is offered by Nowotny et al. (2003, p.14-30) with their concept of “agora”, representing a different perspective on space between science and non-science. Evolving from the concept of boundary organisations, the “agora” represents a metaphorical space that goes beyond traditional boundaries of organisations and institutions. Rather than seeing the need for translation between boundaries or a renegotiation of boundaries, it aims at completely blurring the epistemological boundaries between knowledge generators and receivers. The “agora” can also be seen as the space where “science meets the public” (Nowotny, 2003, p.28-30). Hence, instead of merely producing and disseminating information, science is seen as actively contributing in the process of governance (Funtowicz et al., 2000, p.335 as cited in Pohl et al., 2010, p.269).

3.2.3.Embracing the diversity of epistemologies and ontologies

Besides blurring boundaries between researchers and practitioners, epistemological boundaries are also blurred in co-production of knowledge (Howarth et al., 2022, p.8).
Co-production of knowledge embraces a social-constructivist stance that acknowledges that knowledge is shaped by the social and cultural contexts of the co-producers. It questions the positivist approach that regards science as a neutral and rational enterprise that can reveal the

true nature of reality through empirical testing and verification. It contrasts with the positivist paradigm that claims that science can achieve pure objectivity and certainty through empirical evidence and logical reasoning (Tebes, 2018, p.19; Jasanoff, 2006, p.104).

In this co-production of knowledge values multiple ways of knowing and engages in a dialogic rather than a monologic transfer of information (Howarth et al., 2022, p.8). There isn't only a difference in learning, knowing, and knowledge but also different kinds learning, such as formal, non-formal, or social, different kinds of knowledge such as cultural, local, indigenous, or tacit and different kinds of knowing such as empirical, situational or interpretive (Carson, 1990, p.168; Blackmore, 2007, p.513).

Many authors (Cash et al., 2003; Yua et al., 2022, Djenontin & Meadow, 2018) point out the importance of incorporating especially local or indigenous knowledge into the research process. Already Geertz expounded on the need to explore the rich and context-specific insights that individuals and communities possess about their own cultures, experiences and environments. Despite not giving a clear definition of local knowledge, his work is important for understanding deeper layers of human behaviour, social interactions, and their interpretations. A lot of his work relates to issues of translation between different ontologies which also individuals working with co-production of knowledge are confronted with. While indigenous or local knowledge is increasingly being recognised as valuable, researchers run the risk of using it in an extractive way, especially in the realms of traditional ecological knowledge (TEK), treating it as data that can be collected and interpreted in a generalised abstract manner. Often, only parts of it are used which can be aligned with their own systems of knowledge and which are of direct use for specific project goals (Latulippe & Klenk, 2020, p.10) In doing so, they ignore its cultural and symbolic meanings within a specific context and epistemology (knowing) is separated from ontology (being), methodology (doing) and axiology (accounting/ ethics) (Latulippe & Klenk, 2020, p.8). This in turn leads to a decontextualization and a reduced common understanding (Alexander et al., 2019, p.3-4).

Especially in the context of international and intercultural co-production projects, the creation of a common understanding can be difficult and language barriers further complicate the process (Cash et al., 2003; Howarth et al., 2022, Gibbons et al., 1994,). For example, Hall's model of communication reflects on how different cultures make use of contextual cues when communicating verbally and non-verbally. So-called "low-context cultures" expect communication to be explicit, hence communicating the exact meaning of words whereas (to mean what they say) high context cultures focus on the underlying context (and leave certain things unsaid). Hall (1989, p.85-87) refers to the movement from low to high context systems as "contexting", increasingly filtering what is expressed. Contextual cues can be gestures, tone of the words and not the words themselves. While countries such as for example China, Japan or Spain are generally described as rather high-context countries, the US, the UK or Germany tend to be described as rather low-context countries (UMOH, n.d.). Especially when individuals from low- and high context countries work together misunderstandings can occur. For example, according to Hurn & Tomalin (2016, p.7), individuals from low-context cultures wouldn't adapt what they say to the person they are speaking to as much as individuals from

high-context cultures. This might be perceived as rude by people from high-context cultures. On the other hand, as there is an increased emphasis on non-verbal cues in high-context cultures, they might value silence as a time for reflection while people from low-context cultures could perceive it as a lack of understanding and feel the need to say something to fill the "verbal vacuum (Hurn & Tomalin, 2016, p.181)

Besides trying to overcome colonial and asymmetrical power structures through co-production (Schott & Tengö, 2020, p. 1650; Zurba et al., 2022, p.445), engaging more extensively with the epistemologies and ontologies in which a project is set, can help a smoother collaboration, minimising the risk of misunderstandings.

3.2.4. Reflexivity and the role of researchers

In co-production of knowledge reflexivity is essential to improve the quality, relevance, validity and reliability of research and to assess its effects on policy and practice, and to foster mutual learning and trust among stakeholders (Redman et al., 2021; Schneider et al., 2019, p. 27)

Radical reflexivity, as introduced by (Pollner, 1991, p.370), entails what he calls an "unsettling", an insecurity regarding our suppositions, our discourse and how we describe reality. Cunliffe (2003, p.985) further states that "we need to go further than questioning the truth claims of others, to question how we as researchers (and practitioners) also make truth claims and construct meaning. This assumes that all research, positivist and anti-positivist, is constructed between research participants".

It demands from researchers to reflect about their own subjectivity and assumptions and question their representation of research partners and illuminate the relationship between research participants. Especially in knowledge co-production, it dives deeper into the dynamic relationship between researchers and stakeholders and its influence on co-production outcomes. It further requires reflections about the social and political aspects of their methodological choices, their own and research partners' interests and political influences on the research process (Orr & Bennett, 2009, p.86-87).

In co-production of knowledge researchers often find themselves dealing with an unclear or even divided identity which also requires reflection (Pohl et al., 2010, p.269). Co-production of knowledge aims to break the traditional linear relationship between knowledge producers and consumers and hence blurs the classical boundaries between the roles of academics and non-academics (Miller & Wyborn, 2020, 89). Pohl et al. (2010, 276-277) for example show in four different case studies, how researchers adopted different roles, namely the roles of the reflective scientist who provided scientific expertise, intermediary who mediated between different modes of thought or the facilitator who initiated a collective learning process. He showed that especially individuals who took on the role of the reflective scientist were able to

address challenges of power by making hierarchical relations visible and to empower non-scientific actors to contribute (Pohl et al., 2010, p.278).

In addition to the importance of reflexivity for co-production, however, co-production of knowledge itself leads to increased reflexivity. In the context of application, stakeholders, which traditionally acted outside of the scientific system, become active agents in the definition of the problem to be addressed as well as the setting of methods on how to implement its solution and its evaluation (Gibbons et al., 1994, p.7). In working together, stakeholders learn about others' perceptions, values and preferences and they need to find a way to triangulate these and create a common understanding to function effectively in combining their knowledge. This process requires an increased reflexivity (Norström et al., 2020, p.7-8).

Also in the case of researchers a greater reflexivity is inevitable. The context of application requires them to incorporate social, economic and political considerations and goes far beyond the disciplinary peer review which is mostly based on intellectual interests concerned with the advance of the discipline (Gibbons et al., 1994, p.7).

3.2.5. Co-ownership

Co-ownership is a key principle of co-production of knowledge (Polk, 2015, #). Co-ownership implies that all participants have equal rights and responsibilities in the co-production process, including defining the problem, generating knowledge, and applying solutions (Howarth et al., 2022, p.5).

Aga et al., (2017, p.528) describe how psychological ownership, so the feeling of people that they have ownership for things that they created, leads to greater sustainability, here in the sense of project sustainability according to Wood (1994 as cited in Aga et al., 2017, p.531) "a [project] which is capable of being supported and maintained by a community or individual over an extended period of time with an absolute minimum of outside assistance." Psychological ownership has a strong motivational aspect, as people care for what belongs to them. Ownership has both, cognitive (related to a person's awareness and thoughts about what is owned) and affective element (a feeling of possession that creates a sense of pleasure and competence). Aga et al. (2017, p.530) point out that especially affective aspects make individuals develop a stronger sense of ownership. According to Pierce et al. (2001 as cited in Aga et al., 2017, p.530), there are three ways how psychological ownership is established for a project: through 1) extensive knowledge and familiarity with a project, which can be achieved through participation in its initiation, design and implementation, 2) intensified self-investment in the project in terms of ideas, values, energy or time, and 3) stronger control individuals have over the project development. The third point is also related to the concept of co-leadership.

Aga et al. (2017, p.542) showed how an increased sense of psychological ownership, reached through inclusion of stakeholders at the initiation, but also at later stages of projects, positively

affects project sustainability. These are important considerations when planning the timing of stakeholder-involvement of a knowledge co-production project.

Further conditions for the creation of ownership are the enduring and wide support by stakeholders as well as their frequent evaluation of the project. Additionally, Verwoerd et al. (2022, p.8) identified the importance of adopting a similar language, the creation of a common understanding and a shared practice as pre-conditions for the creation of co-ownership. For example, developing the sensitivity of participants for scientific or right language, helps them to understand a project better and accordingly, develop a greater sense of ownership (Vorwoerd et al., 2020, P.8).

However, creating ownership also faces challenges, such as encouraging more powerful stakeholders to relinquish leadership for better collaboration and debates about property rights (Howarth et al., 2022, p.6).

3.2.6. From research to action, impact and theory of change

The co-production of knowledge goes beyond the mere production of knowledge and theoretical insights, and can result in social transformation (Norström et al., 2020, p.2).This can be either normative or constitutive component of co-production itself based on its collaborative nature (Lang et al., 2012, as cited in Schneider et al., 2019, p.27).

When putting on a normative lens, this development is connected to the rise of sustainability sciences and the growing importance of sustainable development. Instead of only understanding the interactions between humans and nature, science increasingly has the responsibility to contribute to sustainability change, as clearly stated in the UN 2030 Agenda for sustainable development (Kates et al., 2001, as cited in Schneider et al., 2019, p.1).

Co-production of knowledge actively seeks to address societal challenges and needs. Its aim is to move away from "business as usual" science which is often related to disciplinary theoretical problems and the use of academic metrics. Instead, co-production of knowledge acknowledges the social and environmental responsibility of science and addresses real-life problems aiming for the generation of social and environmental transformation (Norström et al., 2020, p.7).

Jagannathan et al. (2020, p.23) differentiate between so-called "Scope 1" and "Scope 2" outcomes. While "Scope 1" outcomes are more pragmatic and include the generation of actionable knowledge related to practical needs of society with a relatively near-terms scope, which can be utilised by stakeholders for decision-making, "Scope 2" outcomes are more ambitious in its aspiration for more long-term transformations and can change existing power dynamics, the relationship between science and society, or even political systems.

Co-production of knowledge aiming for transformations often engages with the so-called "theory of change" which originated from the field of development cooperation and program management. It is a hypothesis that outlines how certain activities are linked to outputs and

outcomes through causal pathways, and finally achieve the desired goal and generate impacts. Accordingly, it can provide a roadmap for achieving social and environmental change and continuously gets refined through action and reflection. Additionally, it can be used to develop a common understanding of goals and the development of metrics to assess the successfulness of the co-production process (Norström et al., 2020, p.5; Schneider et al., 2019, p.27).

However, there isn't one specific way of applying the theory of change. To create societal impact, there are multiple pathways. Schneider et al. (2019, p.33) for example examined three different ways: "a) promoting systems, target, and transformation knowledge for more informed and equitable decision-making, b) fostering social learning for collective action, and c) enhancing competences for reflective leadership" and stated that they were especially efficient when combined with each other.

However, although such processes can produce socially robust knowledge, it proves to be challenging to measure its success in the creation of sustainability transformations and especially "Scope 2" outcomes are less predictable. On the one hand, it is difficult to detect impacts produced beyond the scope of the project and on the other hand societal transformation processes are very complex and there are many disturbing external influences such as changing power relations, legal and political structures etc. (Schneider et al., 2019, p.33).

Besides being an agent of transformation, co-production creates knowledge about social transformation. Especially during the co-design phase vast amounts of knowledge is produced, for example by entangling social structures and identifying different roles of local actors, analysing existing conflicts and mapping needs of transformation. This highlights how co-design is much more than just a preparatory phase, but a pivotal moment for the generation of knowledge in itself (Moser, 2016, p.111-112).

3.2.7. Goal orientation

Many authors underline the necessity of having a goal-oriented approach in co-production of knowledge projects (Howarth et al., 2022, p.6; Norström et al., 2020, p.5). Goals can range from goals such as the use of tools and models, the deepening of understanding and prompting of reflection among participants, increasing stakeholders' capacities, the challenging of traditional norms or a redistribution of power dynamics. Also, increased engagement rather than solely being a strategy to achieve other outcomes can be a goal in itself (Jagannathan et al., 2020, p.25) .

Goals need to be clearly defined and meaningful for all participants. Challenges and a measure of success need to be defined collectively. For this, the creation of a common understanding of the local conditions, the motivations and interests of various actors are inevitable.

A clear definition of project goals is essential for the creation of a mutual understanding of where the project is heading, what the desired outcomes are and how roles including leadership should be distributed in order to get to this desired outcome (Howarth et al., 2022, p.6; Polk,

2015, p.118). This creates a sense of responsibility and ownership and works as a uniting and motivating force, especially for heterogeneous groups (Godemann, 2008, p.637). Additionally, it gives stakeholders a better idea of what they can expect from the project as well as from organisers and accordingly, increases mutual trust (Vinke-de Kruijf et al., 2022, p.403).

Yet, in the advancement of projects, goals can be contested as new actors join in or priorities change. Thus, in an iterative process of creation and evaluation goals constantly need to be revised and adapted to the new circumstances (Norström et al., 2020, p.5).

Furthermore the question remains about the scope and time of the defined goal. Harvey et al. (2019, p. 112-115) Found that in different case studies an emphasis on more structured, bounded (in scope and time/ project-based) and output-oriented processes centred around creating "Scope 1" outcomes in the form of actionable knowledge was generally perceived as more successful due to clearly defined goals which were achievable within a fixed timeframe. However, there are doubts whether time-bound and project-based approaches might achieve the pursuit of a more transformative outcome (Harvey et al., 2019, p.112-115).

3.2.8. Context matters

The co-production of knowledge is always situated within a specific context. Context can, but does not necessarily refer to place-based scales such as local, regional, global, etc. It can also refer to certain issues (Norström et al., 2020, p.3).

Co-production should take into account the social, economic and ecological contexts in which the project is based and what challenges and opportunities come with them. This gives a sense of which goals are feasible. By taking into account the needs and interests of individuals who are interested or affected by the challenge, co-production addresses the usability gap. Accordingly, information produced should also be practically usable by decision-makers and other individuals concerned (Vincent et al., 2021, p.38). Through this adaptation, the produced knowledge will face increased legitimacy, credibility and trust (Vincent et al., 2021, p.49).

In contextualising, certain challenges need to be addressed such as power dynamics, institutional settings, trust, and knowledge systems (Vincent et al., 2021, p.49). Norström et al. (2020, p.3) suggests the following questions to address these challenges: "who will be impacted or affected by the process and its outcomes? Who has the power to enable or constrain action? How will policy, regulatory, institutional and cultural factors shape the process and the realisation of desired outcomes?" In this sense, neglecting to confront the political or power dynamics of co-production can sustain prevailing power imbalances and erode efforts towards societal transformation (Jagannathan et al., 2020, p. 23)

Although contextualisation is necessary and brings many advantages with it, it mostly leads to results that cannot be readily generalised to broader contexts. So, methods and measures that might have worked in one context might not be applicable in another (Vincent et al., 2021, p.38).

3.2.9. Contesting power relations

Inherent to the contexts in which co-production of knowledge takes place are different power dynamics. The discourse of participation and inclusion is becoming increasingly prominent, but the question remains in how far these actually do and should address and challenge power relations.

Co-production projects are often dominated by rational scientific discourses trying to integrate different kinds of knowledge into a science-based framework. This depoliticizing approach might be less time or resource intensive, but fails to acknowledge different interests, beliefs, and political differences and reinforces traditional ways of producing and disseminating knowledge. According to Turnhout et al. (2020, p.16) this reinforces unequal power relations.

It is important to take into account that power is something static, which can once be identified in a specific location. Power relations are dynamic and not only local power relations need to be addressed, but also how power is created within or through the project and the discourse within which it resides. Although co-production of knowledge is often perceived to have the ability to redistribute power, and empower those in the process (Howarth et al., 2022, p.3), the use of terms such as "participation", "shared ownership" etc. can obscure or even reinforce asymmetrical power relations (Gaventa, 2006, p.23).

Gaventa (2006, p.23-25) suggests the use of the so-called "power cube", an approach to identify levels, spaces and forms of power. While taking into consideration different spatial levels such as local, national and global, he puts even more emphasis on spaces and forms.

First, instead of only analysing who holds power, an analysis of power should also apply to the spaces made for co-creation. These spaces, in which circumstances and by whom they have been created, are not neutral and boundaries determine who may enter and what is possible within them (Cornwall, 2002, as cited in Gaventa, 2006, p.23). Gaventa (2006, p.24) draws on definitions of Hayward (Hayward, 1998, p.2, as cited in Gaventa, 2006, p.26) of power as "the network of social boundaries that delimit fields of possible actions" whereas he refers to freedom as "the capacity to participate effectively in shaping the social limits that define what is possible".

Accordingly, those who create the spaces of co-production are more likely to have power within it. To assess how such spaces are created and what this signifies Gaventa (2006, p.27) introduces three different kinds of spaces: 1) "closed spaces" where elites make decisions and the wider public doesn't have access to and where there is no intention of broadening the boundaries for inclusion 2) "invited spaces" where people are invited by higher authorities which might be institutionalised and draw on forms such as consultation, and 3) "claimed/created spaces" that may arise from popular mobilisations and hence are truly bottom-up. These spaces are dynamic and boundaries are in constant change of opening and closing. Many projects draw on the creation of "invited spaces". First, invited people might gain power through acquiring skills and experience, and being able to affect surrounding

spaces. On the other hand, the creation of "invited spaces" might only serve for the restoration of legitimacy of "closed spaces" (Gaventa, 2006, p.26-27).

Second, for the analysis of spatial levels, further than solely analysing co-production at the local, national and global level, Gaventa (2006, p.28) emphasises the increasing interrelatedness of these levels and the change in traditional perceptions of where power is localised through globalisation. To challenge asymmetrical power relations, he especially highlights the need for the creation of vertical links across actors at each level.

Third, Gaventa (2006, p.29-30) differentiates between visible power, "formal rules, structures, authorities, institutions and procedures of decision making", hidden power, "powerful people and institutions maintain their influence by controlling who gets to the decision-making table and what gets on the agenda" and invisible power, that "shapes the psychological and ideological boundaries of participation". While many projects and studies only address visible power relations by asking who participates, who benefits and who has power, more attention needs to be brought to hidden and invisible power relations. Issues such as who is in- or excluded from spaces of participation, who decides the boundaries of participation and how do people's self-perceptions (their feelings of superiority or inferiority), ideologies and culture relate to power structures? Need to be addressed (Gaventa, 2006, p.29). Accordingly, to create, what (Jagannathan et al., 2020, p.23) call "Scope 2" outcome, hence a transformation in societal power structures and a change in the status quo, not only institutional spaces for participation need to be created, but also awareness about power asymmetries and peoples' own position within a system, or similar to what Freire called *Conscientização* (Freire, 2000, p.36, 75, 104), needs to be established (Gaventa, 2006, p.29-30).

Especially in projects run through North-South partnerships, the risk of falling into colonial patterns cannot be underestimated and attention has to be paid to how power is distributed within the project (Turnhout et al., 2020, p.16). Instead of perpetuating the asymmetry of financial resources and knowledge (one-way transfer) flowing from the global North (producers) to the global South (passive recipients), co-production of knowledge should aim at breaking with such traditions. An asymmetry of power within the partnership can impair the motivation and commitment of Southern partners. Vincent et al. (2020, p.877) underline the necessity of the inclusion of participants in the very beginning of a project and the generation of equal ownership between the partners. What further enhances balancing power relations is the equitable control over funds between project partners (Vincent et al., 2020, p.878). Within this, attention needs to be paid to the bias of elite actors. It has to be made sure that not only elites such as actors from government, large NGOs or scientists take ownership of the process (Turnhout et al., 2020, p.16).

4. Methodology

At the core of the research methodology lies the utilisation of a descriptive multiple case-study analysis within the PaMo project. The Case-study analysis is based on and informed by a qualitative content

analysis using an inductive approach. While Tanzania was part of the tender for the master's thesis position in the PaMo project, the partners in Toliara, Madagascar joined at a later stage.

I collected the majority of my data during my field work in Toliara where I stayed from the 13th of April, intercepted by the workshop on Mafia Island and field trips to Anakao and Sarodrano, until the 15th of April. For the data collection, I used a mixed-methods approach including a literature review, interviews, questionnaires and participant observation with multiple sources of evidence. I didn't strictly separate these methods, on the contrary, more than just informing each other, I combined them to identify convergent themes and issues.

After data collection, I used qualitative content analysis to analyse them. For this,, I systematically coded interviews, generated themes and connected them to overarching themes with the use of NodeXL. I additionally included themes which have not been mentioned in interviews or used the other methods to complement findings from the interviews. This triangulation should provide a rich and contextualised analysis of the co-production of knowledge in the PaMo project as well as perceptions of the current state of coastal management and inclusion in decision-making.

4.1. The Case Study Approach

Following Yin's (2018, p.46) definition, case studies allow for the investigation of a "contemporary phenomenon ("the case") in depth and within its real-world context, especially when the boundaries between phenomenon and a context may not be clearly evident."

As the PaMo project occurs within 2 very specific contexts and involves a diverse set of stakeholders from communities to private companies, NGOs, research institutions etc. the case study approach helps to understand how these contextual factors influence the co-production process and outcomes and vice versa. Yin (2018, p.39) provides three conditions for the choice of a case study approach, namely "(a) the form of research question posed (how/ why/ what), (b) the control a researcher has over the actual behavioural events (no), and (c) the degree of focus on contemporary as opposed to entirely historical events (focus on contemporary)".

a) First, Yin (2018, p.40) states that in order to use a case study approach, the questions "how" and "why" should be used, which apply to my first research question, namely: how is the co-production of knowledge understood by the PaMo team? For the question "what", he makes a difference between an exploratory "what"- question and a "what"-question in the sense of "how many", "to what extent". The exploratory kind of "what" is the case for my research questions: What are stakeholders' and organisers' perspectives on the strengths, weaknesses, opportunities and threats for the co-production of knowledge? What are suggestions for the improvement of the co-production process? What are local stakeholders' perspectives on the strengths, weaknesses, opportunities and threats of the current state of local coastal management? What are local stakeholders' perspectives about the current level of participation in decision-making about coastal issues? He further states that "to what extent" questions would rather fit to a survey, and in my case I posed one such question, namely, to what extent do the perspectives of stakeholders and organisers align? To explore this question I included a survey (questionnaire) in my case study to get a general sense of participants' and organisers' insights of the workshops, which I wouldn't have been able to capture only through interviews due to time limitations.
b) Second, Yin (2018, p.42-43) argues that in order to use a case study approach, researchers should have no control over events and cannot manipulate relevant behaviours. This is the case

for my research. Although I interacted with organisers and stakeholders, and doing participant observation I certainly had an effect on interviewees and interlocutors, I didn't have control over events and people to the extent of an experimental design. I actively tried to avoid bringing in my own opinion too much, while still building a personal relationship with the people in question. Furthermore, in the section of limitations, I also reflect transparently about my own position in the project.

c) Third, according to Yin (2018, p.43) case studies usually focus on a contemporary event in contrast to a historical one. This was the case for my thesis, as I studied a project which is currently running as well as the current state of coastal management and inclusion in decision-making. I only engaged with history to contextualise my findings in the form of oral history (when people elaborated on specific events to explain certain issues) but also through a literature review.

In contrast to research solely relying on surveys for example, a case study's holistic approach provides the opportunity for an in-depth exploration of the complex social dynamics of the project, for the identification of topics and issues that haven't been pre-defined by the researcher and in general, a critical self-reflection of my own position in the project as well as in the local context (Yin, 2018, p.21)

Case study research can very well be of an explanatory nature in contrast to its sole use as a preliminary mode of inquiry for further research(Yin, 2018, p.36-37). But, given the small number of samples and the lack of comparability, I have chosen to stay at the descriptive level (Yin, 2018, p.28).

4.2. Qualitative Content Analysis

To approach these two cases, I mainly applied a qualitative descriptive approach, and more precisely, a qualitative content analysis as described by Berg (2001, p.238-265).

Qualitative descriptive research aims to provide a comprehensive and detailed account of a phenomenon. Its human-centred and narrative approach make it a valuable analytic framework for capturing different perspectives, human experiences. Detailed descriptions of the phenomenon help contextualise the findings and doing justice to the complexity of social research. It usually involves an inductive approach, meaning that patterns emerge from empirical data rather than being predetermined (Vaismoradi & Snelgrove, 2019, p.10).

Vaismoradi & Snelgrove (2019, p.4) describe two approaches within a qualitative descriptive approach, namely qualitative content analysis and thematic analysis. They state that both have in common in that they rely on the analytic examination of narrations pertaining social phenomena set in a specific cultural context. In both, information, mostly in the form of transcripts and other types of data sources, are converted into a textual format. The iterative process of reviewing the text should enable to highlight key ideas, used as codes and finally reveal the most important themes and hence, uncover the underlying meaning of the collected data.

Since through one of the questionnaires, I was able to collect some quantitative data as well, I decided to follow the qualitative content analysis approach, as the thematic analysis approach exclusively serves the analysis of qualitative data and requires a higher form of abstraction. Furthermore quantitative content analysis presents a more structured way of approaching text materials through its coding technique (Vaismoradi & Snelgrove, 2019, p.7).

There are several factors that I needed to consider for the qualitative content analysis:

1) **Self-reflection:** Although Berg (2001, p.240) states that content analysis should be an "objective analysis of messages conveyed in the data being analyzed .. by means of explicit rules called criteria of selection, which must be formally established before the actual analysis of data", in my research I am not claiming objectivity. Although I set criteria of selection before the actual analysis, I do not claim perfect objectivity in the development of themes since personal judgement indeed had an influence on the development of themes. All the more, it is important to be transparent about my approach and the necessary details that make this process comprehensible as well as including reflections about my own role in the research process.
2) **Triangulation:** By combining multiple methods such as interviews, questionnaires, participant observation, and literature review helped address potential biases and increase confidence in the conclusions drawn from the data analysis. Especially in the case of participants' reflections about the workshop it is important to have multiple perspectives at different points in time due to the problem of "erosion of memory", where "individuals vary in the extent and degree of accuracy with which they can remember - in detail - events and conversations" (Berg, 2001, p.159). (To counteract my own erosion of memory, it was indispensable to keep field notes).
3) **Adequate representation of perspectives:** Additionally to the reiterative process, consultation of participants helped to make sure that the developed themes are complete and adequately represent their experiences, perspectives and emotions. Since most of the workshop participants don't have access to the internet, and hence no email address, it wasn't possible for me to contact all of them. Nevertheless, I made sure that all the organisers received my results and invited them to revise them, make comments and let me know if anything was missing or should be changed.
4) **Contextualisation:** To counteract the danger of missing context as mentioned by Vaismoradi & Snelgrove (2019, #) in my qualitative content analysis, I added descriptions and contextualization of the identified themes, their connections and hierarchies. Instead of looking solely at the numerical occurrence of certain points, I focused on the context in which I found them. Thereby, I paid attention to who raised the point (to which stakeholder group the person belongs to, organisers or participants of the workshops), at which point in time it was mentioned (before or after the workshops) and where. I also looked at ambiguities and similarities.
5) **Comprehensibility:** To make my analysis more accessible for the reader, I added excerpts from interviews and other sources while ensuring the anonymity of participants. Additionally, visual representation of themes, their connections and hierarchies in the form of plots created with the program NodeXL, further facilitate the understanding of my research process and results.

4.2.1.Data analysis

To analyse my data, I followed these steps:

1. Data preparation and familiarisation:

Before I started my analysis, I collected all textual materials, including interview transcripts, my field diary, my notes from the LeNa shape workshops, meeting protocols as well as the gathered literature. To have an overview of the context, I re-read them.

2. Coding and theme creation

Coding is probably the most crucial phase of research data preparation as it involves systematically organising the data in categories. Reading and re-reading the material allowed me to gain a better understanding of its content and context.

With regards to my research questions: What are stakeholders' and organisers' perspectives on the strengths, weaknesses, opportunities and threats for the co-production of knowledge and more concretely within the PaMo project? What are suggestions for the improvement of the co-production process? What are local stakeholders' perspectives on the strengths, weaknesses, opportunities and threats of the current state of local coastal management?, I created three different code groups:

- Words and phrases that carry positive connotation leading to the identification of possible facilitating factors (strengths and opportunities) of co-production of knowledge as well as positive perceptions of the state of local coastal management.
- Words and phrases that carry negative connotation leading to the identification of possible limiting factors (weaknesses and threats) of co-production of knowledge for the co-production of knowledge and the project as well as negative perceptions of the state of local coastal management
- Words and phrases that carry rather neutral connotations, but express some kind of significance or relevance (only by contextualising, it could be identified whether it belonged to rather positive or negative connotations)

Within these groups I made further distinctions:

- I distinguished whether the codes have been used in the context of co-production of knowledge and the PaMo project or in the context of the state of coastal management (such were made bold)
- I refrained from highlighting words that, although carrying a positive or negative connotation, were not used in the intended contexts. For instance, the word "perfect" could be used in various ways. On the one hand, it could be used as "the selection of stakeholders was perfect" or on the other hand as "perfect, let's continue". In the latter case it has a different meaning and wouldn't add to one of the points. Consequently, I left these kinds of words away for a more accurate analysis.

Keeping in mind all the above mentioned points and groups, I proceeded the following way:

1) **Initial coding:** I started with one of the interviews, read all of it and highlighted all the codes taking into consideration all the above mentioned points. Then I inserted all the codes including their contexts (in the form of quotes) into three different sheets in an Excel file. Additionally, as the interviews were held in English, French and German, I also translated all the codes into the said languages.
2) **Revision of Codes**: After the initial coding, I revised all the codes and checked whether they would help understanding my research questions.
3) **Creation of first (sub)-themes:** After the initial coding and revision, I already extracted some of the topics that have been mentioned several times or have been identified as significant. In some cases, the name of the elicited themes corresponded to the interviewee's wording, in the case of imprecise or too long wording by interviewees I created my own terms.
4) **Continuation of Coding:** After this first interview, I started with a second one and first of all checked it for the appearance of the already collected codes from the previous interview. Then, I read through it again, to find additional codes I haven't found in the first interview.
5) **Revision of Codes**

6) **Creation of further sub-themes**
7) **Iteration**: After the second transcript was coded, I went back to the first one to see if I missed any of the codes I found additionally in the second transcript.
8) Repetition of points 4 to 7 for all interviews
9) **Creation of themes:** When all the codes were collected and possible (sub-) themes listed, I looked through them again to see if I could combine certain sub-themes to a bigger overarching theme. In qualitative content analysis, themes are described as "the subjective meaning and cultural-contextual message of data… theme is a red thread of underlying meanings, within which similar pieces of data can be tied together" (Vaismoradi & Snelgrove, 2019, p.2). Throughout the iteration cycles, it became clear that oftentimes, specific codes couldn't be connected only to a single theme, but mostly comprised several. For example, if in one sentence having a positive code, an interviewee spoke about how other stakeholders might not have participated in the workshop because they lived far away and only got their invitation late so they couldn't prepare properly, this would result in the themes: time management, logistical factors, and inclusivity.. For the further analysis with NodeXL, these combinations played a major role.
10) **Division of themes into SWOT table**: After the completion of theme generation, different themes (sub- as well as major) were distributed into a SWOT table. While most of the positive codes were distributed to strengths and opportunities, and negative codes to weaknesses and threats, I still looked into every individual context again to make sure I placed them in the right quadrant. While I considered strengths as reflecting aspects which are actually perceived as positive, I considered opportunities as aspects which are not yet in place, but there are conditions in place to make them very likely. Similarly, I considered weaknesses as aspects actually perceived as negative and threats as aspects which are not the case at the moment but might become a problem in the future.

Table 1

List of codes carrying positive negative or neutral connotations

positive	negative	neutral/ importance
Good	Problem	Relevance
Easy	difficulty/ difficult	Want
Positive	Constraint	Need
Confident	Negative	Should
motivation/ motivated	Lack/ miss	Recommend
Optimal	Restriction	Suggest
Rich	Afraid	Improve
Useful	Confused	Surprised
Opportunity	Too	Not common
I am sure	Not sure	Not surprised
Accepted	Should not	Special
Successful	Not perfect	Would like to
Perfect	Impact (neg)	must/ have to
Fair	Disappointed	Major issue
Better	Frightened	Concern
Special	Fed up	Key point
Interested/ interesting	Not clear	Striking
Simple	Complex	Unusual
Clear	Challenge	Astonishing
Impressed	Pressure	Special
Okay	Critical	Request
Inclusive	Illusory	Stand out
great/ awesome/ terrific	Weird	A way

Constructive In partnership/ cooperative/ collaborative Impact Achieve beautiful/ nice Enough Broaden the horizon useful/ reasonable Advantage Valuable experience Solution Like Help Sustainable A plus Representative Respect Meet challenge Support Benefit Improvement efficient/ efficiency No concern Value Solve problem/ conflict satisfied	Strange Humbling Not successful Mismatch Not clear Conflict Unfortunate Not ideal Extreme Not understand Disagree Dicey Annoying Unnerving Stressful Naive Buzzword Not good Underestimated pity/ shame Not motivated/ unmotivated Not possible Different (neg.) Not optimal Risk of failure Stubborn Tricky hard/ tough Plague Devastating Sad Impossible destroy/ destruction/ destructive Dangerous Doesn't have to do with Not easy Getting angry Suffer limited/ limitation Not satisfied Unsustainable Gap Discrepancy	Essential Would be better

Note. These codes have all been extracted from interview transcripts.

Table 2.
Codes SWOT Co-production of knowledge

Facilitating factors	Limiting factors
Strengths	**Weaknesses**
(I am sure) Accepted Successful impressed Inclusive Useful Opportunity glad Broaden the horizon Positive	Should/ sollte/ devrait Problem/ problematic Confused Too (technical) Not sure should Problem impact Disappointed Need

Advantage Valuable experience	Difficult Not clear Complex Challenge Pressure Should have Illusory Lack Weird (komisch) Conflict Unfortunate (unglücklich) Unideal (nicht ideal) Extreme (extrem) Not understand Not agree Annoying Stressful Naive Not good Big topic/ grosses Thema Concern Improvement Could be helpful Doesn't fit Would be easier
opportunities	**Threats**
Opportunity Key point/ Schlüsselpunkt Important Improvement Interesting impact	Frightened Fed up Problem Important Have to lack

Table 3.
Codes SWOT current state of Coastal Management and inclusion in decision-making

Facilitating factors	**Limiting factors**
Strenghts	**Weaknesses**
Good Resolve Accepted Simple Success Advantage Efficient Okay Like Sustainable Special Motivate Support Meet challenge Glad Improve Interested	Problem Should Need difficulties/ difficult Stubborn Impact Tricky Unsustainable Not easy Lack Challenge Hard Strange Demotivated Suffer Getting angry Dangerous

Positive Solution Value	Destructive/ destroy Impossible Conflict Not satisfied Plague Devastating Pressure Sad limited
opportunities	**Threats**
A way motivated	Risk of failure

3. Analysis and visual representation

For the further analysis and visual representation of the elaborated themes I used NodeXL. NodeXL is an Excel add-in that focuses on visualising network data. I used the different (sub-) themes as nodes with the codes as connecting edges. So, if I had one code that f.eg. was connected to three different themes, let's say common understanding, teamwork and role distribution, this would result in three combinations. Then I would add a second code, let's say connected to common understanding, communication between organisers and stakeholders, expectations management, this would give three more combinations. Now the theme of common understanding is connected to 4 words, and hence has the highest degree centrality. Accordingly, degree centrality is a centrality measure counting the total connections (edges) a theme (node) has. Even though I used degree centrality to show the interconnectedness of different themes, and giving more structure to the collected data, by for example adjusting the size of the nodes relative to their degree centrality, it does not necessarily reflect the importance of a specific theme (node). Consequently and considering the relatively restricted sample size of my interviews, I engaged in triangulation of my data by confirming or refuting the relative importance of the different themes, and finally deciding main- and sub-themes. Furthermore it has to be mentioned that these connections are undirected and don't show any causal relationships.

4.3.Validity

To construct **validity**, Yin (2018, p.80) proposes the use of multiple sources of evidence as well as having a draft case study report reviewed. Denzin ((2009, p.28) as cited in Berg, 2001, p.5)) further suggests triangulation on different levels such as data, person, investigator, theory and methodology. For my thesis, I used multiple sources of evidence. Also, one of the organisers and key informant reviewed my thesis. Already during data collection, I discussed my collected data with representatives of IH.SM and ZMT.

Furthermore, I engaged in **data triangulation** on different levels as suggested by Denzin ((2009, p.28) as cited by (Berg, 2001, p.5)). On the level of data triangulation, I collected data at different time points. While I tried to conduct interviews before and after the workshops with the same people I was only able to engage twice with one interviewee before and after, as the time window before the workshops was too limited. Additionally, I conducted interviews and participant observation in different spaces, such as online, in Toliara, Sarodrano and Anakao as well as during the workshop on Mafia Island and a diversity of people including different stakeholder groups such as NGOs, researchers, administration, representatives of local networks, and fishers/ seaweed- and sea cucumber farmers as well as private

companies. On the level of **person triangulation**, I had the chance to speak to individuals in informal conversations andinterviews, but also participating in two focus groups and experiencing individuals in interactions with others (especially within the organiser group), and different discussion settings during the workshops. On the level of **methodological triangulation** I engaged in both, within- and between-method triangulation. For within-method triangulation, I included closed as well as open-ended questions in questionnaires and conducted interviews with people from different backgrounds. For between-method triangulation I involved multiple methods including qualitative (interviews, participant observation, focus groups, open-ended survey questions) and a limited amount of quantitative (closed questions in questionnaires). However, I wasn't able to engage in investigator and theory triangulation as proposed by Denzin ((1978, p. 28) as cited in Berg, 2001, p.5)).

However, it has to be noted that I wasn't able to generate internal validity because according to Yin (2018, p.78-79), it can only be established for explanatory and causal studies. Furthermore, establishing external validity, which as suggested by Yin (2018, p.78-79) implies generalisability of research findings, wasn't possible due to the high contextuality of my research. Nonetheless, I discussed important topics which apart from my research context can be of interest and concern.

4.4. Reliability

According to Yin (2018, p.82), reliability can be established when "operations of a study - such as its data collection procedures - can be repeated with the same results". While he acknowledges that chances to conduct the same case study again happen very rarely, he insists that researchers still reflect on the reliability of their results. Reliability can be increased through the precise documentation of the research procedures. As I was greatly dependent on the time availability of interviewees and interlocutors as well as other conditions such as weather and other research groups doing their fieldwork, it wouldn't be possible to repeat interviews and participant observation with exactly the same people in the same time frame. What generates a certain reliability though, is the fact that I transcribed the interviews, documented every meeting, the workshops, as well as keeping a field diary. Furthermore, (Berg, 2001, p.241) describes how greater reliability can be generated through a consistent and transparent selection of criteria within the qualitative content analysis. By systematically collecting all the codes with their respective contexts in an Excel file, and by presenting in another document my reflections on how I classified certain cases that I was not one hundred percent sure about in the SWOT table, I consolidated a certain reliability. Consequently, although the data collection could not be exactly replicated, other researchers might come to similar results based on my written records.

4.5. Data Collection

4.5.1. Interviews

In the course of my fieldwork in Toliara, I conducted sixteen semi-structured interviews in total. Included were four representatives of local NGOs (CGP, WCS, BV, PIC), four representatives of research institutions who formed part of the organising team (IH.SM, ZMT), two representatives of administration (MFBE), two representatives of a private company (Ocean Farmers), two representatives of local networks (RENAFEP, MIHARI), and two seaweed/ sea cucumber farmers/ fishermen.

I obtained the contact information of the respondents through one of the workshop organisers responsible for distributing invitations to the participants. I employed various approaches to engage with the respondents. In instances where uncertainty persisted regarding their proficiency in either English or French, a colleague from my office at IH.SM initiated phone communication to elucidate the purpose of the interview. For those respondents with whom I had established prior acquaintance during the workshop or my presence in Toliara, direct contact was established either during the workshop itself or subsequently by visiting their respective offices. In the case of farmers and fishers, it was necessary to locate them through the network of contacts I established during my fieldwork in Anakao and Sarodrano. All respondents except for two, which were invited, but didn't show up, participated in the workshop.

The respondents accepted to participate in interviews that lasted between half an hour and one hour, depending on their availability, their inputs and my follow-up questions. I conducted 13 face-to-face interviews in respondents' offices or homes, restaurants or just somewhere outdoors in the village. The other three interviews I conducted online via Zoom. All respondents gave permission for the recording of the interviews, which I later transcribed. Depending on the language skills of the respondents, I conducted the interviews in either English, French, German, French with English translation or Malagasy with English translation with the help of two different translators both linked to IHSM. All respondents agreed on being recorded for the subsequent transcription.

I designed semi-structured interview questions that were customised for each respondent involved. In doing so, the respondents had the chance to bring up new topics and issues that wouldn't have been reflected in closed questions. In all interviews I included topics about the general perceptions of the current-state coastal management, their participation in decision-making and their familiarity with the concept of co-production of knowledge. I conducted interviews both before and after the workshop depending on the respondent's availability, and my personal time restrictions. While the interviews before the workshop included questions about the respondent's expectations, hopes and suggestions for the workshop, the ones after the workshop included questions about their reflections of the workshop including limiting and facilitating factors for a successful co-production of knowledge and hence, recommendations for future workshops and general hopes for the development of the project. Interviews with the organising team also included questions about the effectiveness of the planning, teamwork, and reflections about their own position in the project as well as in the local context.

4.5.2. Questionnaires

After the two workshops I distributed questionnaires to all participants in printed form. The English version was translated by a masters student from IH.SM into Malagasy and French and a researcher at IMS into Swahili. Before the workshops I made sure with the people responsible for invitations that all participants were literate and the questions were discussed with the organising team. Their main purpose was to assess the diversity of the participants and get

feedback of the workshop's inclusivity, and its limiting and facilitating factors. The questionnaires were anonymous and included Likert scales from one to five, single-choice questions and open-ended questions. On the one hand, open-ended questions allowed participants to bring up new topics and issues that weren't discussed enough or not at all due to time restrictions as well as proposals for the advancement of the project. On the other hand, Likert-scale questions should create a certain comparability between the different workshops and an assessment why certain points might have worked in one context but not in another. When everyone was done I collected the questionnaires, scanned them and created a shared excel file where my translators could insert the answers for the open-ended questions.

In the following weeks I sent an English online questionnaire created with Survey Monkey to the organising team. Similar to the questionnaire distributed to the participants of the workshops, it was meant to grasp their perception of the workshop, but with an additional focus on the planning and teamwork aspect. Moreover, I asked organisers that participated in both workshops to compare the two workshops and give possible answers for a difference in their effectiveness as well as issues which arose which can or cannot be overcome.

4.5.3. Participant Observation

Participant observation is a research method often used in social sciences, especially in anthropology. It involves the researcher immersing themselves in the environment or social group they are studying as an active participant, meaning that instead of solely observing they also have to interact with their research partners and experience a specific context firsthand. Participant observation is particularly suited for the exploration of organisational structures, social roles among group members and normative values in their natural setting. In contrast to focus groups, for example, it allows researchers to follow conversations and discussions that form spontaneously instead of creating an artificial situation (Berg, 2001, p.117-118) Furthermore, it allows for the understanding of nonverbal communication, the anticipation and understanding responses, and the interpretation of meaning (DeWalt & DeWalt, 2011, p.11).

Participant Observation is a key element of my research, as it allowed me to have a more holistic grasp of the PaMo project and its role and effects in the local contexts. Not only did I gain empirical insights into the constellation of local stakeholders, their roles in coastal management, but also in the collaboration of the organising team and the diverse epistemologies present. Additionally to the mere perceptions of co-production of knowledge, I experienced first-hand, how it is actually performed in every-day life and within the project.

I conducted participant observation in four distinct ways:

First, I participated in the planning meetings of the workshops where I gained first insights into the dynamics of the intercultural and -disciplinary organising team, the individual contributions to the project as well as their individual understanding and narratives around the concept of co-production and co-design. During a number of online meetings held on Zoom, and in-person

meetings I mostly took notes in the form of a meeting protocol on my computer and sometimes on my phone. In more spontaneous meet-ups I tried to remember as much as possible and took notes later in the evening.

Second, I participated in two online workshops of the LeNa Shape project. Its aim is to develop a generic framework to determine both ex ante and ex post impacts of a project on the SDGs in the field of bioeconomy and natural resource management. The workshops took place on the 30/04/23 and the 04/05/23. Invited was the whole PaMo organising team, i.e. people from ZMT, IMS, IHSM and the Ministry for Fisheries and Blue Economy. As the workshops included discussions about long-term goals of the project, the organiser's roles, a stakeholder analysis of the local context and enablers and barriers to research impact, they provided a fruitful source for my thesis. While participating in the workshop, I focused on the limiting and facilitating factors of co-production as well as people's perceptions of the concept.

Third, I carried out participant observation during my time in Toliara. There, I lived with an employee of IHSM and also worked on my thesis from an office at IHSM. This allowed me to experience and participate in many in-formal discussions not only with people working at IHSM, but also with other groups I met by coincidence. To delve deeper into the local social realities, to gain trust, and the ability to engage with people, learning the local language is greatly advantageous for conducting a meaningful participant observation. For these reasons, I wanted to learn some basics in Malagasy, which I did with a teacher from the Alliance Française, my roommate found on facebook, the main communication platform in Toliara. For example, I learned that the dialect spoken in Toliara is very different from the official dialect spoken in Antananarivo which made it even more important for the organisers to use a local dialect during the workshop. She also taught me how I should address people properly in the communities and that it could be interesting for me to ask for the so-called "fady" which means taboo, because it reveals a lot about the local culture and beliefs and can be related to how space ought to be used. During these informal conversations I attentively observed the discourse surrounding coastal management, the perceptions held by local stakeholders and their interconnectedness, and notably, the perceptions pertaining to the workshop and its organizers. Additionally, I found it intriguing to examine how the themes and concerns raised during the workshop manifest within the social fabric and identify individuals and groups affected by them.

Fourth, in the course of two field trips to the fishing villages Anakao and Sarodrano, I learned more about the every-day lives of the people most affected by coastal management decisions and engaged in different activities. Furthermore I was able to conduct three interviews with participants of the workshop and then empirically experience what it means for them.

In the case of Anakao, I had the privilege of accompanying a research team consisting of three members from IHSM, comprising a PhD student and two master's students, during the period from 31/03/23 to 05/04/23. The team took charge of organising transportation by boat, accommodation arrangements, and provision of meals. Given that the team was engaged in their own research endeavours, I had the opportunity to closely accompany their activities. This

firsthand exposure to their research practices afforded me invaluable insights into the dynamics between scientists and local communities, thereby greatly facilitating the planning of my subsequent field trip. In Anakao, we established contact with various community members through a designated contact person. The research team, focusing on the economic dimensions of seaweed farming, graciously allowed me to benefit from their expertise. I actively participated in two of their conducted focus groups: one held in front of the Ocean Farmers' office involving eight male employees, and another held in the backyard of a house with a group of seven women who were also seaweed farmers. While they were working with a predefined questionnaire, I availed myself of the opportunity to pose follow-up questions that were translated by one of the other researchers, whenever I encountered topics relevant to my master's thesis. After thinking about the most appropriate method of documentation, I decided to record my observations in a notebook. Although the people participating in the focus groups did not attend the workshop, my involvement provided valuable insights into the current status of coastal management, local decision-making processes and more general social dynamics (oral histories, aspirations/ hopes of the people). In addition, I took the opportunity to visit a seaweed farm and actively participate in the daily tasks of a seaweed farmer such as rowing to the seaweed fields, harvesting seaweed and drying it.

On my next field-trip to Sarodrano, it was important for me to speak with community members who had participated in the workshop and to learn how the issues discussed impacted their lives. I chose Sarodrano because of its numerous referrals, accessibility by public transportation, the two workshop participants, and the presence of blue economy activities. I happened to come in contact with the president of the fishermen in the office of the Ministry of Fisheries and Blue Economy, who offered to host me in his house for a few days. Once this was agreed upon, I quickly organised a translator, an undergraduate student from IHSM, to accompany me on this excursion. Together we visited Sarodrano from 07/04/23 to 10/04/23. Activities during the fieldwork depended heavily on the availability of community members and could not be planned precisely in advance. We were able to conduct two interviews with workshop participants in their respective homes in Malagasy with English translation. Later, we were invited to accompany them in activities such as seaweed farming, fishing, and night spearfishing/ wild sea cucumber hunting. We were also able to establish contact with various community members, including a boat builder, the local priest, and . This contact was especially facilitated by our participation in the local Easter celebration, where we were introduced to many community members. During all of these activities, I took notes on my cell phone, which I later transferred to my computer.

5. Limitations/ Assumptions

During the data collection phase of the research, I encountered various factors that influenced my ability to collect data as well as their quality and reliability. While there were certain aspects that I would have had the ability to manage, there were also factors that were beyond my control. By acknowledging these shortcomings, I am aiming to provide a comprehensive

understanding of the contextual constraints that may have affected the collection and interpretation of my results.

5.1. In control

There were several factors that could have been controlled:

1) **Data storage:** During the fieldwork phase, I primarily documented my observations by directly inputting notes into Google Docs on my computer at the end of each day. However, in Sarodrano, where the electricity supply was insufficient, charging my computer became difficult. Consequently, I resorted to using my phone for note-taking and also recorded two interviews on it. Unfortunately, due to technical difficulties with my phone, all the data stored on it was lost. This experience highlighted the importance of considering alternative approaches to note-taking during field research, such as employing handwritten methods or ensuring the availability of reliable power banks and back up resources. As most of the data was already stored and I reconstructed the two interviews and their most important points together with my translator, this shouldn't have had a big impact on my results.
2) **Expectations and Methodology:** One mistake worth mentioning was that I had set too ambitious expectations for my research methodology. In the field, it turned out that my original plan was not feasible, due to both time constraints and available resources. Working with the person responsible for stakeholder selection, we had agreed to identify potential interviewees upon my arrival in Toliara. However, progress in this regard was slow, leading me to realise that a more proactive approach to pre-selecting interviewees would have been necessary. Thus, I did not manage to interview the same individuals before as well as after each of the workshops. Another source of discouragement arose from my assumption that a comparative analysis between Toliara and Mafia Island would be feasible. In hindsight, better preparation for a possible single case study would have been beneficial. As I reflect on these challenges, it becomes clear that managing expectations and adapting the research design to practical constraints are important components of conducting effective fieldwork.
3) **Interview method:** In terms of the interview process, there are some aspects that could have been approached differently. First, in terms of recording the interviews, it would have been advisable not to put my phone on the table in such a way that the interviewee could easily see it. Although the interviewees agreed to be recorded, to see the phone seemed to make some of them a little nervous. Second, it would have been beneficial to make it clear before the interviews that a translator would be available. Although interviewees occasionally stated that they could communicate in English, this was not always the case, thus the presence of a translator would have been beneficial there as well. And third, it would have been better to have a more detailed discussion with the translator in advance about exactly how to proceed with the translation. The strategy of translating smaller sections of the dialogue in real time, rather than providing a condensed version of the response at the end, would have resulted in more accurate and nuanced translations. Switching between languages during the interviews also

presented a challenge during the transcription process. Although I may not have fully captured the most critical views, the data can very well be used and interpreted.

4) **Interviewee's responses:** As the interviews were semi-structural, different individuals gave different degrees of details in their answers, hence, in the analysis the degree of centrality generated by NodeXL might be somewhat overestimated for their mentioned themes.
5) **More proactive behaviour:** Throughout my data collection process I noticed the importance of proactive behaviour, particularly in instances where contact was predominantly established through online means. Proactive behaviour, in this context, refers to the proactive implementation of strategies such as for example sending frequent reminders to complete a survey, or being more assertive when soliciting the necessary data or contacts.
6) **Data analysis: Contextualisation of codes:** As already stated before, I didn't exactly follow Berg (2001, p.238-265)'s approach of qualitative content analysis who states that researchers should refrain from including intended meaning of a sentence. Although not often needed, I allowed myself to engage in contextual interpretations of what was said, especially with people who I got to know personally. In the interviews for example, topics were sometimes brought up that had been discussed previously in informal conversations. This prior knowledge, as well as contextual cues such as intonation, facial expressions, or gestures, enabled me to identify certain attitudes and moments that suggest irony. (Especially in high-context countries as described by Hall's Model, such cues are an important aspect of communication). Especially with ambiguous terms, considering the context in which specific codes were said was essential. For example, words like "special", "different" or "interesting" can either carry a positive or negative connotation and only taking into consideration contextual cues allows for its interpretation. This is also the reason why the same codes can sometimes be found in different fields.
7) Role definition in participant observation: Even though a role cannot be completely defined, I still made some choices of how I present myself infront of the local communities: here some reflections: What has to be kept in mind with participant observation is that it conveys a subjectivity dimension, favouring a degree of personal perspectivity on what is being observed. This is why researchers need to engage in extensive reflection about their roles, their assumptions, as well as how they might cause reactive effects by the context they are doing research in. Within this framework, Berg (2001, p.147-148) refers to the Hawthorne effect, i.e. whenever people realise that they are part of a research study, they will change their usual behaviour. Berg (2001) suggests different approaches to increase the invisibility of the researcher as introduced by Stoddart (1986). While these can include methods such as spending a longer time with study participants, trying to fit into the context either in a symbolic way or by participating in everyday activities, by forming personal relationships with research partners, by masking one's real research interests or by completely masking one's identity as a researcher. On the one side, although I wasn't able to spend a lot of time in the local contexts of Anakao and Sarodrano, I actively asked people to be able to join them in their work activities, which was also important for me to understand more about coastal activities (It turned out that I am quite a skilled fisherwoman but not such a skilled seaweed farmer). On the other side, even though I didn't actively ask, I was invited by my hosts to

community events in which I then tried to fit in, but where I still caught a lot of attention. However, some of these "invisibility" methods, especially the last two raise ethical concerns and are also described as potentially "dangerous" by Berg (2001, p.147-148), so I actively avoided them in my field research, by transparently communicating my research interests to the people I interacted with. Another point Berg (2001, p.139-140) - referring to Matza (1969) - raises is that researchers - rather than being critics to certain situations - should appreciate situations and research partners' willingness to share their knowledge and perspectives. This does not require researchers to agree with their research partners, but merely showing empathy. For example, during my field work I came across one such incident: a boat builder told me that he thought that raising temperatures were caused by the solar panels that were installed next to their village. Although I didn't agree with this statement, I still appreciated his openness to communicate his opinion.

5.2. Out of control:

Several challenges arose during the data collection phase of my research over which I didn't have any influence:

1) **Infrastructure:** The local infrastructure posed difficulties for efficient work. Frequent power cuts and poor network connectivity hindered online meetings, interviews, and internet research.
2) **Language:** Language barriers presented significant struggles. Despite having some knowledge in French and learning basic Malagasy, effective communication with local individuals was not always possible. Most of the people didn't speak English and only a few spoke French proficiently. This made contacting people quite difficult and during interviews I was often in need of a translator. Even during the workshop in Toliara, where simultaneous translation was provided by Master's students from IH.SM, their limited experience and unfamiliarity with the local dialect sometimes hindered comprehension.

   Language also posed a problem for the coding process within data analysis. On the one hand, the fact that the interviews were held in different languages, posed a problem for the definition of codes, as there aren't always exact translations of specific expressions. On the other hand, it was not possible for me to capture all the nuances of expression and specific word choice in the translated and accordingly abbreviated interviews.
3) **Time Constraints:** The lack of sufficient time for preparation was a concern. Due to a summer school in my Master's program, I only had a two-week window in Toliara to familiarise myself with the local context. In the case of Mafia Island there was no opportunity, as the workshop there took place shortly after the one in Toliara.
4) **Climate and Environmental Conditions:** High temperatures, reaching up to 43°C in Toliara, without air conditioning, impacted my concentration and energy levels. Additionally, cyclones occurring before and during my stay on the one hand prevented some participants from attending the first workshop and on the other hand prevented me from accessing certain locations. For example, one of the roads leading to Anakao was flooded due to the cyclone, so we had to shift the field trip to later and finally were only able to access it by boat. Furthermore, the timing of fieldwork also depended on tidal change. While the low-tide conditions in Anakao were advantageous for the

research group I joined, as it provided an opportunity to engage with seaweed farmers during their available free time, it posed challenges for my own participant observation. Finding individuals to accompany and observe became a hindrance due to the limited availability of people during low-tide periods.

5) **Transportation:** Transportation proved to be a significant challenge. While Pousse-Pousse (bicycle rickshaws) served as low-priced means of travel within Toliara, taxi services were expensive and public transport outside the city was unreliable and considered less safe.
6) **Communication:** Apart from language barriers, communication presented difficulties. Limited access to smartphones and internet connectivity meant that calling was often the only means of contacting people. Since I wasn't able to make calls with my phone, I was dependent on other people. For instance, before our field trip to Sarodrano, I had issues reaching my translator as she only had internet while being in the University or the Institute.
7) **Health Issues:** Personal health became a major setback during my internship. Influenza-like symptoms persisted throughout a significant portion of my stay, despite attempts at self-medication and rest. As a consequence, I lost several productive days. After consulting a doctor, the use of multiple prescribed medications caused side effects, further affecting my well-being and ability to work.
8) **Bureaucracy and Organisational Difficulties:** What affected my thesis the most, was not receiving a research permit for Mafia Island due to bureaucratic procedures despite my timely submission of the application. This prevented me from conducting interviews and field work in Mafia Island.
9) **Access Constraints:** Access to certain information and locations was not guaranteed. For instance, I was denied entry to a sea cucumber farm and I could not access certain data which was not essential for my thesis but would have been interesting for my contextual analysis as well as for the PaMo project.
10) **Role Definition:** Defining my role within the project posed some challenges. Balancing active involvement and maintaining a more theoretical approach for my thesis created uncertainties among participants regarding my role in the project, and the goals of the project itself. For instance, during an interview with one of the community members who participated in a workshop, he expressed his expectation for financial assistance to repair houses damaged by the cyclone. Hence, although I didn't play an active role in the planning and implementation of the workshops, I found myself compelled to engage in expectations management.
11) **Collaboration:** Collaboration wasn't always fruitful and there was a certain reluctance of individuals to participate in interviews.
12) **Data analysis: translation:** In the cases where translation during the interview was needed, I was dependent on the correct and complete reproduction by translators of what was said. As the translations were mostly condensed to some extent, translators most probably didn't use the exact wording of the interviewees. Although I have confidence in my translators to have forwarded me the most important information correctly, a self-interpretation on their part can not be excluded. Furthermore, in interviews conducted in English with respondents whose native language was not

English, they may not have been able to express themselves as they would have in their native language and, accordingly, may have used words whose meaning was not entirely clear to them. Also, the translation of codes isn't always perfectly possible, or there might be several words with the same meaning.

13) **Limited data availability or data which is not up to date:** When describing the contexts, I came across many gaps of data, especially regarding statistics.

These challenges offer insights into the complexities of conducting social research in a very unfamiliar context. It is important to acknowledge these in interpreting the data collected. In addition, these contextual factors may be important for further research. Even though some factors cannot be controlled, it is still possible to adjust and prepare for them.

6. Presentation of Research Case

6.1. The PaMo project - an overview

PaMo-NbS is a transnational research project that was created as a response to a call from the MeerWissen-initiative.

MeerWissen is an African-German initiative launched in 2018 by the German Federal Ministry for Economic Cooperation and Development (BMZ) and funded by GIZ's Marine Conservation Support Project. The initiative aims at supporting BMZ's Ten-point Plan of Action for Marine Conservation and Sustainable Fisheries through the creation of multi-stakeholder partnership projects and the generation of ocean knowledge. The foundation of this initiative rests upon three fundamental pillars: the exploration of innovative technologies for digital solutions, the facilitation of dialogue and knowledge transfer between marine researchers and policy-makers, and the empowerment of African partners in marine research through collaborative projects that foster African-German partnerships and knowledge development. By centering its attention on the ocean, the MeerWissen Initiative contributes to the advances of the United Nations Decade of Ocean Science for Sustainable Development, known as Ocean Decade (*MeerWissen*, n.d.).

The call for proposals requested a project that addresses major threats to East African coastal ecosystems and local livelihoods, such as climate change, ocean warming, and increasing human pressures on the ground due to extractive practices and pollution, by providing policy makers with a decision support tool, namely participatory modelling to improve the implementation and planning of nature-based solutions. The project should be running from 2022 to 2025.

The MeerWissen Initiative views simulation **models** as tools to provide a better understanding of the impacts of different management scenarios on the socio-ecological system. To ensure that these models actually depict local realities and lead to trustworthy results, they should be

based on quantitative and qualitative data, including local traditional and indigenous knowledge.The inclusion of local knowledge is seen as a prerequisite for the subsequent successful implementation of management decisions.

The call further divided the desirable results into scientific and and practical outcomes:

scientific:

- Evaluation of the participatory model building process
- A new model to allow predictions for the local case study problem

practical:

- Structured process to progress in the management/planning issue.
- Development of practical steps towards decision support based on traditional and scientific knowledge.
- Capacity building with regard to participatory mapping of ecosystems impact concept and joint qualitative model development.
- A pilot tool to be adapted to other regions.

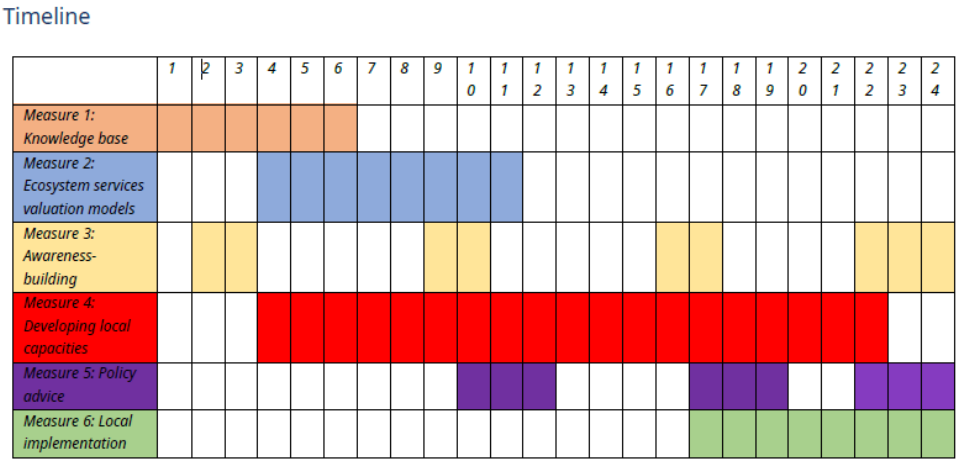
6.1.1. Goals and planned measures

A group of scientists responded to this call with the creation of PaMo-NbS (Participatory Modelling for Nature based Solutions in the WIO region), a project operating in Toliara, Madagascar and Mafia Island, Tanzania. Their approach is divided into six measures:

1) The Co-design of a knowledge base of ecosystem services and their valuation through a series of workshops, interviews and surveys at both pilot sites
2) The creation of qualitative ecosystem valuation models based on knowledge gathered in measure 1 through mapping of local stakeholder needs and requirements regarding ecosystem services, the development of a framework handbook for process documentation, workshops to jointly develop the concept models and the implementation of a knowledge database. These maps should show causal pathways between the implementation of specific NbS and their potential ecological and social impacts.
3) Raise awareness of the critical role played by ecosystem services in the provision of resources and climate change mitigation through the creation spaces and activities for informal discussions amongst multi-stakeholder groups, concrete recommendations of management activities based on NbS and finally, a jointly developed factsheet of the decision-support tool.
4) Capacity development for ecosystem service and resource management through the creation of a handbook on local stakeholder involvement and its propagation through newsletters and social media, the design and training on the developed framework including a pilot training, the involvement of students and general data and material sharing on the project website and regional channels.

5) Development of policy advice on the use of local knowledge to improve the management of coastal ecosystems and the provisioning of nature-based services to coastal communities through policy briefs on project results, a report with recommendations and an action plan for WIOMSA, the Nairobi Convention and the Nairobi Convention COP 2024 and reveal results to the UN Ocean Decade and at the WIOMSA Scientific Symposium 2024.
6) Implementation of a local management system based on the developed decision support tools and continuous monitoring the state of the ecosystem and related services.

Figure 1.
PaMo - Timeline



Note. From first PaMo research proposal

6.1.2. The current state

Up until now, the PaMo project is progressing towards the end of its co-design phase in which two workshops, one in Toliara and one in Mafia Island have been completed. The aim of these two first workshops was to introduce the project to the study areas and determine specific issues which need to be addressed throughout the project advancement.

After the two workshops, it has been decided that the focus in the two contexts would be a different one.

6.2. The Partners

ZMT: Leibniz Centre for Tropical Marine Research

The Leibniz Centre for Tropical Marine Research (ZMT) is a scientific institute based in Bremen, Germany dedicated to the investigation of tropical and subtropical ecosystems and their sustainable use. For this, they place an emphasis on creating research projects and capacity development in partnership with other international institutes and actors throughout the tropical belt. These projects should help create expertise and structures for sustainable coastal management.

In response to the call from the MeerWissen initiative, three researchers from ZMT came up with the first research proposal. Within the PaMo project ZMT mainly contributes with its expertise on participatory modelling, project management and the provision of a joint online platform where documents can be stored and exchanged.

IMS: Institute of Marine Sciences, University of Dar es Salaam, Zanzibar, Tanzania

The Institute of Marine Sciences (IMS) and ZMT already have a long lasting partnership since 2009 encompassing different theses and research projects such as the Leibniz Graduate School SUTAS and several MeerWissen projects. IMS already joined ZMT for the submission of the PaMo project proposal.

Based in Zanzibar, IMS is a department under the University of Dar es Salaam. It engages in marine science research and transmission of knowledge through training. It further provides consultancy services in marine affairs to the public service for the exploration and exploitation of marine resources. Its major concerns are overfishing and destructive fishing practices in Tanzania, sedimentation and pollution from land based sources, its coral transplantation and restoration projects, the management of marine protected areas and the threat of invasive species. The Institute also plays a role in formulating various policies at the national level related to the use, conservation, and management of coastal and marine resources. As part of this, it coordinated a series of workshops at the national and regional levels on the development of integrated coastal zone management (*GEF Targeted Research - Centers of Excellence (COEs)*, n.d.).

From IMS, three researchers were involved in planning and conducting the workshops for the PaMo project: one lecturer, two senior lecturers, and the director of the institute. Their main contribution is to provide knowledge on long-term environmental and social information and information on relevant local stakeholders related to the Mafia Island study site.

MFBE: Ministry of Fisheries and Blue Economy

The Ministry of Fisheries and Blue Economy is a Malagasy public department responsible for managing the exploitation and use of marine and fisheries resources and implementing ocean governance.

The Department develops many of its policies in consultation with IHSM researchers, and the close collaboration goes back a long way. The collaboration between the ZMT and MFBE emerged from the West Indian Ocean Governance & Exchange Network (WIOGEN) project, one of the MeerWissen projects that created a platform for science and policy networking to promote the combination of governance approaches and sustainable use of biodiversity in the West Indian Ocean and hence, bridging social and marine sciences.

One person from MFBE was involved in the project formation. Also MFBE contributes to the PaMo project through its expertise on local resource use and ecosystem services in and around Toliara. This person was also the main responsible for contacting stakeholders in Toliara and for facilitating the workshop.

IHSM: Institut Halieutique et des Sciences Marines

The Institut Halieutique et des Sciences Marines (IHSM) is based in Toliara, Madagascar and engages in research in the domain of Marine Sciences, Fishing, Aquaculture and Coastal Environment.

The institute employs more than 50 people, two of whom were involved in the planning and implementation of the first workshop. In the further course of the project, their main task, similar to that of IMS, is to provide knowledge about the ecological and social state of the local context. However, unlike IMS, they were not involved from the beginning, but were brought in ZMT at a later stage as researchers also knew each other from a previous project.

My involvement

I too wasn't part of the project from the very beginning and my role changed after having attended a few online meetings. Initially, I was to be involved in the planning, but after consultation with my supervisor, my role was determined as a participant observer, following the process and subsequently also responsible for an evaluation of the workshops and the co-design phase.

6.3. Context - Mafia Island, Tanzania

On Mafia Island the project intends to focus on communities on the south-eastern side around the village of Utende.

Mafia Island is an island lying off the east coast of Tanzania. It belongs to the Mafia District, one of the six administrative districts in the Pwani region. It is governed from the mainland and has never been considered part of the semi-autonomous region of Zanzibar. With 394 km2 it is the third largest Tanzanian ocean territory. Its main town is Kilindoni on the west coast (Kock & Stanley, 2009).

According to the national census of Tanzania 2002, the population of the district of Mafia was 40'801(Tanzania Sensa, n.d.). The economy is based on fishing and subsistence agriculture. Especially for the island communities of Juani, Jibondo and Bwejuu (a bit less in Chole) fishing plays a vital role for their livelihoods, providing around 70-80% of their income. In other villages, fishing is second to agriculture, but nonetheless provides an important seasonal income (Ministry of Livestock and Fisheries Development, 2011, p.15).

The word "Mafia" finds its origin in the Swahili term "mahali pa afya", which translates to "a healthy dwelling place". This designation aligns with the remarkable ecological characteristics

of Mafia Island, which has the highest marine biodiversity in the country and is home to one of the most productive ecosystems in the world (Bryceson et al., 2006, as cited in Moshy et al.).

This rich biodiversity also attracts ecosystem-based tourism, mainly for scuba diving, bird watching and fishing. Although large-scale coastal tourism has not yet taken hold in Tanzania due to remoteness and lack of infrastructure, it is playing an increasingly important role in Tanzania's coastal economy and MPA development (Gustavson et al., 2009, 84).

First concerns about the protection of coastal areas and marine resources in Tanzania came up in the 1960s, followed by the establishment of various reserves along the Tanzanian coast in 1975. Due to a lack of financial and human resources, these first attempts weren't very successful. To make management more adequate, the Mafia Island Marine Park (MIMP) was established in 1991 under the Tanzania Marine Parks and Reserves Act. For the supervision of the park, a committee was elected by the Principal Secretary of Ministry of Natural Resources, Tourism and Environment, consisting of representatives from the Institute of Marine Sciences (IMS), WWF, WCS, the Fisheries Division, the Regional Natural Resources Office, and a member of the parliament in Mafia. Still in 1991, a public workshop was held to consult the communities and include them in the planning process. The MIMP is Tanzania's largest Marine Protected Area, spanning 882 square kilometres involving 13 communities with a population of 23'000, which is a bit less than half of the population of the whole Mafia District. It is the first marine park in Tanzania to allow local residents to live within its boundaries (Ministry of Livestock and Fisheries Development, 2011, 2). Included are the inhabited islands of Chole, Juani, Jibondo and Bwejuu (Ministry of Livestock and Fisheries Development, 2011, 13)

Currently the MIMP's management practices rely on the restrictions and bans of destructive resource extraction methods, construction and tourism activities and the application of a strict zoning scheme with different levels of protection, access and temporalities of closure.

When it comes to practices, some of them are completely banned for everyone such as for example the use of specific kinds of nets for fishing (beach-seine nets, tawling) the use of spear-guns, chemicals and poisons for fishing etc. Others are allowed, but only in specific zones or only for the self-use by residents in contrast to commercial sale. This includes for example sea coral mining for domestic construction, mangrove-cutting etc.

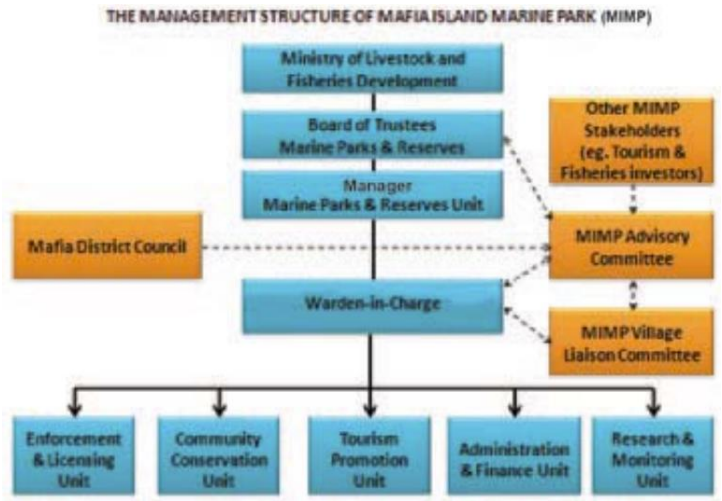
The zoning system includes:

- a **core zone** with the presenting the highest level of protection and the complete prohibition of human activity (except for controlled tourism and scientific research) due to its importance to biodiversity or cultural significance,
- specific use zones presenting an intermediate level of protection because of its importance for the provision of local livelihoods
- and general use zones witht the lowest protection status (Ministry of Livestock and Fisheries Development, 2011, 50-52)

The **decision-making** of MIMP is clearly regulated in a hierarchical manner. While the Board of Trustees formulates policies for all Marine parks in the country and directs the Marine Parks and Reserves Unit (MPRU), the advisory committee, composed of representatives from local communities, regional and district government, NGOs, research institutions and tourism as well as fish processing operators, advises said Board of Trustees. The MPRU is also able to propose a Warden to the Board of Trustees, whose responsibilities lie in the administration of the park and the community involvement. The MIMP Village Liaison Commitee represent the link between the communities and the MIMP and has been established by the villages within MIMP. Each Village Liaison Commitee is responsible for the compliance of their villagers to the regulations.

Also the Mafia District Council collaborates with the MIMP in different areas such as the collection of fees and the according disbursement of revenue, fishing licesnses, land tenure etc (Ministry of Livestock and Fisheries Development, 2011, 41-42).

Figure 2.
Management structure of Mafia Island Marine Park (MIMP)



Note. from Ministry of Livestock and Fisheries Development (2011)

Such restrictions did not occur without conflict. McClanahan et al. (2009, 347-348) for example, found that most perceptual differences between villagers and MIMP managers, and thus most conflicts, arose from spatial and temporal closures and species restrictions and less from gear restrictions and minimum fish lengths. According to McClanahan et al. (2009, 347-348) these perceptions are correlated with proximity to the park and their economic alternatives. Where people lived close to fisheries closures, but at the same time were more dependent on marine sources because they couldn't rely on agriculture, attitudes towards MIMP were the most negative. Also the findings of Kincaid et al. (2014, 233-244) coincided with these results and added further aspects such as the increase in catches and the involvement in MIMP-related activities. According to them, the affiliation to a specific community and the

use of a certain gear type were still more explanatory for the difference in perceptions about the compatibility of fisheries and conservation.

6.4. Context Toliara, Madagascar

Even though the workshop took place in Toliara, stakeholders from the whole coastal area in the region of Atsimo-Andrefana were invited.

Atsimo-Andrefana is a region in Madagascar, located in the deep south of the country. It includes a vast coastal zone and covers an area of 66,236 square kilometres. As of 2020, the region was home to approximately 1.892 million people, mostly in rural communities with a relatively young population (Atsimo-Andrefana (Region, Madagascar) - Population Statistics, Charts, Map and Location).

Atsimo-Andrefana is characterised by semi-arid landscapes with an average annual rainfall of about 350 mm. Lack of rain is caused on the one hand by the rain shadow effect of the Anosyenne Mountains and on the other hand by upwelling of cold currents off the south coast that limit the development of clouds along the coastline. Climate change further exacerbates the situation leading to rising temperatures, erratic rainfall patterns, cyclones, and locust plagues, droughts and consequently to far-reaching socio-economic challenges.

The lack of rain for example has effects on demographic patterns. Increasing droughts and absence of effective irrigation systems make agriculture a non-viable source of income. A report from the World Bank of 2017 showed that the number of people living on less than USD 1.90, reached 91% in the deep south, especially in rural areas, leading to food insecurity and vulnerable livelihoods (Healy, 2017). In Atsimo Andrefana, the prevalence of insufficient food consumption is at 34% of the population (World Food Programme, 2023). This vulnerability causes increasing migration to the coastal regions, adding to the already increasing population, especially concentrated around Toliara where people can sell their products. This concentration is a result of the lack of infrastructure such as roads and refrigeration facilities (Chaboud, 2006, 200).

Coastal communities are already heavily dependent on local ecosystems such as coral reefs, seagrass beds, terrestrial dry forest and mangroves for their subsistence and income (Scales et al., 2017; Moat & Smith, 2007).

Their activities include fishing in and around coral reefs and mangroves, the extraction of timber for housing and fencing as well as fuel wood collection, charcoal production from dry forests, extraction and burning of shells for lime production which is used for house construction (Rakotomahazo et al., 2019, 46-47). Increasing human pressure poses a great risk to these ecosystems and natural resources are tending to decline (Bruggemann et al., 2012,

p.13). Bruggemann et al. (2012, p.8-9) for example found that fishing yields decreased by more than 50% in the Toliara province in a time range of 20 years from 1995 to 2015.

The current state of resource exploitation highlights the need for more sustainable management practices (Bernier et al., 2011, 60).

In the present time, there exists a vast variety of management practices. As the government of Madagascar has increasingly decentralised the governance of natural resources, it is essential to understand the local regulations (and their interplay with the national level). Many of these local regulations have their roots in traditional Malagasy social norms reaching far back into the past or newer measures, often stemming from local research institutes, NGOs or private companies explicitly addressing the issue of resource depletion. It is important to mention that often these newer measures are required to comply with the traditional local customs.

Regarding Malagasy social norms, there are different customary rules in place that have consequences for land tenure and conservation. Two of the main customary rules are "dina" and "fady".

A "**fady**" is a set of prohibitions including the definition of good manners, or strict taboos that according to Malagasy culture could cause a supernatural retribution in the case of its violation. They are often found associated with eating habits, burial practices or work-free days, but also in conservation related practices, such as the protection of specific species or habitats, the use of specific techniques etc (Jones et al., 2008, 979-982). For example, the coral reef encompassing the island Nosy Ve, holds the status of a "fady" zone. As a consequence, fishing activities within this designated zone are reputedly prohibited. A field survey conducted by Bruggemann et al. (2012, p.9) showed that the biomass of reef fishes and coral cover was indeed higher at this "fady" site than at other sites of the Grand Récif of Toliara.

Traditionally, "**dina"** are social conventions helping to regulate relations within and between communities. They are widely used and generally respected among Madagascar's population. It enables communities to develop and apply a set of rules often in relation to natural resource management. GELOSE, a state legislation, enabled the legal recognition of dina as an official governance tool. To reach this recognition, a dina has to be created and agreed by the local community, be compliant with local norms, be approved by local authorities and conform to already existing national laws (Andriamalala & Gardner, 2010, 465-466). As "dina" can be created and changed, it is not only a cultural remnant from past time, but also found its way into other approaches of natural resource management, for example in the form of so-called "community-managed" or "co-managed", or "locally-managed" (marine) protected areas (LM(M)As/ PAs/MPAs).

Andriamalala & Gardner (2010, 465-472) present the example of Velondriake, a community-managed marine protected area established in 2006 in the southwest of Madagascar. There, the "dina", based on already existing management practices, was created by the Velondriake association, the NGO Blue Ventures and other community members and approved by the

general assembly of the association, the mayor of the commune, the head of the district and representatives of different ministries. The “dina” included the ban of different activities such as the use of laro, a neurotoxin, beach seining, the use of too small mesh sizes, and the hunting of protected species, specific fishing times and temporary as well as permanent closures for fishing, octopus and crab hunting. Furthermore, it defined the punishment for breaking the rule. Law enforcement is based on an hierarchical approach, leaving the authority to resolve the issue to the lowest level possible (Andriamalala & Gardner, 2010, 466-467).
Another example where “dina” was used in the Tahiry Honko initiative, aiming at the conservation of mangroves through the sale of carbon credits via Plan Vivo certificates. The initiative was jointly created by the NGO Blue Ventures and the Velondriake Association. In the planning phase of the initiative, the local Marine Research Institute IHSM was consulted to investigate the use of mangrove resources and the local social-ecological system. In the course of its implementation, “dina” were created that for example prohibited night fishing, the cutting of mangrove wood, and the definition of reforestation zones (Rakotomahazo et al., 2019, 45-48).

Furthermore, alongside the ban of specific activities, the restriction on the use of specific instruments, and the implementation of protected areas, conservation endeavours have incorporated an additional management approach, namely the provision of alternative activities, such as the so-called “Blue Economy”. There is an emerging body of literature and “blue economy” activities are increasingly gaining momentum world-wide. “Blue Economy” according to the EU includes five focus areas: aquaculture, marine renewable energy, marine mineral mining, marine biotechnology and marine and coastal tourism. Yet, there is not an accepted definition and views on its effectiveness in sustainable development are debated (Garland et al., 2019, 10-12). In the coastal region of Atsimo Andrefana, the main focus lies on aquaculture in the form of seaweed and sea cucumber farming. A report from PIC2 (2016) states that the increasing exploitation of these sectors could help reduce the pressure on the marine environment and at the same time create alternative sources of income.

First attempts of cultivating algae already began in 1989 in Madagascar. It was a joint endeavour of IHSM, the association BIOMAD. After experiencing various throwbacks, the sector nonetheless grew in Madagascar, including further stakeholders such as NGOs, different private companies and funding sources. Sea cucumber farming began even earlier, with low amounts shipped to different parts of Asia and later on gained increasing attention attracting new players (PIC2, 2016, 8-9).

In general, the network of stakeholders is very complex, but it can be divided into different functional groups: (a list of the most important groups and their most important players)

Table 4
Stakeholder List Madagascar

Stakeholder Groups	Administration	Research Institutions	NGOs (local, national, international)	Networks and Platforms	Fisheries Associations	Funding Institutions	Private companies
Activities	Fisheries management, regulation, monitoring	Research and training on social and environmental issues	Support local small-scale fishers	Connecting point of fisheries associations with NGOs and other stakeholders	Representatives of fisher communities, represent their ideas/ thoughts, etc. infront of other stakeholders	Financial contribution to projects	Producers and collectors of marine products
Most important stakeholders	MFBE (Ministry of Fisheries and Blue Economy	IH.SM (Institute Halieutique et des Sicences Marines) University of Toliara (University of Mons) (Université libre de Bruxelles) (Université de Liège)	BV (Blue Ventures WCS WWF PIC2 Reef Doctor CGP	RENAFEP MIHARI	VELONDRIAKE MANJABOAKE SAMBELÉ TEARIAKE	GIZ Madagascar World Bank UNDP FAO French Embassy Australian Embassy	OF (Ocean Farmers) IOT (Indian Ocean Trepang) Copefrito

Note. Retrieved from different sources, but mostly from interviews. This list is not complete and accordingly, doesn't represent the whole diversity of coastal actors, but it includes stakeholders that participated during the workshop as well as those pointed out to be important by interviewees.

In summary, the coastal area of the southwest of Madagascar presents an intricate network of stakeholders, their activities and collaborations. To understand the current coastal management, it is not only important to know the current management practices, but also how they are embedded in the social-ecological system. This includes considerations about culture, socio-economic factors, local, national and international dynamics as well as reflections about historical events and environmental and climatic conditions. Even though I am not able to capture the whole complexity of these interactions in the course of my thesis, this research enabled me to contextualise the identified themes and the general dynamic of the PaMo project.

6.5. Workshop Toliara

The first workshop was held in Toliara on the 23rd of February. On this day, the weather was a little cooler compared to the previous two weeks which was very appreciated by myself and the researchers from ZMT. February is indeed one of the hottest months in Toliara, because it is still part of the summer season.

The setup

After our breakfast, we took the short walk of around five minutes from the hotel to the conference room at IHSM which is also used as a class room. It was on the second floor with an ocean-view. Since a cyclone passed over Toliara the day before, the University was closed which meant a lot of free rooms for group discussions. When we arrived, everything was already set up. The tables where the participants were to sit were arranged in a U-shape so that everyone could see the facilitators and speakers. Behind the U-shaped tables there were two more rows of tables for the researchers of ZMT including me and the master's students. The seats were not assigned, so that the arriving participants could decide for themselves where they wanted to sit. Between the seats of the researchers from the ZMT, there was one free seat each, which was occupied by a master's student who was responsible for personal translation, since the workshop was held in Malagasy. The task of translation sometimes presented challenges due to the translators' limited familiarity with certain local expressions, given that some of them were from outside of Toliara. The tables were covered with white and blue tablecloths and for each participant, a booklet plus a name plate, a bottle of water and two pens, one from IHSM and one from ZMT was distributed. While a couple of master's students worked on the sound desk, the organizers from ZMT and IHSM settled in with their presentations, which would later be projected on the wall. The electronic equipment consisted of a microphone, a loudspeaker and a beamer. In addition, there were four cameras to capture the most important moments. Two were operated by master's students while one was from one of the researchers of ZMT and the other was mine.

The PaMo team

From the organising team three researchers from ZMT, two researchers from IHSM and one representative from the Ministry of Fisheries and Blue Economy were present. One of the organisers from IHSM came later.

The participants

The workshop took place with a total of 23 participants. Among the participants were representatives of Locally-Managed Marine Areas (LMMAs), administration, academia, NGOs, fishermen- and women associations and networks:

- NGOs: WWF, Blue Ventures, PIC, WCS, CGP,
- private companies: Ocean Farmers, IOT
- LMMAs: Befasy, Ambatomilo, Maromena, FIMIHARA
- networks: MIHARI, ??
- administration: DRPEB
- academia: University of Toliara

In an interview I was told that the participants had to organise their transport themselves as they all came from different directions. Depending on where they came from, they either came by boat, Pousse-Pousse which is a kind of bicycle rickshaw….

Workshop Programme:

1) Arrival

As time progressed, an increasing number of participants joined and took a seat. While some participants engaged in conversations, others were just observing their surroundings or writing their names on the plates. The Malagasy contingent of the PaMo team greeted each participant personally with a handshake. When asked by the ZMT researchers if it was appropriate to do this as well, the Malagasy organisers assured them that they thought it was unnecessary. The registration, unlike outlined in the workshop program didn't happen at this point as there were still more participants expected.

2) Opening remarks and Introductions

According to the schedule, the first introductory words were spoken by an IH.SM researcher who was part of the PaMo organizing team. The agenda of the workshop was projected to the wall and the participants were listening attentively, and some of them were taking notes into their booklets. Only a few had a laptop. Every now and then, the researcher said some things that made the participants laugh and brought a relaxed atmosphere into the round. After the first short workshop introduction, the participants were applauding when the Director of IH.SM was about to give a second short introduction. After a few initial sound problems, the fix was quick after a few button presses on the sound desk.
At that time, some of the seats were still vacant.

3) Opening Guest of honor

After the opening remarks, the guest of honour, the Regional Director of MFBE, who wasn't part of the PaMo organising team, introduced himself, the collaboration with IH.SM and ZMT in Malagasy. When he finished, people applauded and he himself translated his words into English. He thanked ZMT and the participating groups for their presence and invited them to participate proactively for a successful workshop. He further talked about his hopes for the workshop outcome, especially the sharing of knowledge for the development and management of Blue Economy.

4) MPBEP presentation

According to the schedule, even a little early, an official of MPBEP who is part of the organising team stepped in front of the participants. In his speech that was held in Malagasy, he highlighted that the primary focus of the ministry in this workshop is the facilitation of widespread participation and the promotion of the professionalisation of fisheries and the integration of Blue Economy and conservation efforts through participatory modelling. According to him, MPBEP's desired outcome is that this series of workshops in which stakeholders are consulted repeatedly, would provide it with the insights needed to take management decisions in the fisheries sector.

5) IH.SM presentation

After MPBEP's presentation, a researcher who is also part of the PaMo team presented IH.SM. While he presented in Malagasy, the presentation, which presented the history of IH.SM, its current mission, and the various stakeholders involved, was in French. The presentation

especially emphasised the number of master degree graduates and their job perspectives. During the presentation a woman entered the room and took a seat.

6) PaMo-NbS presentation/ Co-Design/ Participatory Modelling

After apologising for not speaking Malagasy, the researchers from ZMT thanked the Director of MPBEP for his words and the presence of the participants in English highlighting the collaborative nature of the project and their participation's importance. For me it was easier to capture what was said, as I wasn't in need of a translator. At this point a researcher from IH.SM who was assigned the task of translation interrupted them to be able to translate sentence by sentence. After he was done, many of the participant's faces lit up with smiles. As agreed upon in previous meetings, the researchers tried to use simple language in the advancement of their presentation. With a power point presentation which was in English, they continued with the presentation of ZMT emphasising that its fundamental principles are based on the combination of natural and social sciences and how innovative it was back at the time when ZMT was founded. While they continued, another person arrived and took a seat. One key point in the presentation was ZMT's international collaborations, and also its own internationality.

7) Co-Design and Modelling

Moving forward, another researcher from ZMT introduced the concept of co-design with phrases like: "the project has a very fancy name, but we will jointly develop an idea about the ecosystems… and it's really difficult to find a solution that makes everybody happy. Sometimes decisions are made at a higher level, but not with local knowledge. What we try to do more is really embrace this traditional knowledge and incorporate it in research". The participants listened very attentively and some took notes, somebody even looked at what his neighbour was writing down.

8) Workshop objectives

Transitioning to the next point, a researcher presents the different workshop objectives which were

1) how they might be impacted through different management practices, and to translate this into a map where they could maximise their output,
2) to construct simple , objective models on social and ecological systems where everything is based on their perspectives and inputs, in concrete how changes in management would lead to changes in the systems, and
3) make it self-sustained and leave the won knowledge within the communities. At this point he mentioned that to his knowledge there is already a space for the exchange of practices and knowledge here, but that the project would also happen in Tanzania and that there could be a fruitful exchange.

He further underlined that this is just the first phase, in which the PaMo team wants to learn how the current management is affecting the people's life and agree on topics and issues that need to be addressed. The development of tools to assess these impacts would only be developed in a second phase.

After the presentation of the objectives a first question was asked by a participant, namely what kind of tool that will be produced at the end of the workshop.
The answer came from a researcher from IH.SM stressing that the tool wouldn't be something high-tech, but merely a decision-making tool which allows for drawing connections between the space and management practices and policies.

At this moment a collective gesture of clapping resonated through the room after being prompted by one of the Malagasy facilitators. My interpreter explained that such a practice is customary in workshops, serving as a symbolic closure of a part and the expression of joy. This practice, known as Lamako, is simply translated as "applause".
Not outlined in the workshop agenda, but brought up by a leader of a LMMA, the question of what every stakeholder is expecting from the workshop was thrown into the round.

The stakeholder's expectations ranged from more general to quite specific.
More general expectations:

- The exchange and integration of different kinds of knowledge, ideas and experiences
- A sustainable outcome: The project shouldn't end with the last workshop but be sustained in the future
- Extending mutual learning and exchange to the national and international levels.
- Having a model or tool that can be applied
- improve management practices while addressing the needs of the communities and organisations.
- improve the relationships between the stakeholders

Specific expectations:

- increase Blue Economy production
- address the issue of LMMAs and their oversaturation with too many fishermen
- address the issue of boat licences
- Address the problem of lack of knowledge about a particular species of fish that is a staple of the communities' diet but is discouraged from consumption under the MPPEB due to apparent health problems.

The round ended with another Lamako.

TEA BREAK
During the break, snacks, coffee and tea were provided and the participants had the opportunity to communicate with each other in a less formal setting.

9) Group Discussions
Before the next session started, a presency form was going around.
Then, the participants were divided into the following stakeholder groups:

After this first division, the decision was taken to merge group 3 and 4
Group 1: NGOs including WCS, PIC, WWF, CGP (6 people)
Group 2: private sector: OF, IOT (2 people)

Group 3: association of fishermen/ platforms/ networks (11 people)
Group 4: academia and administration (4 people)

After initially having five groups, including group 3 divided into association of fishermen and platforms/ networks, one of the facilitators decided it would make most sense to merge them into one.

The groups were asked to answer the following questions:

1) For you, what are your common struggles concerning the ocean and its management?
2) What will be the consequences for each struggle?
3) What are solutions for each problem?

The questions, even though different from the original workshop agenda, still represented what had been discussed in the last meeting before the workshop. The facilitators encouraged the groups to diligently record their responses. After another Lamako, the groups dispersed and went to different rooms where they discussed the questions posed. While the smallest groups, group 2 (private sector) and group 4 (academia and administration) stayed in the main conference room, the bigger ones group 1 (NGOs) and group 3 (community members and networks) went to separate rooms. One of the facilitators went through the different rooms to make sure that each group understood its task. Another went around to record short videos and take pictures. I also visited all the groups for a while and noticed that, for example, Group 3 had very lively discussions, with lots of hand gestures and raised voices, while others were more reserved and that in the groups with women present, she took notes.

10) Group presentations

After the groups finished their discussions, they were asked to gather again in the main conference room. One after the other group presented their identified issues while the rest listened. All groups presented in what seemed to me in a very confident manner.

During the presentations one of the facilitators took notes and collected all the issues brought up.

LUNCH BREAK

During Lunch, traditional Malagasy food was served.

10) Group discussions

At the beginning of the group discussions, one of the facilitators narrowed down the issues to the ones that have been mentioned by all groups.

This resulted in three main issues:

- The conflict of space. There is no clear demarcation of use zones for the many actors operating in the maritime domain.

- The non valorization of available data. Even though all actors are in the possession of their own data, they are not shared effectively or used in the decision-making process.
- The non-compliance and non-application of legislation. Even if there are laws concerning spatial and resource use, they often aren't respected.

While he exposed the three points some of the participants checked their booklets. In a lot of points the participants agreed with each other, but also partially contradictory views came to light.

For example, in the case of conflict of space, group 1 brought up in their presentation that there was a conflict between fishermen, tourism, and private companies. Conversely, a representative of Group 2 offered a contrasting perspective, articulating his enterprise's existing approach to navigating spatial challenges. He mentioned the existence of their well-structured framework that included formal interactions in the form of consultation between the local community and the company.

Still referring to this point a member of a local community intervened and shared his own experience of such a conflict and how it was resolved:

He introduced the problem with the implementation of a new Blue Economy project in their village. Even though consultations happened before the instalment of the seaweed farm, they realised only later that the fishing boats couldn't pass through the fields anymore. In a joint endeavour they found a solution to the problem, namely creating roads where boats could pass through to reach their fishing grounds. In explaining this issue, he also underlined the importance of solutions adapted to the local context, without a third external party intervening.

From this exposé, further questions arose that were discussed vividly. As for example, which stakeholders should be involved or how a change in policies could lead to an improvement. A member of an association stated, that a change in law would take many years in the context of Madagascar and therefore isn't a viable option for something that needs fast change.

Also for the second issue about data availability and sharing, propositions came up on how to address it such as having a collective data platform or standardising the methods of surveying.

Throughout the discussion, one of the stakeholders took notes into a table that was provided by the organisers.

Also this part was officially finished with a Lamaka.

11) The way forward and final comments

Instead of having another tea break, the team decided to go ahead with the next parts of the workshop as we were running out of time. First it wasn't very clear who should introduce the last part, but after a short discussion one of the organisers took the word, saying how valuable the gathered information was and how with this input the project could be further developed.

He also emphasised how the participants are an essential part of the project and should be involved all the way through continuous consultations.

12) Questionnaire

Also the other organisers thanked the participants, while I started to distribute my questionnaires. When all of them were distributed, I quickly explained what my thesis was about and how important their feedback is not only for my thesis but also for the further development of the project. Even though I prepared a different speech, I adjusted it to what I have experienced during the workshop so far. For example, I picked up the joke about the "fancy word" again, but how it is something that is already subconsciously practised and then I added some expressions of my personal thoughts of how I think research should be done. Even though at the beginning the participants seemed to understand their task, some questions came up when they had to fill in the questionnaire. One of the organisers stepped in and started to go step by step through all the questions with the participants, making sure that everybody understood them.

My speech seemed to resonate quite well, especially with a Master's student who showed a lot of interest in my research. After the questionnaires were filled in, I collected them and people started to leave. Some of the participants that came from further away were asked to pass by one of the tables to receive their transport reimbursements.

6.7. Workshop Mafia Island

The second workshop was held in Mafia Island on the 28th of February.

The setup

Together with the researchers from ZMT we ordered a taxi from the hotel to the workshop site. Even though one of the ZMT researchers felt a bit sick, he still decided to join. The workshop took place in the MIMP (Mafia Island Marine Park) Conference Hall in Utende, right at the entrance of the Marine Park. When we arrived everything was already set up. In contrast to Toliara, there weren't any tables, but chairs were distributed in rows facing to the front like in a classroom. While the ones on the right half of the room were wooden and had little tables attached to them, the ones on the left looked more like upholstered office chairs. While some representatives of IMS were still preparing things, including the translation of my questionnaire, one of them advised us to take a seat on the left side. The presentation was projected to the front wall with the Swahili title "UTATUZI WA CHANGAMOTO KUTUMIA NJIA SHRIRIKISHI PAMOJA NA MAARIFA ASILI". Next to the presentation there was a flipchart which could be used later on for the presentation of the group discussions.

The PaMo team

From the organising team three researchers from ZMT, three representatives from IMS, one representative from DRPEB, one representative from the Marine Park, one researcher from IHSM, and one representative from the Ministry of Fisheries and Blue Economy were present.

The participants
The workshop took place with a total of 35 participants. Among the participants were representatives of administration and communities:

- Administration: Mafia Island Marine Park (MIMP) officials, Mafia District Council
- Communities: Juani, Chole, Jibondo, Kiegeani

The workshop was held in Swahili with frontal translation by a researcher from IMS. The first presentation held by ZMT in English was translated into Swahili for all the participants.

Workshop Programme:
1) Arrival
With time, more and more participants arrived and two different attendance lists and the program of the workshop were distributed. All the participants were asked to sit on the right side of the room. While we were still waiting for the missing people, who according to one of the organisers were on their way by boat, I went around taking pictures.

2) Opening remarks and Introductions
The main facilitator of today's workshop invited the local leader to make an introduction. After his speech, everyone said the same sentence together and the participants were asked to introduce themselves including their names, organisation, association or village without addressing their expectations of the workshop.

Next, the director of IMS made a short introduction about the history and current activities of IMS, especially how IMS expanded its research focus from only fisheries to more diverse topics. In the course of her speech, she also highlighted the importance of traditional knowledge. Everybody listened very attentively and applauded when she finished.

The second introduction was made by a representative of ZMT, who first thanked everyone for attending. In his speech he mentioned that the undertaking would be an extensive and enduring process, commencing from this moment. After thanking GIZ for its funding, he concluded his remarks with the Swahili phrase "asante sana", which evoked smiles in some individuals.

Subsequently, the main facilitator introduced a representative from Madagascar who rose from his seat and proceeded to the front to continue the introduction. Expressing gratitude for the invitation, the representative acknowledged the insights gained from the initial workshop in Toliara, particularly emphasising the significance of participation. Furthermore, he affirmed his commitment to applying the acquired knowledge to future endeavours.

3) Opening by guest of honour
Then, moving forward the manager of the Marine Park Reserves Unit continued the series of introductions. After thanking the participants, GIZ and the workshop organisers, he expressed

his hopes that the participants would take the opportunity to integrate their knowledge in the project, as it for a long time helped preserve marine biodiversity and resources. He further mentioned the traditional knowledge they aim to document is not only helpful for Mafia, but that it could als be utilised in other marine conservation areas. With this, he declared the workshop officially opened.

After the round of introductions the main facilitator from IMS presented the workshop programme with some powerpoint slides. From this, some questions arose as for example, whether there were any formal ways of exchanging knowledge amongst fishermen.

4) PaMo-NbS project presentation

Similar to the workshop in Toliara, a representative from ZMT first introduced ZMT, highlighting their emphasis on the combination of natural and social sciences, followed by a presentation about participatory modelling. In the second presentation, the representative of ZMT showed an example of such a map explaining, how for example "fisheries influence how many fish there are, they influence the reef, the reef is used by the tourists and both are providing livelihoods to the communities and we want to show knowledge about these connections". Some of the participants took pictures of the map with their phones. He further added, "today we will not make the finished map, but we will lay the foundation for building the map and find solutions on how to improve the situation for everyone."

A participant, concerned that there wouldn't be enough time to discuss everything, asked what the exact topic of the workshop was, be it mangroves, fish or corals. One of the organisers responded that this workshop was only the initial phase and more would follow, but that the essence of the project was their participation.

TEA BREAK

5) Group Discussions 1

While some of the participants were still outside enjoying their tea break, the main facilitator already started with the next presentation. On his presentation there was a list of different points which include different kinds of knowledge:

1) *biophysical/ environmental or habitats knowledge*
2) *Resource knowledge and relationships between resource and environment*
3) *Oceanographic factors*
4) *Utilisation of marine environment and resources*
5) *Traditional management of marine environment and resources*

Questions to be answered:

1) What environmental challenges do they face on Mafia Island?
2) Resources
3) What traditional knowledge exists to resolve the problem?
4) What is needed in terms of traditional knowledge?
5) Who needs to be involved?

Unlike in the first workshop, the participants weren't divided according to their stakeholder group, but randomly by giving them numbers from one to three. Before the groups separated to discuss the questions, they were asked to gather in front of the workshop venue to take a group picture.

GROUP DISCUSSIONS

6) Group Presentations 1

Group 1:

Group one started with its presentation. The person that was writing on the flip chart was also the one presenting. As environmental challenges they identified beach erosion and coral reef degradation in relation to it as well as climate change and as a consequence, the unpredictability of the weather like it used to be possible in the past. As issues regarding resources they presented the lack of awareness and education in their sustainable management and the contradiction between the current law and traditional fishing practices as it prevents the use of traditional gear. Even though they couldn't find any existing traditional knowledge that would help to resolve these problems, they stated the needed interventions from the local people that should decide on temporary closures and which gear to use as it happened in the past. For example, according to customary procedures they would only be allowed to fish in the mornings and at certain times in the afternoon, which was controlled by the elders. They stated that this system should be reintroduced. For question number 5 they decided that especially the people that are concerned by these interventions, so the people in particular villages should be the institutional actors coming up with solutions.

After the presentation, the facilitator asked the group whether there was anything missing. As there weren't any interventions, group 2 continued with its presentation.

Group 2:

As environmental issues they identified climate change and accordingly the warming of the ocean. They stated that as fish were getting increasingly depleted, they needed to go further and deeper and use different gears to catch them. A second issue they identified was as mentioned by group 1 beach erosion. In relation to resources they mentioned the increasing number of fishers and vessels in a limited area leading to overfishing. Also they addressed the non-involvement of the local people in decision-making about the management of the coast and the use of specific gear. As answer to the question what traditional knowledge exists was the existence of traditional laws of specific villages that for example included actions like replanting trees along the coast line. To the question of what traditional knowledge is needed to address these issues, they stated that there was no traditional knowledge that could help, but that the intervention should be non-traditional for example in the form of a formalisation of the fisheries sector including loans to improve fishing activities. Even though there were investments, they would usually not benefit local fishers. They would also like to play a bigger role in tourism when it comes to water sports activities, as for now only hotel owners would profit from such activities. Another solution they proposed was in the area of education. There should be environmental education as a fixed part of school curriculums as well as educational

activities in terms of entrepreneurship. As one of the most important points they highlighted the importance of their participation from the initial stage of projects until their implementation. After the presentation one of the participants made a remark that issues related to climate change do not only threaten resources directly in the ocean, but that it is connected to the land. As crop farming becomes increasingly difficult, farmers decide to become fishermen instead.
To this remark another participant added that traditional rituals in resource management should be acknowledged, as they are believed to have the potential to enhance certain resources, such as rainfall. According to him, these rituals should be taken into consideration when implementing management strategies. Also, when designating fishing zones and prohibited areas, it should be ensured that local communities can also derive benefits. In addition, where governments or agencies adopt regulations, mechanisms should be in place to actively engage local communities and take steps to evaluate effectiveness, such as through repeated feedback from community members.
To this, the facilitator mentioned the presence of the fisheries officer who would also take note of the discussion.

Group 3:
Group 3 mentioned as answer to the first question the inadequate formal education of fishers, the environmental degradation and destruction of breeding grounds such as coral reefs through the use of destructive practices, the lack of capacity development and their non-inclusion in loan schemes to increase their financial capacities. For the second question they underlined the importance of traditional leaders or village elders who are in the possession of a rich knowledge in the form of rituals and taboos. As knowledge needed they pinpointed to the traditional way of managing fishing areas in the form of temporal closures which should allow the fishing grounds to replenish. Involved in these decisions should be the elder fishers of the respective villages.
No questions were asked to this presentation.

At this point one of the organisers signified that it was prayer time.

LUNCH BREAK

<u>7) Group Discussions 2</u>
With almost an hour delay, the workshop continued with the discussion of the second set of questions. This time the questions were more related to the traditional knowledge itself.

1) How is local knowledge stored and transferred?
2) What kind of local knowledge is held?
3) How is local knowledge passed over to the next generation?
4) SWOC (strengths/ weaknesses/ opportunities/ challenges) analysis for local knowledge

The questions were again discussed in the same groups, which had about thirty minutes to do so.

8) Group Presentations 2

The order of the groups that presented was different this time.

Group 3

In this group, again a woman presented. The group answered to the first question that knowledge was transferred through teaching from the older to the younger ones. Major areas of local knowledge could be found in identifying fishing grounds and types of fish, as well as knowledge on traditional fishing. According to them, local knowledge is passed on to the next generation by oration and practical engagement such as for example fishing expeditions that allow the younger ones not only to observe but also to experience. As strengths of traditional knowledge they identified the sustainability of traditional resource management. Weaknesses on the other hand were seen in the lack of documentation of local knowledge, and the lack of a wider dissemination and accessibility of their knowledge. Opportunities were seen in the potential to increase youth employment and in the minimal cost of acquisition, as it is usable by everyone. One identified challenge was the change of lifestyle. Whereas in earlier times young people used to get together with their elders to learn from them and fish together, today's changing lifestyles leave no time for this. The second identified challenge was the difficulty of implementation of management practices related to traditional knowledge, because of its informality.

Group 2

Group 2 started with the identification of five points where local knowledge is utilised in fishing activities. These are: the use of monsoon wings, the knowledge of astrology for celestial navigation, the knowledge of the islamic calendar to identify different seasons, and the knowledge of how to repair gear and vessels. Similar to group 3, they addressed the issue of lack of documentation of local knowledge as knowledge transfer is based on informal narration and practical exercises. In the SWOC analysis they identified the knowledge of vessel construction, astronomical knowledge and the opportunity to fish during all seasons as strengths. On the other side they also stated that weaknesses are the lack of capacity to fish in all areas, the informality of collecting this sort of knowledge and decreasing amount of resources to construct vessels. Within the local context, particular emphasis was placed on the favourable aspect of having a market to sell their products, as well as the existence of individuals possessing the requisite expertise. However, challenges were identified in relation to the volatility of prices and the elevated expenses associated with obtaining materials.

Group 1

As previously indicated during their first presentation, the group asserted that traditional knowledge is currently underutilised and should be incorporated into formal education or digitally preserved through video and audio recordings. They proposed that heightened efforts should be made to enhance public awareness in order to facilitate effective knowledge storage. They recognized the strength of the older generation's knowledge base and emphasised the potential for younger generations to learn from them, as well as the potential for commercialisation. However, they also saw a weakness in the illiteracy of elders, which poses

challenges to knowledge retention. In addition, they pointed to the general challenge of the modern world, in which youth may show less interest in traditional knowledge.

A remark was made by the same participant as before, namely on the existence of adequate knowledge in every aspect of fisheries, from the capacity to build their own gear including their reparations to the storage through salting and smoking. One of the organisers added that the issue was that the young people weren't interested in this kind of knowledge anymore.

Getting more into the discussion, the concern was expressed that one village might be favoured over another precisely because they share fishing grounds. The facilitator assured that no decisions would be made without the consultation of the villagers.

9) Final comments community representative

Since we were over time, the tea break was skipped and we jumped right into the final comments. After all the questions had been clarified, the local leader gave a closing speech in which he thanked all the participants and emphasised the bond between the villages, comparing them to brothers and sisters united by a common bond. He stressed the importance of involving both communities in the project, pointing out the mutual benefits of cooperation.

After his words, the questionnaire was distributed. Unlike in Toliara, the participants filled them in individually without going through all the questions together and I didn't have the chance to explain why it is important for the project and myself.

One of the representatives of ZMT also made a closing comment, thanking the participants for the interesting insights he had gained and expressing his hope that the workshop had contributed to shared learning and that the process would continue.

7. Results

Through an iterative process of coding and theme generation in the approach of qualitative content analysis, key themes brought up in interviews were elicited and divided into two SWOT tables.

Regarding perceptions about the co-production of knowledge in the PaMo project, 41 themes were identified as facilitating factors (28 for strengths, and 13 for Opportunities), and 55 themes were identified as limiting factors (44 for weaknesses and 11 for threats).

Regarding perceptions about the current state of coastal management, 28 themes were identified as facilitating factors (25 for strengths, and 3 for Opportunities), and 55 themes were identified as limiting factors (58 for weaknesses and 1 for threats).

By applying NodeXL, I discerned the interconnectedness of the different themes. Degree centrality is a centrality measure counting the total connections (edges) a node has. Even though degree centrality shows the interconnectedness of different themes and gives more structure to the collected data, it does not necessarily reveal the importance of a specific node (theme). Consequently and considering the relatively restricted sample size of my interviews, I engaged in triangulation of my data by confirming or refuting the relative importance of the different themes, and finally deciding main- and sub-themes. Furthermore it has to be mentioned that these connections are undirected and don't show any causal relationships. The description of specific causal relationships in this analysis is based exclusively on the accounts of the interviewees or interlocutors and thus represents their views and not my personal interpretation.

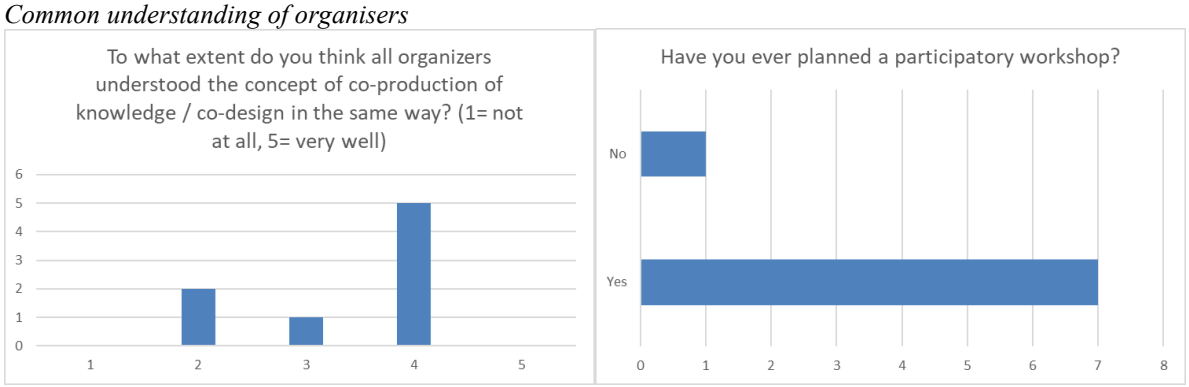
In the elaboration of the most prominent connections, also information from informal conversations, experiences from participant observation and considerations from the LeNa Shape workshop and meetings were brought in to confirm or oppose these findings. Furthermore I included quotes from Interviews into the text which describe the connection between the found themes.

7.1. Perceptions of Co-Production of knowledge

Regarding the common understanding of co-production, the opinions of the organisers were relatively divergent.

Figure 3.

Common understanding of organisers



Note. Results from the online survey conducted with the PaMo project organisers. The survey was created with surveymonkey.

With an average of 2,6 representatives from ZMT rated the common understanding of co-production of knowledge the lowest, followed by the Malagasy representatives with an average of 3,4 and finally representatives from Tanzania with a rating of 4. In relation to the organisers' experience, seven out of eight indicated that they have already organised such a workshop.

Organisers from Germany asserted that they were already familiar with the concept of knowledge co-production, while their counterparts from Madagascar indicated that their

previous engagements and interactions with stakeholders included analogous collaborative efforts, even if they were not explicitly described as knowledge co-production. They had become particularly aware of this through discussions with PaMo partners.

> ***[1]*** *"In principle, this has been shaping our projects for a very, very, very long time. So this is nothing new in terms of approach, and in terms of the choice of words with co-design, this was in 2018, when we had a very explicit co-design phase for another [funding organisation] project, so to speak." - organiser Germany*
>
> ***[2]*** *Yeah, let's say the Co-design. The co-design concept was something I felt that co-design is something like sophistical like that needs special software, something like this. But when it was explained by the guys from the ZMT, it makes it clearer and simple. So this is something that I learned, something that impressed me because when I felt about co-design I have something in mind, something like sophistical something like software, high tech technology, something like this…Yeah, sure I will, because this is something that is really useful for us. But I think I need more training for this before implementing anything related to this. - organiser Madagascar*
>
> ***[3]*** *"I just feel that I understand it more. Yeah, also because of the participation of some specialists, some other specialist or some other point of view from other partners, such like [name], his presentation, for example. For example, to give you a concrete example, we've discussed I was explaining something, trying to explain to him what it should be. He explained to me the same thing before, but I didn't necessarily understand. And then when I explained my point of view, he said that's exactly the same thing. And there I understand. So that helps understanding more easily… So that's something also that I learned about co-designing. In fact, if you interviewed me before the workshop, I would say no, I didn't hear and I didn't participate into the co-designing or co-production. But now that I understand it more, I told you just before that I have been participating and I have been organising the same. It's only that we did not use the terms." - organiser Madagascar*
>
> *[4] "It's both. Even if it's co-design, it can't be completely detached from the people who organise it. And of course the local context plays a much bigger role. And in Toliara, unlike in Mafia, I think there are many NGOs that have been active for many years, where this joint work, which doesn't have to be co-design, but at least such joint work, is more in the foreground. And that can, I think the experience from Mafia Island is a little bit less, although there are also some NGOs working there." - organiser Germany*
>
> *[5] "Because it's supposed to be co-design, because it's not supposed to be this typical, yes, the ones from Germany come there with the ideas and the daily allowance and that.... And it should be exactly the other way around, as bottom up and also, it should work exactly the other way around. And we all don't have the experience of how best to manage the process."*

The organisers' understanding of co-production and co-design was also tightly connected to the definition of project goals. In the LeNa Shape Workshop on ex-ante impact, organisers had to elaborate on their visions for the project. Here is what they brought up:

Table 5
Organisers' future vision for the PaMo project

Societal transformation/ inclusion in decision-making/ mediation

- To provide a useful feedback on the co-production in the PaMo project and to find ways to make research more inclusive and accessible
- Finding "solutions" to local conflicts, help mediate
- A decision-making tool that will resolve conflict between actors. So a kind of conflict resolution
- Giving agency and power to local communities

Conservation

- Conservation of coastal areas and local communities/ knowledge participating

Inclusion and valorization of local knowledge

- Have a structural approach to including local communities in local decision making
- local and scientific knowledge used for management

Coastal management

- To have marine management where local and indigenous knowledge is an integral basis for decision-making
- using knowledge in modelling scenarios, selecting best scenarios
- Improved management of local coastal/ marine resources
- contribution to management

Development of local economy

- Providing economic perspectives for local communities, poverty alleviation

Although most of the visions were mentioned in combination, one concern was the feasibility of economic development and more generally, whether it should be part of the project. One of the organisers expressed it in the following way:

> *[6]"the whole point of including local knowledge is not end itself, but I also wonder, if there is also the idea of improving in some way the economic situation of local communities" - organiser*

However, one organiser also looked positively into the future as far as the application of the co-production approach is concerned:

> *[7] "I think that the term is becoming more and more widespread and that this is also becoming more and more popular with our partners. Also as a nice improvement of the approach, so to speak, how research funds are allocated and how research is conducted. For me, the co-production of knowledge means that you sit down together with your different backgrounds and then basically develop results together for the projects or for parts of the projects or products that are promised and include the fact that we come from different backgrounds, bring different knowledge, come from different disciplines and exactly that is brought together without it being decided beforehand, so to speak, in which direction the whole thing should go."*

Regarding the geographical scope of the PaMo project organisers were largely in agreement. On the one hand, the project should address the local situations, also described as a sort of pilot project. In Madagascar the concern was raised that the area was quite extended and that the project would need to work with various LMMAs (the Ministry of Fisheries and Blue Economy is working with around 22 fishing regions). On the other hand, there is a general agreement that the tool which should be developed should be applicable to other contexts, even universally.

The temporal scope was a bit more unclear, as it is heavily dependent on future funding opportunities.

7.2. SWOT Co-Production of Knowledge

In identifying themes related to the co-production of knowledge and perceptions about the two workshops, a preponderance of themes emerged from the organisers themselves. This is partly because many of my interviewees and contacts were part of the organising team and I also spent more time with them in informal conversations, but also because of the greater amount of information they shared with me due to their extensive engagement with the topic and deeper involvement in the process. Consequently, many of the themes covered relate to the planning phase of the workshop, an aspect with which other stakeholders were less familiar.

Regarding perceptions about the co-production of knowledge in the PaMo project, 41 themes were identified as facilitating factors (28 for strengths, and 13 for Opportunities), and 55 themes were identified as limiting factors (44 for weaknesses and 11 for threats).

Table 6.
SWOT table for perceptions about co-production of knowledge

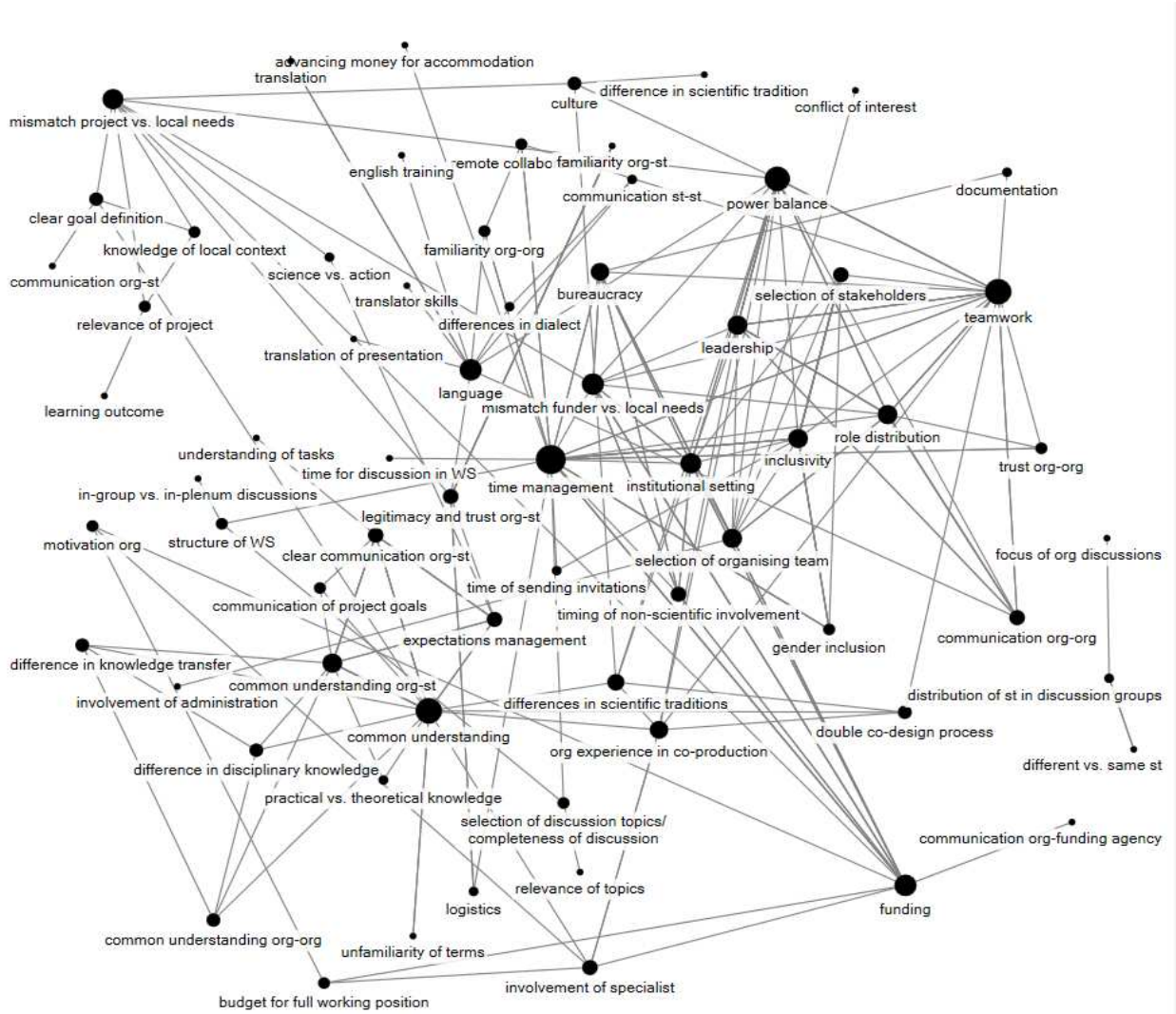
Facilitating factors	Limiting factors
Strenghts	**Weaknesses**
Active participation Selection of organising team Familiarity Legitimacy and trust Courage to express themselves Language Freedom to choose how they want to discuss Documentation Structure of workshop **Inclusivity** Selection of stakeholders Involvement of administration Familiarity Language Inclusion of local knowledge **Relevance of project** Learning outcomes Project matches local needs Clear goals LeNa-Shape workshop **Common understanding** Effective communication Selection of organising team Teamwork **Familiarity** In-person time **Power balance** Nature of co-production	**Time management** Inclusivity Gender inclusion Time of sending invitations Selection of organising team Selection of stakeholders Involvement of administration Conflict of interest Time for discussions Selection of topics Teamwork Bureaucracy Distribution of roles Remote collaboration Familiarity (org-org/ org-st) Trust (org-org) Double co-production process Motivation Culture Difference in scientific traditions **Funding** Logistics Advances for accommodation Institutional setting Timing of non-scientific involvement Mismatch funder vs. local needs **Language** Communication (org-org/ org-st) Translation of presentations Difference in dialects Translation Translation skills Expectations management Legitimacy and trust Common understanding Unfamiliarity of terms Involvement of specialist Action (development) vs. research

	Communication of project goals Mismatch project vs. local needs Role definition Leadership Power balance culture
Opportunities	**Threats**
<u>Adaptation to local context</u> Nature of co-production Inclusivity Selection of organising team Inclusion of local knowledge Project matches local needs Knowledge about the local context Culture Regular exchange **<u>Readiness to express their will</u>** Active participation Experience (org) Familiarity	**<u>Inclusivity</u>** Gender inclusion Selection of organising team Selection of stakeholders Active participation Culture (traditional gender roles) **<u>Institutional settings</u>** Power balance Culture Mismatch of project vs. local needs Expectations management Sustainability Funding Transfer of ownership leadership

7.2.1.Weaknesses

In total, I could identify 68 themes with 104 unique edges and 119 edges with duplicates in the case of weaknesses.

Figure 4.
Themes Weaknesses Co-production of knowledge



Note. This figure was produced using NodeXL. Own work.

Time management

Of these the theme with the highest degree centrality was **time management** with 18 connections. I divided these 18 into four sub-topics with different sub-sub topics.

One of the sub-topics I pinpointed was **inclusivity**. It has eight connections in total of which two are related to time management, namely gender inclusion and time of sending out invitations. The connection of time and **gender inclusion** has especially been mentioned by two representatives of an NGO and a network, both engaging in female empowerment. They both explained to me that in Madagascar, women mostly assume a traditional role, be it in the realms of housework, childcare or other kinds of work such as fishing (women fish by foot,

mostly Octopus while men fish more often in the deeper parts using a Pirogue). And exactly because of their traditional roles as housewives and mothers, they often don't have time to assist in reunions.

> *[8] "I think for them, it's really a big challenge sometimes to be able to participate in a meeting, to take a whole day to attend a workshop." - stakeholder*

> *[9] "But women are sometimes too busy with what's going on at home or looking after children, especially when they have several, four or five. It's hard to manage, and only a few women who may already have grown-up children can really take part in community meetings. So if you want to improve something, you have to choose times when the women are free, like early afternoon between 2 a.m. when the children go to school, or when the husbands are already back from fishing, for example. That way, the women can participate." - stakeholder*

This issue was noticeable too in the workshop itself. There were only two women and one of the women that was invited didn't participate that day.

Another theme mentioned for the connection of time and inclusivity was the **time of sending the invitations**. One of my interviewees stated that it would be better sending out invitations around a month before the workshop instead of a couple of days before, so they could organise themselves.

> *[10] "I think it's better to prepare, maybe send out invitations if possible, a month in advance or something like that. Because sometimes the invitations arrive five or three days before the meeting, and people live far away. It's a bit difficult to reach them later." - stakeholder*

Apart from time restrictions, **inclusivity** and **teamwork** were also affected by other sub-sub themes such as the **selection of the organising team** and the **selection of stakeholders**.

In various planning meetings, the organising team (IMS, and IH.SM and ZMT) decided to leave the stakeholder selection to the respective local entity, as they know the local stakeholder landscape the best, under the condition that the most important stakeholder groups would be represented. Nonetheless, the stakeholder selection caused some disagreements between the organisers and slight criticism on the part of the participants. In an informal conversation during the workshop in Toliara for example, it was mentioned to me by one of the participants that the stakeholder group of tourism was missing, even though they play an important role for the question of coastal management. In the case of Mafia Island there was a dispute during the workshop that some villages might have been preferred over others, which might result in a conflict. Also, organisers criticised that the stakeholder selection in Mafia Island could have been more diverse and that important groups such as tourism or private companies were missing. That the tourism sector should have been involved became clear when a post-workshop meeting was interrupted by a hotel owner who complained that he or any other representative of the tourism sector had not been invited. He expressed indignation that he had to find out about the workshop through Facebook and that he feared that important decisions would be made without him.

[11] "As far as Mafia is concerned, I mean, they haven't yet agreed on which villages are to benefit, are allowed to benefit and are involved, and that could change again. Yes, and I think the idea is to change that again. There you have to look now a bit that it is internally in the project team, if we are then already all agreed that this was perhaps not yet perfect, then it is already the first step." - organiser

Further, there were certain disagreements regarding the selection of the organising team itself. For example, in the case of Toliara, some members of the organising team questioned **involvement of the administration** in the whole planning part, as they assumed, they also might have stakes in the area and there could be some sort of **conflict of interest**. In the case of Mafia Island similar thoughts concerned the involvement of the Marine Park, which only participated in the last planning meeting, but was involved in the stakeholder selection.

[12] "academy and administration should work together to identify the real problem"

[13] "This Marine Park also steered the process a lot. Yes, the moderation was now, so to speak, there from the university. But as I understand it, who is now invited and so on, that was rather controlled by the park. That is, you still have a stakeholder in it, who is now actually not officially part of the project consortium, but who is still very important, so it does not work without, but who somehow also has a bit of a strange, or for me still unclear role in the project organisation... And I also do not know who invited whom, but I think that there is already the self-image we have a say. But of course they are actually quite essential stakeholders when it comes to management, they are actually also central, they are just stakeholders, they are actually not part of the research project" - organiser

One theme mentioned by the workshop participants was time management during the workshop. They would have wished to have more **time for discussions** and felt there wasn't enough time to discuss all important topics **(selection of topics)**. Many also wished for a two-day workshop.

Another sub-theme with a degree centrality of 14 is **teamwork**. Even though there are some overlaps of sub-themes between teamwork and funding (for instance **bureaucracy**), there is enough distance in the connection with time management to divide it into two sub-themes. Four of its sub-themes are also related to time, namely role distribution, remote collaboration, familiarity org-org, and trust org-org.

What stood out the most was the theme I called **role distribution** with a degree centrality of eight. This theme was particularly emphasised by the organisers, hence administration and researchers referring to the planning phase of the workshop. Interviewees highlighted that one connection of the role distribution with time management is the theme of **remote collaboration**. Except for shortly before the workshop, meetings only happened remotely via Zoom and it was difficult to find dates that would fit into everybody's schedule. Sometimes, not all organisers could assist, be it due to work, personal or infrastructural reasons such as power-cuts or bad connection. Furthermore, the importance of physical meetings to create **familiarity (org-org)** and hence, **trust (org-org)** between the project partners was mentioned. To have these personal relationships, more time in presence would have been needed and

remote collaboration turned out to be rather ineffective: One of my interview partners elaborated on it this way:

> *[14] "even after three years of Corona, it's super important, wherever you do it, to shake people's hands, to look each other in the eye, to sit together at a table, to talk about expectations, even with the people on the ground. Because virtually, you wouldn't have been able to involve anyone from the communities. Virtually, it was difficult to find appointments within the project, because people sit at their desks and someone always comes in who is more important and wants something. And that was actually good. I have the feeling that we have achieved a lot more in a much shorter time than we would ever have done virtually. And it's still important to set aside quite a bit of time to build those relationships." - organiser*

In these mentioned meetings, mainly workshop content and administrative issues were discussed, such as travels, accommodation of organisers and participants, new partnerships and funding. As remote collaboration didn't give the organisers the opportunity to have informal conversations, there was also less discussion about the different roles they can and want to assume. One of the interviewees has brought up an important reflection which has already been discussed by some of the organisers and has been reinforced through the LeNa Shape workshop. He called it a **double-co-production process**, meaning that knowledge is not only co-produced by the stakeholders during the workshops, but also amongst the organisers themselves, including discussions about different roles, concept definitions, their own experiences and knowledge and how they want to work together as a team. The reason why this what he called "meta-discussion" didn't happen as intensively as needed, was again, the lack of time because other important organisational matters needed to be discussed , but also perceived differences in **motivation**, **culture** and **scientific traditions**. Even though some organisers brought it up in following informal conversations, their prior assumption that it could be perceived as a waste of time by their partners has prevented them from addressing the issue more extensively before the workshops.

> *[15] "This whole meta-discussion, we didn't really have it, it's also a bit strange to start. So when you work in a context where people already know and can do this very well, this whole transdisciplinary thing, and when you start a project with other people who are already working in this same space, of course, you first do a reflection and then here, you interpret it in this way and you talk about the roles, then it's just quite normal in this niche, but generally in science it's just not normal. That is, you have to arrive with practices that are actually strange and at first maybe also have gaps" - organiser*

The third sub-theme connected to time-management turned out to be **funding**. Issues with funding connected to time didn't only affect the planning and realisation of the workshops themselves, but also prevented the project from becoming what some interviewees perceived as being the ideal of co-production and co-design.

The combination of time management, funding, **logistics** (including **advances for accommodation**) and **institutional setting** can be illustrated in a moment remembered by all organisers, namely the evening two days before the first workshop in Toliara.Due to a change in partnership, one of the funding organisations proposed to take over the organisation of logistics including hotels for the stakeholders coming from further away and catering. Due to time pressure, the funding organisation had to admit that it wasn't able to organise it and

refused to finance the workshop. Consequently, the organisers had to make a decision whether they would cancel the workshop or advance money from their own pockets (and being refunded at a later stage). Ultimately they opted for the latter, which caused a lot of stress within the team and raised very pragmatic questions such as the withdrawal limits on their credit cards, the availability of working ATMs (sometimes they didn't work, or didn't have enough money, especially around the usual payday dates) and the safety of transporting big amounts of cash. In the end, the money could be procured, but there was still an open question about the budget for the stakeholders.

> *[16] "But it didn't happen because there was this problem with the arrangement between the organiser, I mean myself, and the institute, with the [funding organisation]. So at the last time of the workshop, the [funding organisation] refused to finance the project, especially the preparation and the logistic" - organiser*

> *[17] "I think the constraint would be really administrative points because it always takes time, the procedures always take time. And I think it would be very difficult for us to organise the workshop if we did not already have most of the materials and equipment that was needed. And we also had some kind of, let's say, money that we can advance for the expenses of the workshop. But yeah, we could avoid problems, we could go ahead with the workshop, but if we did not have that capacity to anticipate some stuff, that would be the biggest constraint." - organiser*

Funding further greatly influences the **timing of non-scientific involvement** in co-production of knowledge projects. Even though the MeerWissen guide on co-design (Ferse et al., 2022, p.17) states that the "timing of engagement needs to be tailored to the stakeholder and development stage of the project" it also emphasises that "early stakeholder engagement is beneficial" and helps strengthen collaboration, ownership and a clear goal definition. The benefits of an early involvement were also perceived by the organisers, but countered with funding difficulties, more precisely, conventional scientific processes, research proposals including the specification of research goals are prerequisite for obtaining financial support.

> *[18] "And of course, co-design would be, if you're very critical and want to do it perfectly, it would be to go to the communities without anything and ask if they're interested in working on a project at all. That would be the logical consequence if you were to go all the way. Of course, we assumed that they would be interested in working on such a project, and the partners confirmed that they would. From that point of view, that was okay for us, but of course that would be something if you were really serious about it. If some kind of research landscape would give that, that would say, here you have a blank check, go to the area, talk to the people, ask if they are interested in research collaborations and what would be the conditions then. But I think that's also a bit illusory to implement" - organiser*

This need for pre-defining specific aspects of the project without the initial involvement of stakeholders can lead to a **mismatch of funder vs. local needs**. One of my interviewees elaborated his assumption how specific requirements given by the funding organisation might not be in line with the local context and the needs of the involved stakeholders. In this case, the requirement was the production of an online tool, which, regarding the low level of digitalisation of the given area, might not be adequate.

[19] "Well, we've already set ourselves in concrete a bit, with certain promises, also in the proposal and so, from which we can no longer get away so well...the [funding organisation] also wants to promote a bit of digitization and things like that, then of course we've also written a bit in that direction, yes, the model and then we make an online tool and so and that's also all possible. But no one would use your online tool, it doesn't fit into everyday life." organiser

Language

As a second theme which is not necessarily related to time management was the issue of **language** with a degree centrality of 10. Language played an important role during the workshop, especially for the **communication org-st**, but also in the planning phase and the **communication org-org**.

Although the organisers facilitated the workshop in the local language Malagasy and Swahili, which has been generally well received, some stakeholders mentioned difficulties of understanding the workshop content as well as discussions with each other, as some of the powerpoint **presentations** weren't translated to the local language and they sometimes spoke **different dialects**.

[20] "For the presentations, even if we try to explain in Malagasy, if the presentations are in English, sometimes people read the points and it allows them to have an idea about the things written in the points, and it would be better if next time we try to translate into Malagasy" - stakeholder

[21] "It's difficult, especially for the fishermen, they don't understand French and they only understand Malagasy. And even for the Malagasy language, they don't understand the official Malagasy language, but they only understand the Vezo language." - stakeholder

Criticism on the part of the organisers was expressed in connection with the translation of the workshops, which in Toliara was through simultaneous translation by students of IH.SM and in Mafia Island by one of the organisers in plenum. Even though they appreciated the presence of translators, issues such as their **translation skills**, their fluency in English, but also the condensed version of the in-plenum translation were mentioned. My translator during the workshop in Toliara also mentioned to me that he came from outside of Toliara, hence due to the difference in dialect he himself didn't understand everything that was discussed by the stakeholders.

[22] "Well, there was different handling in both workshops, too. On Mafia Island, everything was translated at the front. And in Toliara, only our English things were translated at the front, and everything else that was Malagasy, was translated by personal translators. But these were often only summaries and we always had to encourage them a bit to give more details. So, that would certainly be easier with people who speak more fluently." - organiser

Because of these translation difficulties, it was also challenging for the organisers to understand how the participants perceived the project and whether they were on the right track to meet their expectations (**expectations management**). Moreover, the question arose whether they received the necessary **legitimacy and trust** from the participants to continue on this path.

[23] "Since I didn't get to hear much of what was said on the side at the workshops, it's difficult to assess. I think that for some, yes, also stupid, reasons, as a project from abroad, one has, so to speak, a different role than local institutions. So, you are seen differently than the local university, I think. It's hard to say in which direction this is going now. Personally, I don't think we have this legitimacy yet. Not as part of the project, and not the ZMT either. So not so directly. I think people don't really know where they stand with us yet."

Common understanding

Common understanding turned out to be one of the most frequently mentioned themes during the interviews in connection with co-production. It is also highly connected with other themes having a degree centrality of fourteen. Even though there are certain overlaps with time management (teamwork/ remote collaboration, funding) and language (communication org-st, org-org), it is still connected to a more diverse set of sub-sub themes.

Differences in understanding didn't only consist of the different perceptions of concepts such as co-production, co–design, or nature-based solutions, but also in the different perceptions of the role of the project in the local context within the organising team but also between organisers and stakeholders.

Although after the two workshops the organisers realised that they in some way already engaged in co-production, there was initial **unfamiliarity of terms** which created confusion [2].

As already mentioned, Some stated that their experience in co-production was still too limited and that the **involvement of a specialist** in co-production could be advantageous, also because all organisers are involved in a handful of other projects and this is not their main focus, hence decreasing their motivation. But, including a third party can also turn out to be difficult due to reasons of lack of funding for a full working position.

[24]"It was the first workshop and I hope that for the next workshop there will be time for a specialist or somebody qualified to explain more about the process. But for this workshop I think it's okay because the main goal of the workshop is to get an overview. It was an overview, so we get the overview and for the next step forward, I think we need this qualified person to explain everything in detail." - organiser

One interviewee assumed that also the stakeholders might not have understood the concepts of co-design and nature-based solutions:

[25] "At the beginning of the workshop, because it was too technical. The word like Co-design, nature-based solution. This is the first time that people heard that kind of words. They were confused." - organiser

This difficulty of communicating effectively the meaning of such concepts and generating a common understanding also influences the stakeholders' expectations towards the project, a problem some organisers referred to as **expectations management** which is one of my identified sub-sub themes. On the one hand, the demands on the project differ between organisers leading to the division of aims into **action (development) vs. research**. While for one organiser it was clear that the participants wouldn't expect more than research, another

organiser held the view that the stakeholders would expect more than research, some kind of implementation.

> *[26] "They know that we are not doing development project activities. They know that it's research. And most of the time people are not very motivated in participating in research. But since to me it is positive that they were motivated, even if they knew that it is about research, not to gain money, not to gain development activities, that's something new, something positive." - organiser*

> *[27]"I think that they have, before they have their own expectation. But as it was led by the administration, the administration was present during the workshop, they expect more. They expect more, especially the follow up of the project. The follow up of the workshop….after the workshop, I think they have more expectation. Now. When we ask them about their expectation, they said something different, but now they have an idea of what we can do with this project." - organiser*

> *[28]"I believe that the intention has already been conveyed. But I'm not sure in all cases whether it has been received exactly as we actually wanted it to be and whether there aren't, so to speak, very many more concrete hopes for projects that distribute money. It's hard to say." - organiser*

> *[29]"And because it's money from northern Europe. And I think there have already been many much larger projects here that have done something. I think that immediately raises expectations that very concrete solutions will be presented in a very short time. And managing that is always a bit difficult." - organiser*

> *[30]"I think my viewpoint as an administration is like oriented in fisheries management and governance, a problem that can be solved with the community. But in Tanzania they think differently academically, like an academic point of view, something like a knowledge, a data that can be used for further research." - organiser*

On the other hand, this is also the case for the stakeholders **(inefficient communication of project goals)**. When in an informal conversation one of the stakeholders asked me whether the project would bring money to repair their houses which have been destroyed by a recent cyclone, it became evident to me that at least some of the stakeholders expect to receive financial contributions through the project (this was also mentioned in an interview with another stakeholders). In consultation with the organisers I know that there are at least no direct financial contributions planned, which in this case would lead to the already mentioned theme **mismatch project vs. local needs**.

A second major connection to the theme of common understanding is the theme of **role definition** and the associated theme of **leadership**, **culture** and **power balance**.
First, there was the discrepancy that on the one hand to be in line with principles of co-production hierarchies were tried to be kept as flat as possible but on the other hand there was the need of a leading party. Despite ZMT's endeavour not to assume the leading role of the project, in their perception they ended up taking the lead while noticing a certain reluctance (or lack of motivation) of the other organisers to do so. (lack of motivation)

> *[31] "I think there was a bit of confusion about the roles, which was also due to the fact that it was not so clear who was the project partner. And in general, it is still not so clear who will take the lead or not. And because of this, there was perhaps a lack of commitment from everyone and also a lack of direction.*

Everyone was waiting for each other a bit, perhaps. But no one really took the lead....that with the leadership, I don't know, that's perhaps another big issue, who now in such a cooperation, which you want to do very much at eye level, how you do leadership and who actually does it, for some reason the ZMT had a kind of leadership role, still has it. Also for [funding agency], I think I've already said informally, they don't have a contract and yet we are somehow responsible. Which is actually a bit strange, and maybe in general it's not so clear who is responsible. So somehow we have the project lead. At the same time, maybe we didn't want to take it on completely, because we don't want to prescribe so much, because it's supposed to be co-design, because it's not supposed to be this typical thing" - organiser

Second, organisers were generally unsure about their own roles and even shared with me that they would like to change their current role

[32] "I was pointed as the focal point of the project, and from the beginning, I was the person who organised, especially the participation of the stakeholders. So let's say I'm a little bit confused now. Yeah. Because there is the part of the[institution], the part of the [insititution]. We both collaborate together to make this project work. But yeah, I'm not sure I don't know exactly what my position is in this. Maybe I represent the [institution] for this project, but I don't know exactly what is my position." - organiser

[33] "So firstly, I'm the contact person. That's the first responsibility. And then we organised that workshop. But now we have to define everything again, because I'm the contact person. But I feel, and I'm convinced that [person] that, you know, is the man who fits better to the topics of the project and he is really interesting in the project. So I would say I was the coordinator of the project as organiser, but also involved in the scientific questions. But I would prefer for the next step of the project I will probably remain the administrative responsible of the project." - organiser

Third, the combination of contrasting ontologies and differences in **culture** turned out to be a challenge for the organisers.
To illustrate this point, I would like to briefly cite a specific example from the workshop on Mafia Island that aptly captures the essence of the issue. During a discourse on the causes of declining fish stocks, a participant from a fishing community made a causal connection by linking the decline to diminishing adherence to religious practices among youth, including prayers to Allah before fishing. Despite efforts by the organising team to emphasise the importance of incorporating traditional and local wisdom into coastal management, there is a lack of a clear strategy for incorporating or handling cases such as those mentioned above. Informal dialogues were held to consider the validation of knowledge, the typology of knowledge (pragmatic versus theoretical knowledge), and positivist scientific paradigms.

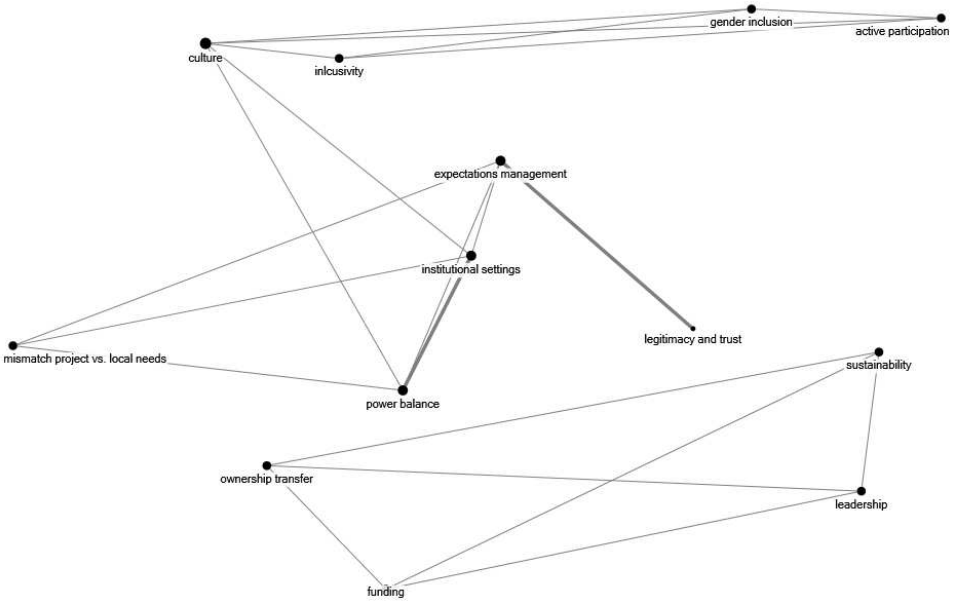
[34] "but if I were to ask now, maybe also to show what he knows, who would perhaps not identify it as knowledge at all. And to tickle that out of people, if not, but to integrate that into our project could of course also be a challenge, so that it is not so knowingly lived. But, that it's not so defined as knowledge, but as practice maybe." - organiser

7.2.2. Threats

In the case of threats, I identified 13 different themes, with 19 unique edges and four duplicate edges. The most connected theme turned out to be culture with a degree centrality

of five. The highest edge weight could be found for expectations management-legitimacy and trust and for institutional settings-power balance. From these, I created three major themes (inclusivity, sustainability and institutional settings), which aren't as connected amongst themselves.

Figure 5.
Themes Threats Co-production of knowledge



Note. This figure was produced using NodeXL. Own work.

Inclusivity

One of the concerns raised by a representative of a network was the theme of **inclusivity** (Degree centrality=3), and more exactly **gender inclusion** and **active participation**. The interviewee mentioned that in traditional Malagasy **culture**, women generally weren't included in decision-making and that before deciding something, they would have to ask their husbands. So, one of their concerns regarding inclusivity was that the women participating in the workshop wouldn't participate actively enough.

> *[35] "We hope that the person who is going to participate from [stakeholder] at this workshop goes to participate and manages to speak something, manages to participate well and comes to report some problems or the situation of [stakeholder]...if she goes there and just listens and doesn't participate, it becomes hard for us. We want the person who's going to participate to tell us what the problem is... They're not yet used to making their decisions directly. They're used to asking their own husbands before making a decision" - stakeholder*

However, this interview happened before the workshop and it turned out that the women who participated took a rather active role, both in the group discussions, and group presentations, yet, less so in the discussions in-plenum.

Institutional settings

Another major theme concerning threats as the theme of **institutional settings** (vertex degree =4). Institutional settings were considered relevant by various organisers when it comes to project implementation as it conveys a specific **power balance**, also connected to how hierarchical a **culture** tends to be. Interviewees stated that in case of a strong vertical hierarchy, co-production might face greater limitations and eventually lead to a **mismatch of the project vs. local needs** and the inability to meet the participants' expectations (**expectations management**)

> *[36] "I am still very unsure what the expectations of the communities actually are. I still don't know exactly what they are hoping for, so to speak, and at the same time what is feasible, because there is also a legal framework, the institutional framework. You can't just do the research project as you like, it's very much embedded in social structures, which are also important and strong. And then to find the role of the research project is not so easy, I think." - organiser*

> *[37]"It may be that in certain regions things are very hierarchical, and then it is of course difficult to take a bottom-up approach, where you actually want to involve many people in a joint problem-solving process. And that, of course, has to be politically desired. And that's something that we also have little influence on in the context of such a relatively small project." - organiser*

On the other hand, stakeholders might have differing expectations (expectations management) regarding the projects depending on which institutions are involved.

Sustainability

A third concern that was mentioned by interviewees was the theme of **sustainability** (vertex degree=3). On the one hand they raised the concern that there is a need for sustainability in terms of continuation of the project but that it could be threatened by a lack of **funding** and on the other hand, the inability to **transfer ownership** or that stakeholders would take over **leadership**.

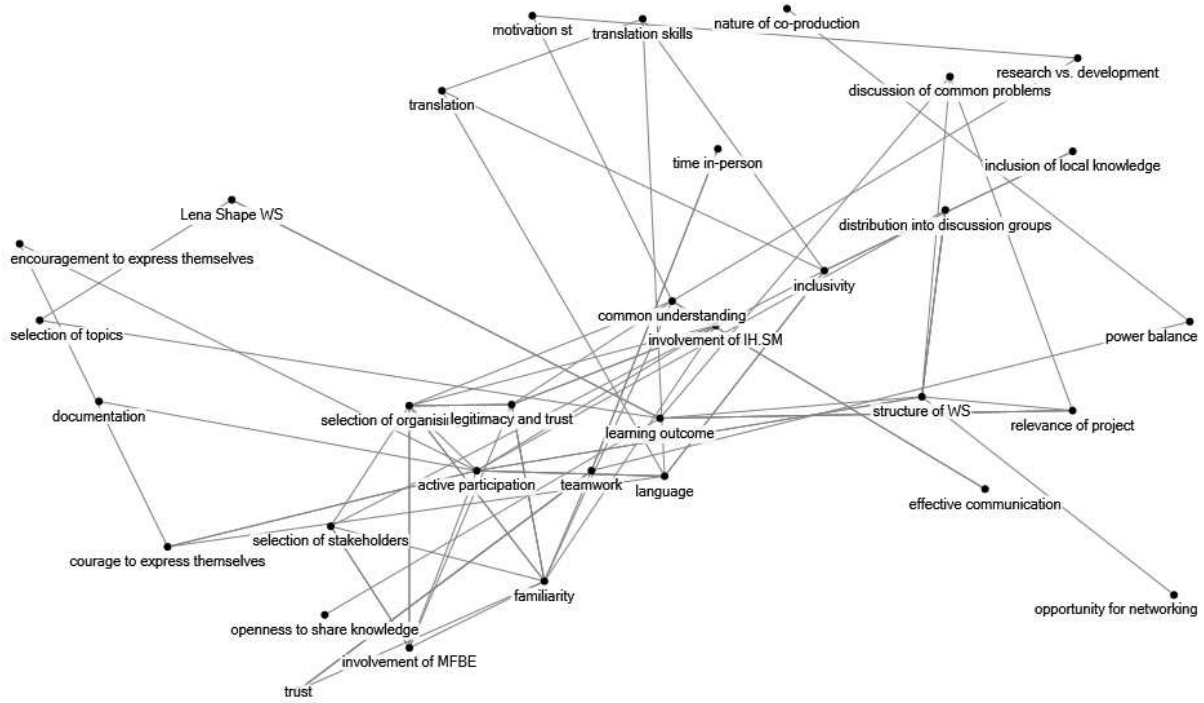
> *[38] "The fact that projects are not always sustainable is not necessarily only due to the projects themselves, but often also due to the circumstances and that then at some point the money is missing and that it is not always possible to hand over everything." - organiser*

Furthermore during the workshop in Toliara, stakeholders also reported negative experiences with previous initiatives that promised certain outcomes and project sustainability, but then failed to deliver.

7.2.3. Strengths

For strengths I was able to identify 15 themes with 39 unique edges. Most of the strengths are related to the implementation of the workshop.

Figure 6.
Themes Strengths Co-production of knowledge



Note. This figure was produced using NodeXL. Own work.

<u>Active participation</u>

One of the main strengths that has been expressed was the active participation of the stakeholders.

According to organisers, the **selection of the organising team**, or rather their **familiarity** (especially in the case of Toliara) led to increased **legitimacy and trust**, and hence, to a more active participation of the stakeholders. This especially referred to the involvement of the MFBE and IH.SM.

> *[39]"My first comment is that we had the chance for that workshop to work a lot for many years with the communities, which allowed us to have an easy communication with them." - organiser*

> *[40] "we are used to organise such kind of thing and we know people, but I mean, the participants were positive when they know that it is organised at IH.SM, as I said, there is kind of trust." - organiser*

Organisers further encouraged stakeholders right from the start not to hesitate to express their opinions (**courage to express themselves**).

> *[41] "And my feeling is that I've been participating to such kind of workshops and that time maybe because of our message at the beginning as well. But I can tell you that they really participated in the discussion. They did not hesitate to say what they want, even if it is something like against the general idea of working with the ministry, for example." - organiser*

Three other factors that, according to organisers and participants, laid the foundation for an active participation were the use of local **language,** giving the stakeholders the **freedom to choose how they want to discuss and document their ideas** as well as the general **structure of the workshop** including the separation into stakeholder groups .

> *[42]So I think what was positive and what was also a bit different from other meetings was that it took place in local languages. That was at least the impression that was given and that there was a much greater participation than if it had been in French or English." - organiser*

> *[43]"So to me, that was also one of the reasons why we had very rich discussion and because we used the native language of people." - organiser*

> *[44]"It's not because there was no restriction, but it was because, first of all, we told them at the beginning that they should not be afraid of telling their idea. That's one thing. " - organiser*

> *[45]"Because for me it's much more important that people have the feeling that they can speak freely. Maybe they also have the feeling that they're not being watched by the guests or anything like that, but that they can simply discuss the topic as it's easiest for them. Maybe also the way you document it, for now, is the way it's easiest for them." - organiser*

> *[46] "The workshop, it was really well structured and there was participation from everyone." - stakeholder*

> *[47] "On Mafia Island, yes, there was also a division according to stakeholder groups. That has advantages, of course, in that the discussions perhaps get going faster and that conflicts don't come out until later." - organiser*

Inclusivity

There were three sub-themes that, according to organisers and stakeholders, generated a greater **inclusivity** in the workshop in Toliara. First, it was commented that there was a representative **selection of stakeholders** in the workshop, also and mostly due to MFBE's role (**involvement of MFBE/ selection of organising team**) in the selection and its **familiarity** with the local context and stakeholders.

> *[48] " I think we had a very good representation of the communities, but more broadly of the stakeholders, because there was not only communities there. - stakeholder*

Second, the use of local **language,** allowed the stakeholders to participate during the workshop. Also translation helped organisers and stakeholders to understand each other and participate, and the skills of thr translators were praised by an organiser. And third, the **inclusion of local knowledge** and could participate from an early problem-definition stage made people feel more taken seriously and included, which was well received. The opportunity to share knowledge and learn from others also motivated a lot of the participants.

> *[49] "the students that worked with us were very good students and they were quite good in English as well. So we didn't have problems. - organiser*

> *[50] "Individuals have always said that they are very happy to be heard, that they are also happy to be able to contribute traditional knowledge, which is another area that we can also work on with traditional knowledge and what can be done with it. Exactly that I already had the feeling that most actually already found that good to be heard." - organiser*

> *[51]"But I still had the feeling that it was nice to be able to participate in the knowledge that people had and that they were actually happy to share it. I had the feeling that in both workshops that was actually a new concept. What was very well received is that they were also allowed to participate in the problem definition and say what they would like to have a solution for and also what they themselves have of knowledge to contribute to that." - organiser*

> *[52] "So, first of all, he is very motivated and very glad to be invited to attend to this workshop because they sometimes notice that there is certain kind of gap or between academic knowledge as well as scientific knowledge and grounded knowledge or traditional knowledge" - stakeholder*

Relevance of Project

What particularly highlights the **relevance of the project** are the **learning outcomes**. Various participants as well as organisers affirmed how interesting and informative the workshop had been. While organisers from respective countries learned a lot about the local context, participants especially learned how common problems also affect other local actors. Because the workshop was just the beginning, both participants and organisers in general could not yet provide a clear assessment of the workshop's effectiveness and future development or adaptation to the local context. However, some were very confident about the project's future and think that the **project matches the local needs**, partly of its **clear goals**.

> *[53]"and there it was primarily, I think, that I had the feeling, from what the partners or the people from on site, with whom I had contact, had told me, I had the feeling that this is a project where you can actually still have the maximum impact, where also the concept so of local marine managed areas is already there and where you could achieve a lot with the project, so to speak" - organiser*

> *[54]"But from Germany, I think what I've perceived is that you were learning a lot. I mean, they were learning a lot about this. The fact that while speaking to us, while discussing with us and during the workshop, people from Germany have, like, wow, understand something positive. It means to me that they learned a lot. It means to me that it's something new for them. " - organiser*

[55]So this kind of concept, it's not because it's the first time I have attended or I have heard it, but it always interesting because it's kind of an approach that could be very relevant. Relevant to hear the actors, to listen, to listen the actor, to listen to the stakeholder from the best. Because we have also spoken about Nature based solutions. - stakeholder

[56] "Yes, completely, and I think I always find that interesting. Well, it also broadens your horizons when you realise what you yourself haven't thought about and can't do, haven't thought about" - organiser

Moreover, the participants of the **LeNa-Shape workshop** expressed their interest in that and appreciated the possibilities it offers for further project development.

[57]"I attend the Lena Project the Lena workshop, the two days and I found it also interesting when we planned the project for the next project. We didn't think about the impact, but now we have an idea on how to improve what we have done before. So yeah, I think it was really useful."- organiser

Common understanding

Also considering the theme of **common understanding** positive statements were made. One of the organisers explained to me how initial confusion about specific concepts could be overcome through **effective communication** within the team. [2] [3]

One of the organisers further highlighted that he is confident that the stakeholders understood the goals of the project and that this is research and not development work, especially because IH.SM, a research institute is part of the organising team (**selection of organising team**)

Teamwork

Repeatedly the successful teamwork has been underlined by various organisers. On the one hand this is due to their **familiarity** through prior collaboration and **in-person time** before the workshop.

[58]" had super great partners who put on two very intense workshops in a very short time, where we learned a lot from the situations, from on the ground." - organiser

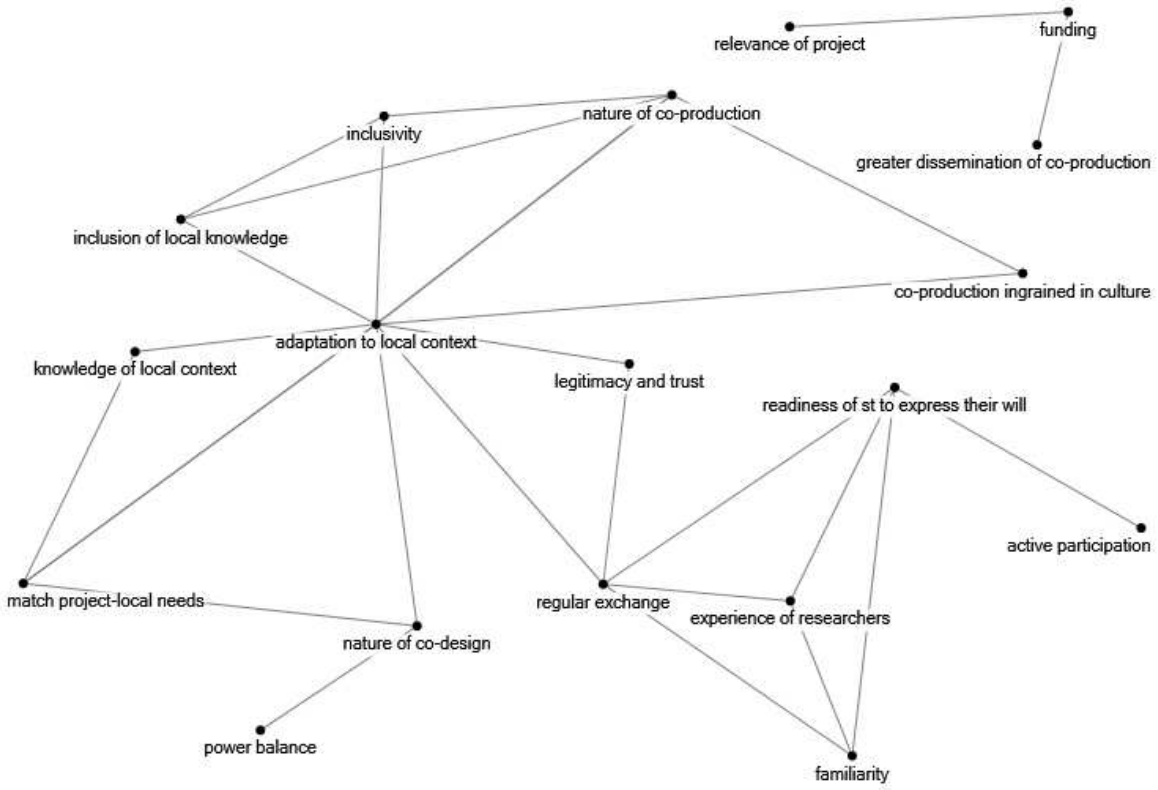
Power balance

One last theme that was talked about positively was **power balance**. One of the organisers elaborated on how the **nature of co-production** implies a smoothing of power differentials. Additionally, it was commented that within the organising team people met at eye level.

[59]"That was from previous partnerships, from projects in the MeerWissen series. There we actually had a long-standing, very long-standing cooperation with the Institute of Marine Science in Zanzibar, which is very constructive, which was also already very cooperative and always at eye level." - organiser

7.2.4. Opportunities

Figure 7.
Themes Opportunities Co-production of knowledge



Note. This figure was produced using NodeXL. Own work.

There are several factors that favour a successful outcome of the project. Regarding opportunities, I have identified 20 themes primarily linked to aspects that facilitate the project's adaptation with the local context.

Adaptation to local context

Regarding opportunities, interviewees mentioned several factors that lay the foundation for a successful **adaptation to the local context.**

One opportunity for the adaptation to the local context is the mere **nature of co-production**. Interviewees pointed out that co-production is connected to the **inclusion of local knowledge (inclusivity)**, be it about the local environment, culture or challenges. In this way, the project gains a more holistic understanding of the context in which it operates and promotes that the project's solutions resonate with the stakeholders' realities **(match project-local needs)**.

> *[60] "how little that local knowledge is actually often, if you're in academia, not used at all, but also accepted as really a form of knowledge that's carried on and on through generations and where people*

actually probably know more than, significantly more than we know about their ecosystems when we get here." - organiser

Throughout the workshops, researchers but also stakeholders gained a deeper **knowledge about the local context** allowing them to adapt their approach.

Interestingly, one of the interviewees repeated what I have already heard in informal conversations, namely that co-production was already ingrained in Malagasy **culture** and that people were used to collaborating on different levels, be it through associations, in reunions, law creation (Dina) or in community-based management of MPAs. (For Tanzania, I don't have any information) [53]

[61] "but I think the experience of Madagascar and all the stakeholders to work together to co design things, and it's actually some kind of cultural because in Madagascar, even for family events, co discussion, co design is kind of traditional way of working. So this is, to me, a very important point that will help us to attend the objectives of the project. But we have to understand that point." - organiser

The planned **regular exchange** between researchers and stakeholders in the form of stakeholder's evaluation of specific outputs, their participation in pilot trainings and workshops and frequent consultation should strengthen should ensure that the project is still in line with local priorities.

Readiness to express their will

As another advantage, the **readiness of stakeholders to express their will** leading to a more **active participation** was brought up. According to interviewees and interlocutors this readiness originates on the one hand from stakeholder's intrinsic motivation and on the other hand is reinforced by the **experience** and **familiarity** with the organisers.

[62] "and that's very important. And I can bring also my experiences from the field. I'm used to work with the communities and with discussion with them every day. Every day. They have lots of ideas that we are not necessarily aware of and that's important to hear from that" - organiser

7.3. Results Questionnaires

During the fieldwork, I issued a total of three questionnaires as part of the data collection process. Two questionnaires were distributed in paper form to stakeholders participating in the workshops in Toliara and Mafia Island, while another questionnaire was distributed online to all project organisers. It is noteworthy that certain questions were common to both the stakeholder and organiser questionnaires, thus addressing common concerns. In addition, these questionnaires also contained questions tailored to the specific characteristics of each group.

Sending the online questionnaire during my fieldwork in Toliara allowed me to adjust questions and include topics mentioned in interviews.

To generate a more holistic picture of the project, I compared the results of the questionnaires with the SWOT analysis. However, it is important to note that I did not include the results from the questionnaire conducted in Mafia Island in my analysis. This decision was driven by the prevalence of incomplete responses and answers that indicated participants might not have fully grasped their assigned tasks.

Furthermore, it is essential to approach the results of the organiser questionnaires with caution. Specifically the section pertaining to the workshop in Mafia Island was notably incomplete, and, as a consequence, may not accurately represent the perspectives of certain organisers.

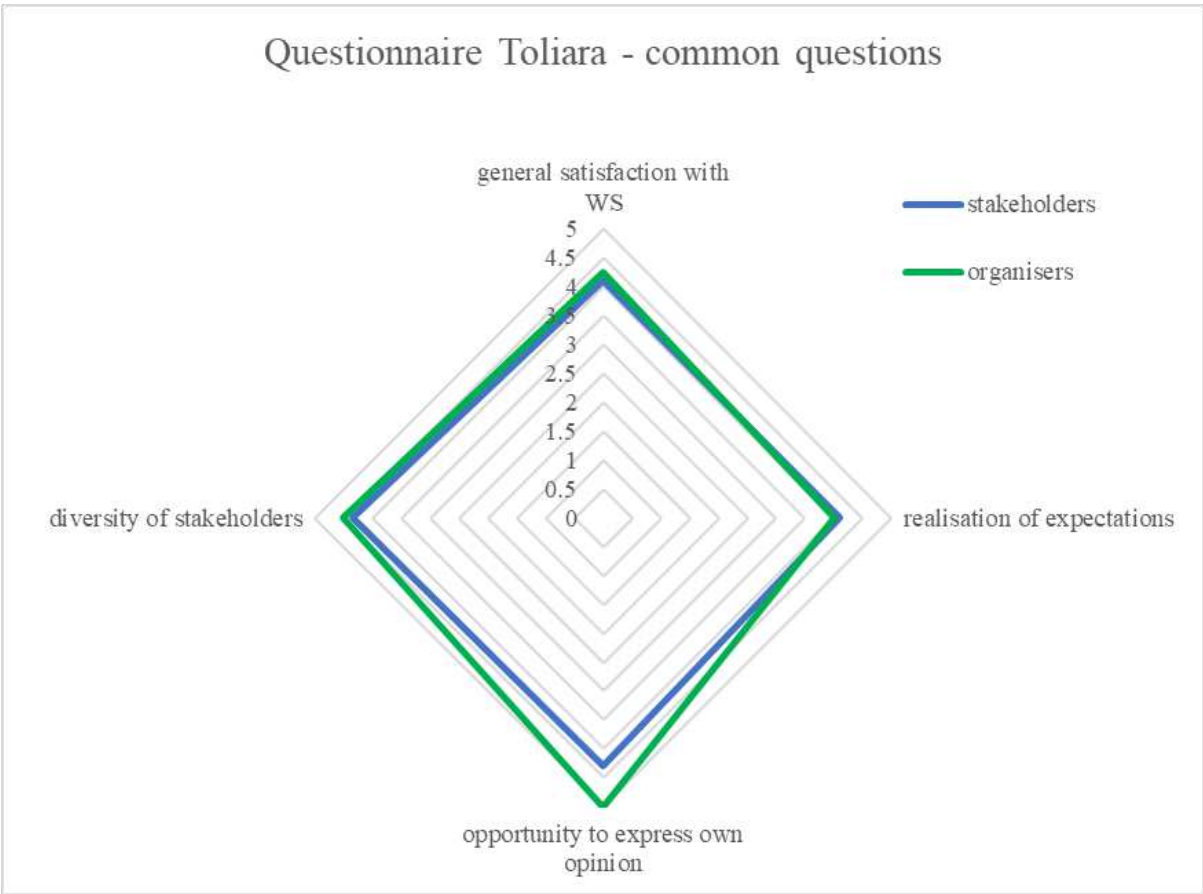
7.3.1. Comparison Questionnaires Stakeholders - Organisers (Toliara)

Both questionnaires contained 10 Likert-scale questions from a range of 1 to 5, of which five are directly comparable (for the organiser questionnaire I combined two questions from the stakeholder questionnaire). However, it has to be noted that while the stakeholder questionnaire was filled in almost completely by 20 participants, the organiser questionnaire was only filled in completely by four organisers (of a total of 8 organisers, six of whom had participated in the workshop in Toliara).

In the following section I will analyse the comparable questions and relate them to the findings of the SWOT:

Figure 8.

Questionnaire common questions - Toliara



Note. This is a combination of the results from an in-paper questionnaire of stakeholders and the online questionnaire of the organisers regarding the workshop in Toliara.

Table 7.

Average number of answers to Likert-scale questions in questionnaires of stakeholders and organisers

Questions	Answers Stakeholders	Answers Organisers
How satisfied were you with the workshop? (1=not satisfied at all, 5 = very satisfied)	**4.1**	**4.25**
Were your expectations regarding the workshop met?	**4.1**	**4**
How diverse was the selection of the stakeholders? (1 = not diverse, 5 = very diverse)	**4.33**	**4.5**
Did the organizers create an atmosphere of openness, trust and mutual respect that allowed everyone to express their opinions, concerns and ideas? (1= not at all, 5= yes, everyone could express their opinions, concerns and ideas) → organiser questionnaire Did you feel comfortable asking questions and expressing your opinion? (1 = not at all, 5 = very comfortable) → stakeholder questionnaire	**4.3** **4.2**	**5**

Could you share your knowledge effectively, and did you feel heard, understood and respected? (1 = not at all, 5 = yes, I felt completely heard, understood and respected) → stakeholder questionnaire		

It can be noted that almost for every question except their expectations, the evaluation of the organisers was slightly better.

Generally, organisers indicated to be more satisfied with the workshop than the stakeholders. Two organisers commented that the major issue was time, on the one hand time for preparation of the workshop and on the other hand time for discussions during the workshop, as they had the feeling that stakeholders didn't have time to discuss everything they wanted. This finding is very much in line with the results of the interviews, where both organisers and stakeholders expressed that time was one of the major limiting factors (**time management**).

With regard to the realisation of expectations, the participants had a slightly more positive attitude than the organisers. Organisers stated that they would have wished for a clearer summary of the points mentioned by participants. This on the one hand aligns with an organiser having stated that throughout the meetings and discussion there should have been better documentation, but contradicts one of the mentioned strengths, namely that it was favourable for stakeholders' active participation to choose their own way of documentation. In light of the slightly worse rating by stakeholders, they brought one major aspect connected to the organisation of the workshop, namely that they would have wished to receive more prior information concerning the workshop in order to be able to prepare accordingly. This can be connected to the limiting factor of **time management** and the **time of sending invitations**, and the **clear communication of the project (or at least workshop) goals**. Further points were brought up concerning the **time for discussions** and the **selection of topics**. Topics they would have expected to be able to discuss were: the creation of a Dina, the employment of destructive fishing practices ("tarikaky"/ "draotsy": beach seining: a fishing technique where a non-selective net hangs vertically in the water with the top edge is buoyed by floats and the bottom is held down by weights, and is able to catch even juvenile individuals/ "laro": fish poisoning/ "valy-bato"), environmental and ecosystem degradation (coral reefs, seagrass meadows), education of the local stakeholders, and problems faced by collectors. These points can be connected to various themes mentioned in relation to weaknesses of coastal management (regulation/ destructive fishing practices) .

Once again, organisers rated the diversity of the selected stakeholders better than the stakeholders. Both groups mentioned the limited presence of women and local NGOs. Stakeholders further specified that the NGO Reef Doctor was missing. Other stakeholder groups that were pointed out as missing were collectors such as COPEFRITO, the tourism sector (and more precisely the department of tourism) which was mentioned several times, representatives of the public sector such as APMF (Agence Portuaire Maritime et Fluviale), Madagascar National Parks, the Ministry of Environment, the Ministry of Estate and Territory

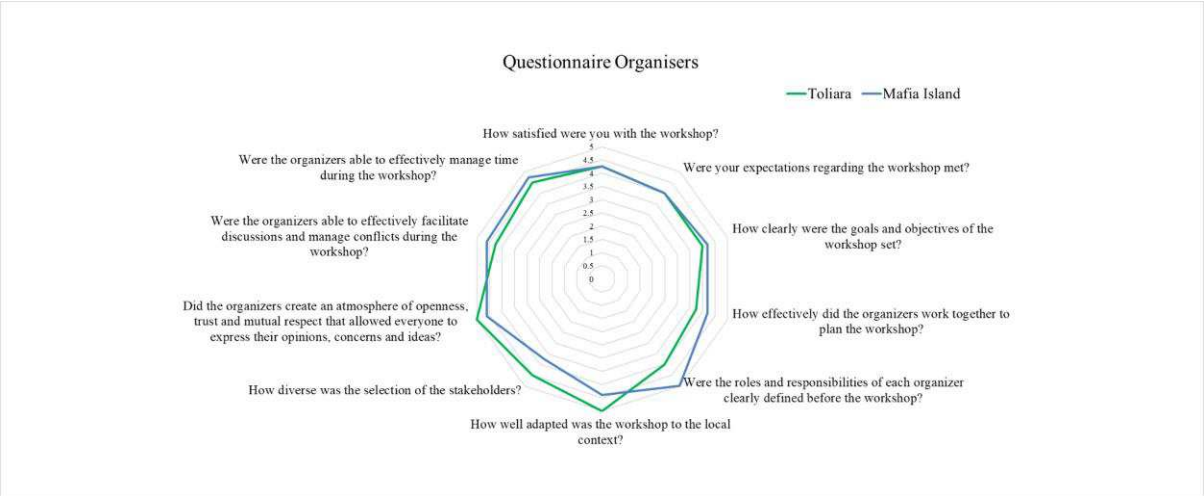
(mentioned three times), the Ministry of Transport, representatives from the legal sector (literally written: judge) and general local politicians such as mayors and fokontany chiefs (and representatives of commune, but from different parts), the private company MAPROSUD (new seaweed farming enterprise established last year in the southern part of Atsimo-Andrefana), representatives from other LMMAs of the region of Atsimo Andrefana (mentioned twice) and generally stakeholders from the northern part of Toliara. Most stakeholders only reported their absence while only one stakeholder stated a possible reason for absences, namely the cyclone which happened shortly before the workshop. The presence of stakeholders as outlined before was linked to various conditions. On the one hand, it depended on the **targeted selection** on the part of the organisers. On the other hand, there were other factors that impeded the presence of individuals, such as problems with **logistics**, the **timing of sending invitations** and general availability of stakeholders due to work-related or personal occupations. At this point, I would like to recall an example given by a participant. A representative of an NGO mentioned in an interview that for example, women had difficulties attending workshops as they were often occupied with child care.

Coming to the last question about the stakeholders' possibility and encouragement to participate actively, only three comments were made. Both groups rated this question rather positively with organisers assigning the highest possible rating. Their only remark revolved around the wish for more time allotted to stakeholders to discuss, which has already been mentioned in relation to other questions. One stakeholder expressed hesitancy to contribute driven by his limited knowledge about coastal issues ("sea frameworks"). In this context, establishing a direct connection to one of the prior mentioned themes turns out to be difficult, however, potential connections might encompass unfamiliarity with terms, communication dynamics, or even perceived power differences that might have deterred him from contributing. Another stakeholder commented on his limited language skills impeding his active participation in workshop discussions. While this observation is closely related to the issues of language and mutual understanding, the actual cause remains somewhat unclear. It could possibly be due to inadequate translation or regional dialect differences, both of which are consistent with the interview findings.

7.3.2. Questions organisers Toliara and Mafia Island

Figure 10.

Average answers to questionnaire of organisers for both workshops



Comparing the organiser satisfaction showed a consistent level across both workshops. While the Mafia Island workshop scored higher in five out of ten Likert scale questions, the Toliara workshop came out ahead on three questions. In two questions both scored the same results.However, despite the seemingly better results associated with the workshop in Mafia Island, there was limited completion with many answers left blank. In addition, notably more divergent viewpoints occurred in the context of Mafia Island than in Toliara. (Particularly striking were the disparate responses related to stakeholder diversity, where ratings ranged from 2 to 5 for Mafia Island and from 4 to 5 for Toliara) There are other factors to consider. The absence of Tanzanian organisers at the workshop in Madagascar and the participation of two Malagasy organisers at the workshop on Mafia Island led to possible discrepancies. In addition, despite simultaneous translation in Toliara and face-to-face translation on Mafia Island, it was difficult for organisers from the different countries to fully understand all discussions. Nonetheless, the open-ended questions combined with the Likert scale provide a way to gain nuanced insights into the challenges that organisers encountered during the workshops.

Regarding the general **satisfaction** in the case of Mafia Island, organisers commented that there could have been a better venue for the workshop and that the focus was too much on fisheries neglecting other factors influencing the coastal management. This could well be related to the selection of stakeholders, as it was mentioned in interviews and informal discussions that most of the stakeholders on Mafia Island belonged to the fishing communities and that the set discussion topics revolved around the issue of traditional knowledge while stakeholder groups such as representatives from tourism were missing.

The theme of **stakeholder selection** in Mafia Island also permeated other questions, for example whether expectations regarding the workshop were met, or how diverse the selection of the stakeholders was. Regarding the diversity of stakeholders, organisers further added in the case of Mafia Island that women representatives, NGOs and high ranking district officials were missing (similar to Toliara: NGOs, women representatives).

Another theme that permeated two questions (realisation of expectations and clear goal definition) was **expectations management**. Instead of referring to their own expectations, organisers made reflections on the stakeholders' potential expectations in open-ended questions. In both cases, organisers estimated the stakeholder's expectations rather high, at times even higher than what they could provide for them during the workshops, pointing to the need of an improved expectations management. This finding is in line with the interviews and my participant observation. Moreover, one answer concerning expectations management illuminated an important consideration revolving around the concept of coproduction which hasn't been discussed extensively during the interviews. This involves the discrepancy of being able to communicate a specific goal, while the approach implies that participants at least partly should define said goal during the workshop. This can be connected to issues previously discussed revolving around the themes **common understanding**, **role definition** and **leadership**.

A third factor to be taken into account is the theme of **teamwork** which appeared in four questions (efficiency of teamwork, role definition, adaptation of workshop to local context, efficiency of facilitating discussion and managing conflicts, *external limiting factors that can be overcome)*. In relation to teamwork the theme of **time management** has been mentioned three times for Toliara and once for Mafia Island. On the one hand time constraints referred to the availability of all partner institutions to be present in planning meetings in both cases and on the other hand the timely availability of funds for the workshop implementation in the case of Toliara. Another concern raised in relation to teamwork was the theme of unclear **distribution of roles** and responsibilities. Although seven out of eight organisers indicated they had previously worked with the approach of a "participatory" workshop, in line with the interview findings, there seems to be persisting confusion about it **(experience in co-production)**. One of the respondents again raised the potential need for the involvement of a specialist who could help moderating and mitigating such issues (in both cases). Still connected to the theme of teamwork, one respondent made the proposition of involving representatives from the district authorities and NGOs (**selection of organising team**). Further, connected to the theme of **leadership** and **communication** within the organising team, a critique has been brought up that during the workshop certain activities have been changed by an organiser in contrast to what has been agreed upon in previous planning meetings.

When looking at the rating it is important to consider that some of the organisers only answered Likert-scale questions and raised concerns in open-ended questions in the case of Toliara, but not in Mafia Island, even though they attended both. This contributes to my speculation that the ratings for Mafia Island could have been lower if the participating organisers had completed both parts.

The questionnaire further revealed the interconnectedness between responses to questions concerning workshop facilitation and **time management**. Both indicated that facilitation could have been more rigorous in terms of adhering to the predefined time plan and that extending the workshop to two days would have been beneficial. This also reflected the wishes of the

interviewed stakeholders. Further, one respondent also pointed out the importance of considering the local culture, as Friday is a day of prayer on Mafia Island and therefore not suitable for conducting a workshop.

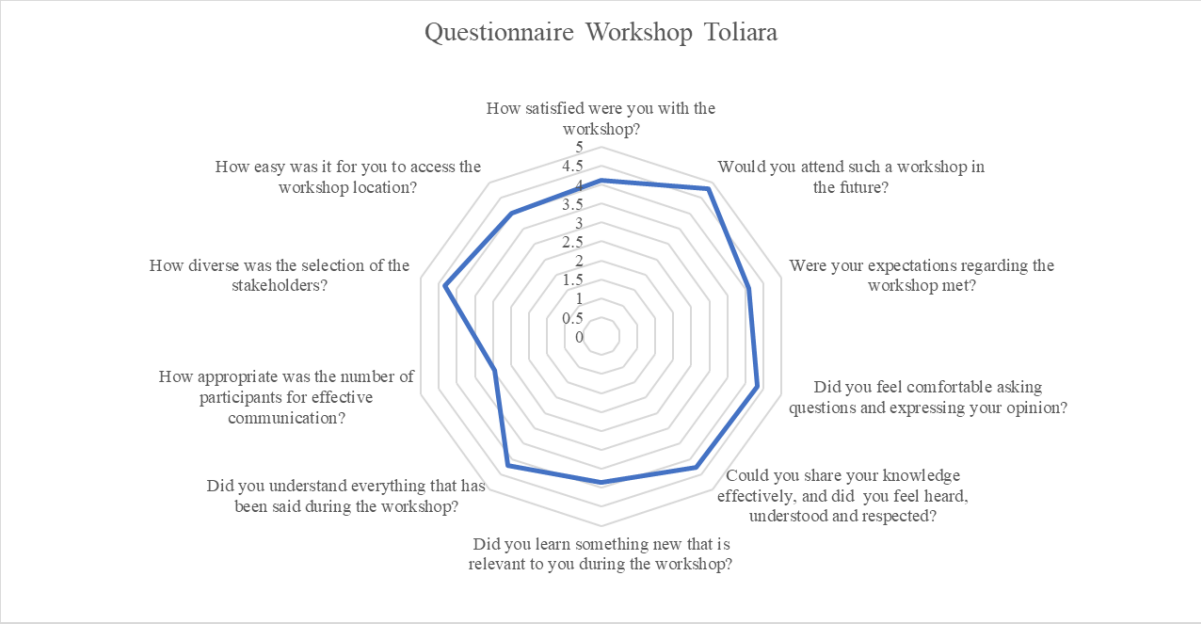
Regarding the theme of **adaptation to the local context**, both workshops were rated very positively by the organisers. The proposal by one respondent, however, went beyond the opportunities mentioned in the interviews, by suggesting the involvement of local stakeholders in the organising team.

In addition, two open-ended questions were asked about limiting factors that can and cannot be overcome. Interestingly, some issues were mentioned as answers to both questions. For example, the problem of **funding** and **logistical factors** were mentioned by one organiser that could be overcome assuming better planning, while another stated that this was not possible. **Institutional framework** and **political will** were also mentioned by the same respondent as problems that can and cannot be overcome, respectively, which could mean that adverse political will at the lower level can be overcome, while political will at a higher level is more difficult or even impossible to change in the realm of this project. Diversity of interests and stakeholders, language problems, and unclear distribution of roles and responsibilities within the organisational team were cited as three other factors that can be overcome.

7.3.3.Questions stakeholders Toliara

Figure 9.

Average answers to questionnaire of stakeholders for the workshop in Toliara



Almost all stakeholders indicated that they would attend a similar workshop in the future again, even though their satisfaction level is lower.

Among the evaluated aspects, the **learning outcome** received the lowest rating, although still in the positive range. Given the results from the interviews and participant observation, the

reduced learning outcome could be attributed to the participants' familiarity with a broad range of coastal issues, especially in the case of NGOs, since they are already very interconnected with other actors and themselves deal with such problems. However, what might have contributed to the positive learning outcome as described by one interviewee could be the mutual exchange and the realisation of how different actors deal with the same problem.

When asked about the stakeholders' understanding of the project, the issues of unclear **goals** of the project and **language**, more specifically the difficulty of understanding certain Malagasy **dialects**, came up.

Regarding the question about the adequacy of the number of participants it is important to note that three is the perfectly adequate number, while one is too few and 5 is too many. With 2.94, this indicates an almost perfect number even though there were ratings saying there were too few or too many. The most common reason (5x) named for a too small number of participants was the cyclone which happened the day before. Especially people from the north couldn't attend due to logistical factors. This also stands in connection with the workshop's accessibility. Here, respondents again mentioned the **timing of sending the invitations**, the cyclone and the **funding** of accommodation and transport.
Four other reasons for a low participation were the lack of interest or motivation and the selection of stakeholders (department of tourism, Madagascar National Parks, Ministry of Environment).

7.4. SWOT Coastal Management

Regarding perceptions about the current state of coastal management, 28 themes were identified as facilitating factors (25 for strengths, and 3 for Opportunities), and 55 themes were identified as limiting factors (58 for weaknesses and 1 for threats).

Table 8.
SWOT table for coastal management

Strenghts	**Weaknesses**
<u>Collaboration</u> Events for familiarisation Constant contact Direct communication Economic incentives Gender equity Development and conservation Popularity of organisation Provision of alternative livelihoods Collaboration PC-NGOs Joint interests International support Showing of results	**<u>Migration</u>** Climate change Lack of rainfall Lack of (agricultural) investment in South of Madagascar Limited use of technology No direct investments *Poverty* Increasing number of fishers Increasing pressure on natural resources Decline in resources Destructive fishing practices (poison, very small mesh sizes/mosquito nets)

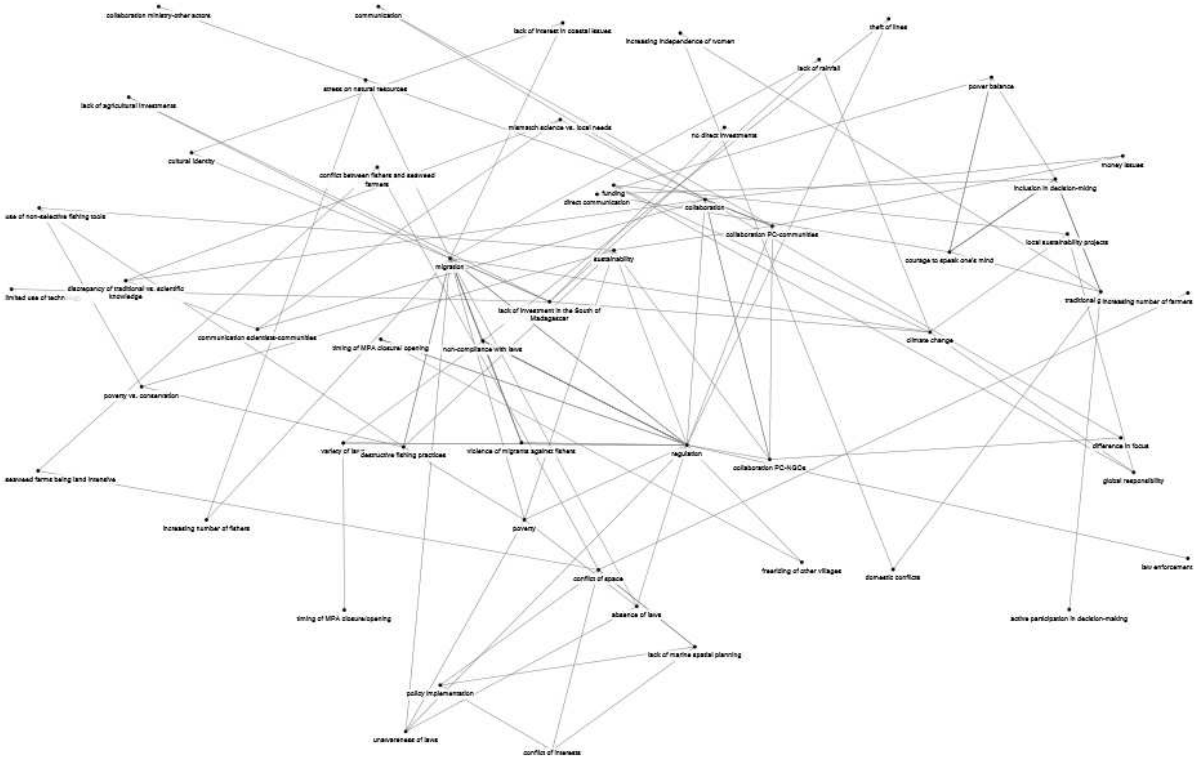
Integration of migrants **Inclusion in decision-making** Constant contact Consultation Inclusion in creation of coastal management plan Community maps Inclusion in monitoring **Regulation** Regulation migration Compliance with laws	Cultural identity of migrants Fishing as temporary alternative to agriculture disinterest in coastal issues Non-compliance with laws Violence of migrants against fishers Use of weapons Global responsibility Sustainability projects obscuring challenge of climate change Large-scale international fishing fleets **Regulation** Absence of laws Law enforcement Non-compliance with laws Unawareness of laws Theft of seaweed lines Poaching of sea cucumbers Different levels of legislation Freeriders from other villages **Conflict of space** Absence of marine spatial planning Policy implementation Increasing number of farmers (seaweed and sea cucumber) Conflict fishers vs. seaweed/ sea cucumber farmers Law enforcement Absence of police Seaweed farming being land intensive Engagement in both activities **Inclusion in decision-making** Courage to speak one's mind Traditional gender roles Balance of power Direct communication **Collaboration** Communication scientists-communities Mismatch science vs. local needs Discrepancy of traditional vs. scientific knowledge Collaboration PC-communities Communication PC-communities Difference in educational level Money matters Collaboration PC-NGOs Difference in focus

opportunities	Threats
Motivation for conservation Positive results of pilot MPAs Environmental and fisheries education	Fast changes

7.4.1. Weaknesses

Figure 10.

Themes Weaknesses Coastal Management



Note. This figure was produced using NodeXL. Own work.

Migration

One of the main themes is **migration**. Even though it was only mentioned by two representatives of NGOs, it has next to regulation the highest vertex degree of 11. Consequently, it summarises a lot of the mentioned sub-themes.

Interviewees mentioned causal relationships including causes and consequences of migration to the coast. Especially one of the interviewees reported extensively about it, mentioning the words “migrants” or “migration” fifteen times. As reasons for the increasing migration she highlighted the impact of **climate change** resulting in a **lack of rainfall** and consequently, reduced agricultural productivity. Further, due to a **lack of agricultural investments in the South of Madagascar** and the **limited use of technology** farmers can’t build the necessary resilience to withstand these changes. It was also mentioned to me that another problem

connected to investments is the **lack of direct investments** and farmers could only hardly access them. As a result, rural populations feel the effects of climate change on their livelihoods most acutely and often have no alternative but to migrate. With migration comes the need for an alternative occupation, which often manifests itself in fishing. Already, the **increasing number of fishers** is putting **pressure on natural resources**, leading to a **decline in various resources** such as fish stocks, but also wood for building pirogues. Additionally, according to one of the interviewees, migrants would engage in more **destructive fishing practices** than the local fishers including the use of poison and very small mesh sizes, even mosquito nets. One reason she cited was the **cultural identity of the migrants**, who see themselves as farmers and view **fishing as only a temporary alternative to agriculture**, in the expectation that the rains will eventually return. This would explain their general perceived **disinterest in coastal issues** and their **non-compliance with laws**. She even reported recurring **violent attacks by migrants on fishers**, including the **use of weapons**. A second reason she gave was their unawareness of existing laws.

> *[63]"But even if we talk about it and they're not aware of it, and that's the challenge, there have been a few problems between migrants and fishermen in the south-west zone. The fishermen try to tell the migrants that you can't do that, that you can't sometimes do that and so on. And the migrants, with their means, have fishing hooks, axes and so on. They even threaten the villagers in one village and say What do you want, you want to stop us from fishing? Then we're going to come to your house and steal everything there is in your house or something." - stakeholder*
>
> *[64] "The problem is that they think they're farmers, and when you talk about something that's also about fishing, they don't just go." - stakeholder*
>
> *[65] "For example, they use the poison fishing technique. There are also others who use nets that are little jerseys or mosquito nets." - stakeholder*
>
> *[66] There isn't really a law that forbids these people from going fishing or doing fishing in the Sud-Ouest region. There are simply laws that prevent, that identify specific species, specific gear for them that destroy the marine resource. But for migrants, there's no ban, and what's also a plus is that the VEZO fishermen are very peaceful people. They're very welcoming. They don't carry weapons, they're very friendly. When there are newcomers, they welcome them. And if that person wants to fish, it's part of their tradition to say that the sea belongs to everyone. "... "And about the DINA, I think they know about it but they pretend not to know. It's just my opinion." - stakeholder*

One interviewee also highlighted climate change as an issue independent of migration, emphasising **global responsibility** and her observation that **sustainability projects** focused on small-scale fisheries can **obscure the overarching challenge of climate change**. Another interviewee pointed out the prevailing gap in sustainability discourses on fisheries, which often disregard the role of **large-scale international fishing fleets**, which operate at greater distances from coastal areas and are the most destructive kind.

Moreover, it is not only rural communities that are affected by poverty; coastal communities also suffer from conditions of poverty forcing them to adopt unsustainable practices to generate income. A representative from an NGO explained to me how hard it can be as an NGO trying to promote sustainable practices, while acknowledging people's living conditions.

[67] "It's a pretty tough job because if you force a parent not to look for money to allow their children to eat, it's impossible. I can't bear to see my child go hungry and think about the environment. It's impossible," - stakeholder

[68] "Regarding some productive aspects, their members are using for now some archaic fishing tools and unsustainable, when they have to fish and to collect fishes, they are using nets that are not conventional. They can capture everything...Fisherwomen specifically. Cause here in the South West, men are using canoe and can fish offshore. But women are fishing near shore, so they don't have too much productive tools and not selective. They use what is possible to get fish. So it is unsustainable." - stakeholder

Regulation

Another major theme is **regulation**. This has different components, namely the **absence of laws**, difficulties with **law enforcement** due to **non-compliance with laws** and the **unawareness of laws** (also connected to migration). There are also **different levels of legislation** (Dina, national, community-level), which make the implementation and enforcement of laws difficult.

As already mentioned, the absence of laws and the insufficient law enforcement can be connected to migration and fisheries, but they also play a key role in other blue economy activities. One interviewee told me, for example, that in the case of seaweed farming, the farmers get lines from the company where they can attach their branches. Sometimes it happens that farmers steal lines from each other (**theft of seaweed lines**).

[69] "The biggest problem is theft. That's the first thing...between farmers. That's the biggest problem, because there are farmers who have lost 12 lines, 15 lines... This kind of problem, we informed them directly in Tuléar at the base that we had such thefts. We had to replace them as quickly as possible so that the farmers could keep their production. Because each farmer had a target already set during the monthly meeting. And so, if they don't have rope, they can't have good production. So they don't reach their targets. And at the end, we evaluated how many strings we had lost. And then, with the social-orga organisers, we held a meeting with the committees to try to find and put in place a strategy to delimit and stop this kind of theft. Because theft is the most dangerous thing for production." - stakeholder

Another example of theft is the **poaching of sea cucumbers**, which according to several sources can end deadly. I was told that growing sea cucumbers is a very lucrative business as they get exported and sold to a high price abroad. In informal conversations some of my contacts told me about an incident where a poacher got shot and that in general, the community as well as the company are allowed to shoot poachers. In an interview with a community member and sea cucumber farmer, he told me that what makes the problem even worse is that sometimes companies buy stolen sea cucumbers without paying close attention to their origin. I myself also got into contact with this tense situation when I wanted to visit one of the sea cucumber farms with a member of a local community and we were not granted access. Further, I also heard about illegal seahorse trade.

[70] "Ah, I hadn't thought of that at all. So, for example, that poaching is such a big problem for sea cucumbers." - organiser

Concern was also expressed regarding the **different levels of legislation** including national and local legislation and Dina. This was mainly related to the timing of MPA closure and opening. Sometimes the closure dates decided by the local NGOs together with the research institute and the communities do not coincide with the closure dates decided at the national level.

[71] "it's weird in the national closure.... "And we negotiate the duration between a month and a half and three months. And the period was discussed with the IHSM at the time, at the latest and more or less around the month from June until June, in the middle of the shutdown. Because December is weird in the national closure. According to scientists at the IHSM Rabihary Daniel, there are PIC de PIC, recruitments and not recruitments recruitment. There are two recruitment periods throughout the year and the second recruitment period is. This is already covered by the national closure on 15 December until 31 January. The second fixed period is already here. There's no point in making certain closures because all the zones will be closed for octopus and before that the first peak we involved in the decision taking into account the scientific reasons that we have to include these spikes there, in the period of closures. It's for each choice and based on the? That way, if we manage to time the first spikes, it's a good idea. But we're also negotiating with the community. When exactly? To. Where will the closure start? The opening was a collaboration, a joint reflection with the collective. That's the role of the platform." - stakeholder

When the need for renewal of the laws came about during the workshop, one fisheries association member remarked that the renewal of laws was a very lengthy process, especially in the context of Madagascar and that it could take many years until a new law is implemented.

Further, one interviewee explained how, when faced with the closure of an MPA, communities feel disadvantaged when it finally opens and they could reap the rewards of their patience (increased fish), but **freeriders from other villages** not affected by the closure beat them to it.

[72] "But at the time of the opening, there will be many people arriving from other villages, while people have not only sacrificed for the closure. And when it opens, even the people who aren't making sacrifices, they'll start to worry, to fear, to refuse to visit the place. And that's when people get angry with the conservation organisation. And why? We've been affected, we've lost out. We, we've dedicated ourselves for several months, but just one day with the others, it's going to happen." - stakeholder

The final issue related to regulation that needs further investigation is the problem of large-scale international fisheries, which was outlined to me in an informal conversation. My interlocutor explained to me that although all conservation efforts in the region are focused on small-scale fishers, more attention needs to be paid to large-scale ocean fisheries, as she believes they have a far greater impact, and that this is closely related to inadequate enforcement of regulations.

Conflict of Space

Conflict of space is amongst the four themes with the highest vertex degrees (six). But besides that, it was also amongst the outcomes of the workshop in Toliara and it was mentioned to me

repeatedly during my field work, in focus groups and in two of the interviews I wasn't able to code.

The greatest weight in the interviews was given to the link between spatial conflicts and lack of **marine spatial planning**, which was mentioned in particular by representatives of the administration. They considered better marine spatial planning important because there is a conflict of interest regarding the use of the marine area, whether by fishing, seaweed/sea cucumber farming, or tourism, and it is currently struggling with **policy implementation**.

> *[73]"space conflict, because there is not really any amenagement, there's not MSP, marine spatial planification. There's no really a planification because all people want to use, want to exploit all the products that relate from the sea, from the marine, there is tourism, there are maritime transport, there are aquaculture...So up to now, this is one of the Ministry, this is one of the Ministry policy. But we are waiting for the implementation. Implementation at any region. At each region" - stakeholder*

Connected to the theme of migration which was mentioned before, there is an i**ncreasing number of** fishers, but also **farmers**. In a focus group conducted in one of my field trips, a group of seaweed farmers told our team that this growing interest in seaweed and sea cucumber farming originates from financial incentives as they can often make more money by farming than just by fishing. This can create **conflicts between fishers and farmers**, as seaweed and sea cucumber farms are quite land intensive and fishers aren't allowed to fish in these areas. Some of my interlocutors told me that fishing there is especially tempting, as according to his and others' observations, fish are accumulating in these areas.

> *[74] "For example, there is seaweed farming. This practice is starting to develop and is taking up a lot of space in the area where fishermen fish. So there's a bit of a conflict between fishermen who want to fish in the seaweed zone. So sometimes there are conflicts. " - stakeholder*

A major problem with **law enforcement** in the event that these boundaries are crossed (at least in Anakao) is that there is **no police presence**, as the community would have to pay for these services but often **lacks the financial resources** to do so (nevertheless, they have developed their own surveillance system in the form of a neighborhood watch, which decides on punishments through social voting, usually resulting in a fine).

But in addition to the conflict between fishermen and seaweed farmers, there is an additional layer of complexity, as people often **engage in both activities**. Some of my interviewees cited the reason that growing seaweed gave them a regular and more stable income around twice a month, but that they had time between harvests to go fishing and earn extra money.(The combination of these two sources of income reduces the risk of lack of income)

> *[75] "There are fishermen who also farm seaweed, but there are other fishermen who do not farm seaweed. Seaweed farming is starting to develop. That's where the problem starts"- stakeholder*

Moreover it was communicated that a considerable number of people have difficulties **accumulating savings** for a variety of reasons. On the one hand, a substantial portion of

financial resources is directed towards burials and grave maintenance, which is deeply embedded in the local culture. On the other hand, especially men would spend a lot of their income on alcohol consumption.

Another conflict of space is in sea cucumber farming, according to one of my interlocutors who is himself a fisherman and sea cucumber farmer. As more and more fishermen realised the financial benefits of sea cucumber farming, the demand for such jobs increased. Companies involved in this field responded by expanding their farming areas. However, the interviewee pointed out that sea cucumber farming is even more land intensive than seaweed farming, and the time it takes for sea cucumbers to grow to the desired size for sale is quite long. Initially, there was a system where the company provided materials and juveniles and the farmers had their own small field. However, as demand increased, the company introduced a new system of communal fields where people would work together and earn equal amounts of money, which is not accepted by everyone and is another source of conflict.

Inclusion in decision-making

Another theme that requires attention is the **inclusion in decision-making** which consists of various components. On the one hand, there is an active exclusion from decision-making in the form of exclusion of women in village reunions. One interlocutor explained that although women were allowed to attend meetings, they generally did not have the right to vote and were not included in decision-making, despite their growing financial contributions to their households.

> *[76] "It's done by fishing on foot and it's one of the challenges of the two ways of fishing where women really excel, and it's the women who mainly focus on fishing on foot....Because, especially in Malagasy customs, it's mainly the men who make the decisions, it's the men who run the village and the women mainly look after the children and/or the home. And even if the women actively contribute to the household income, by fishing on foot, it's mainly the men who make the decisions" - stakeholder*

On the other hand, and also but not only in the context of gender inclusion, there is a lack of **courage to speak one's mind**. In the case of women, one interviewee linked this problem to the still very widespread **traditional gender roles**, especially in the domestic sphere.

> *[77] "But what's still a little lacking in Madagascar is the fact that women really dare to say what they think. Because sometimes, when we have a meeting, only a few women can stand out from the others and really say what they think. But it's mainly men who take an active part in all the activities, even though we actively try to include women" - stakeholder*

> *[78] "So far I'm not satisfied with our women's decision making on names. They're not used to making their own decisions. They are used to asking their own husbands before making a decision. - stakeholder*

This became clear to me during my participant observation when women for example told me that women are usually not allowed to work with men other than their husbands or family members, especially when they go out to sea in the pirogue.

But there is also the cross-gender problem of the perceived **balance of power** when it comes to having the courage to speak out. When problems arise that need to be discussed with a higher authority, community members often hesitate to turn directly to the offices, but communicate through NGOs. This makes the process lengthy.

> *[79] "So basically our interviewees are mentioning that members of the association are reluctant or afraid to go to go in offices, so within the association they are sensitizing the members to visit offices and to discuss directly so to break the barriers so the ice" - stakeholder*

Collaboration

The theme with the third highest degree of centrality of 10 is **collaboration**. Despite its connection to decision-making, collaboration also includes further aspects of exchange between the different actors and how they work together. My main insights about collaboration came from conversations with representatives of private companies, NGOs, and community/ association members who pointed out various reasons why collaboration sometimes does not work effectively.

One issue highlighted by a representative of a fisheries association was the insufficient **communication between scientists and communities**. He pointed out the **discrepancy between traditional and scientific knowledge** on the basis of a concrete example, namely the reasons for the death of a specific fish species. In his opinion the main difference was their approach wherein he saw the community's approach as holistic while the scientific approach is rather isolated.

> *[80] "They sometimes notice that there is certain kind of gap or between academic knowledge as well as scientific knowledge and grounded knowledge or traditional knowledge. So, for instance, he was taking the example of one fish, Fiantum, which scientifics here have explained that they are dying because they are eating some kind of sands or kind of that. But they have noticed that it's not because of sands, but because of the fact that these fish are swimming next to reefs or eating algae that may be poisonous for their metabolism." - stakeholder*

> *[81] "But at the moment, where scientists come to fieldwork, they are exchanging with them and trying to explain some points that there is any discrepancies or defense to knowledge and can be dangerous. So with the example that he took earlier, it was just about fish. But the thing is, they are studying, for instance, the isolated case of one fish. While the case may extend to the all community also they have noticed that scientists also are interested to commercial fish and to the fate of commercial fish they treat it isolately the fate of commercial fish. But in the community there are another fishes that are useful for the ecosystem and for local needs. So they're trying to express their ideas through speaking with scientists who come to the fieldwork but they don't have any way to do like otherwise." - stakeholder*

But also difficulties in the collaboration between the private sector and other actors were mentioned in interviews and informal conversations. One outlined difficulty was the **communication between the private sector and the local community**, partly due to a **difference in educational level**, which according to a representative of a private company leads to problems finding qualified personnel.

[82] "There were sometimes difficulties, for example with levels of understanding. For example, I'm at university level and I've used the tools and all that at university level. But when I get to the community, it's not the university tool that will work with it. With. We always have to find ways of transforming things. How are we going to present this idea to the community? And that's always, um, that always exists, but it's not really a problem, but it's always up to the technicians to find ways of getting the message across. - stakeholder

[83] "And here in Tulear, to be honest, is very difficult to find qualified people. But we try and we have found a really good RH, but most of it comes from Tana and for specific posts they hire Vazaha for example," - stakeholder

Something that repeatedly comes between the **private sector and the community** is **money matters** in terms of timing of payment, amount of payment and more specific incidents.

[84] "Yeah, we had a lot of difficulties. I think I wasn't here until the beginning, from the beginning, but I've heard, and I see as well in my job, some difficulties, that there are always difficulties with the people, especially if you're getting in there, especially if there's money involved, there's always that." - stakeholder

One of my interlocutors told me that one of their problems was that they wouldn't always get paid immediately, but one or more weeks late. He explained that, given his economic situation, even a single week of late payments could lead to significant repercussions. One example given by a community member relates to the area of seaweed farming. Normally, individuals harvest the seaweed and then dry it, after which a company representative collects the harvest. However, in this particular case, the seaweed was returned with a notice stating that it had not been adequately dried, resulting in the withholding of wages. This incident led to dissatisfaction within the community, which attributed responsibility either to the company itself or to the person responsible for transport. In addition, there are cases of community members accusing companies of not respecting their local norms, even to the point of asking them to leave.

Another challenge arises from the **collaboration between private companies and NGOs** stemming from the **difference in their respective focuses**.

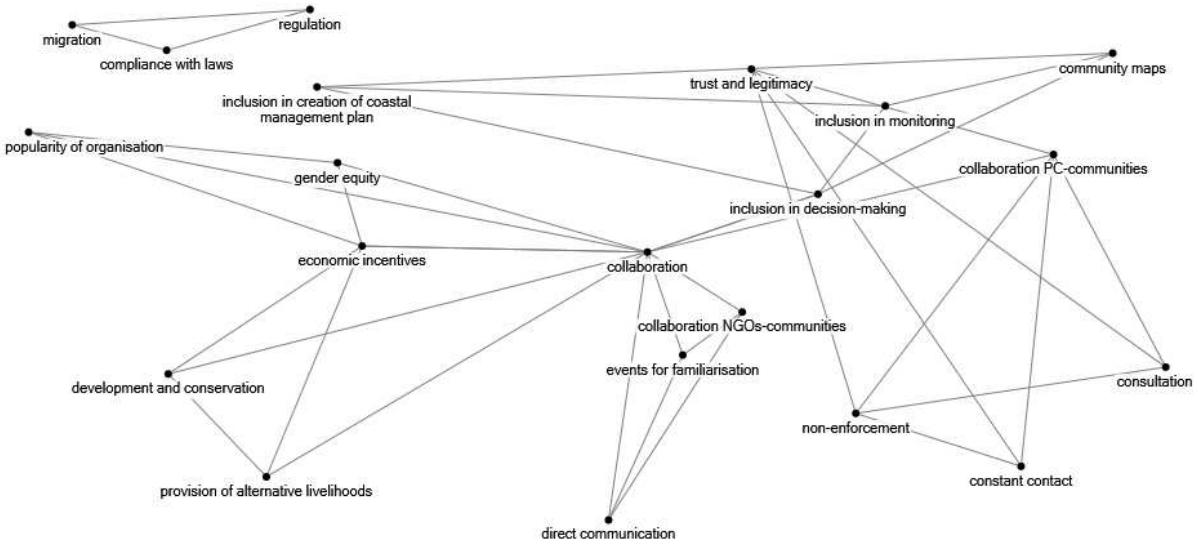
[85] "But right now it's getting difficult to work with [NGO] for example and [NGO] because they have a lot of activities that they have to do and to dedicate full time to Aquaculture is not possible for them. "- stakeholder

7.4.2. Threats

Only one danger was mentioned by a representative of a private company, namely the threat if a company wants to implement changes too fast. In his opinion if changes are brought up too fast, it might threaten the company's collaboration with the local communities.

7.4.3. Strengths

Figure 11.
Themes Strengths Coastal Management



Note. This figure was produced using NodeXL. Own work.

To some of the above mentioned problems, some of my interviewees and interlocutors presented ways of how they are dealing with them.

Collaboration

Collaboration was the most frequently mentioned theme connected to strengths of coastal management. In interviews, representatives from NGOs, private companies, and networks explained strategies that helped them improve collaboration with communities and each other.

One NGO for example outlined its strategy for the **creation of familiarity** between them, the community and the associations, namely in the form of organising specific **events**. In this way, they created closer **contact** and mutual exchange and promoted **direct communication** without the need of intermediaries.

A second strategy for NGOs and private companies is the provision of **economic incentives**, working at the brink of **development and conservation**. A representative from WCS for example explained how they collaborated with collectors to raise prices for marine products after the re-opening of an MPA or how they created a financial grant for the person who catches the biggest octopus after the opening of an MPA.

> *[86]"As we are a conservation organisation, a support organisation, a technical assistance organisation, we also motivate people in the village, for example. From the monitoring of catches, we recorded that the man or woman or or whoever caught the biggest octopus in that area. And the same goes for the others. And at what price? At opening time, for example. Last time, the price was 7,000 Ariary per kilo bought by the collector and the product had already been bought by the collectors. But as a support*

organisation, we give small premiums per reserve to the biggest octopus in that reserve. Sometimes the rains last for kilos at a time. For example, a certain fisherman caught twelve kilos of octopus last time at a price of 7 thousand ariary twelve kilos 7 thousand ariary times two. These are the bonuses that we are offering on our initiative to motivate people to do the same next year. That's the system we've had in place for over ten years." - stakeholder

[87] "In the six villages there are six temporary closures and at the time of the opening there is a certain price increase on the part of the COPEFRITO companies. All this price increase to 500 Ariary per kilo. And that's already motivating people and also motivating some villages that don't want to do them." - stakeholder

An economic incentive may also be essential for husbands to support their wives. If they see that their participation in associations brings money into the household and the association is widely known **(popularity of organisation)**, they are generally more supportive.

[88] "So the situation is sometimes husbands do not agree to the woman initiative, but regarding the institutional level, most of the time institutions are supporting women initiatives and they are opening doors. But there are also some situations where in general husbands are supporting women towards this initiative when it is socially well known. When it becomes famous, husbands are more supportive. Why? Because sometimes associations throughout this organisation women can get support, maybe financial support, so the household can benefit something from the association." - stakeholder

The **provision of alternative livelihoods** happens in **collaboration between NGOs and private companies** with the involvement of scientists assessing the impacts of activities such as seaweed or sea cucumber farming. In this respect, all these actors have **joint interests**.

[89] "Normally we're a conservation organisation, but we find that if we simply prohibit, you mustn't do that, you mustn't do that, you'll never achieve the conservation objective. We need to change our approach. Develop activities such as seaweed farming. We give seaweed farming to the community to reduce the pressure on resources. But it's not us who can do the seaweed farming, it's us working with [company], for example, to meet the needs of the communities, everyone's needs. - stakeholder

[90] "Seaweed farming is generating potential income-generating activities at the moment. There is also livestock farming and modern livestock farming in collaboration with the local livestock management. And soon there will be other income-generating activities too. But for the moment, it's seaweed farming that covers everyone, so there's no need to invest in pesticides or insecticides, no, it's just maintenance and the closed part, and it brings in money for the fishermen, it also reduces pressure on resources because, instead of going fishing 24 hours a day." - stakeholder

In general, NGOs reported on having a good collaboration with other actors on the basis of regular contact and support. Women's organisations mentioned in particular the great **international support** they are receiving.

A third strategy to increase collaboration is **showing results** instead of just talking about them in the form of pilot projects in either cases of NGOs or private companies:

[91]"the way to do it, I think, is to consult the community and ask what they want and what they need and how they want to do it. And maybe if you're convinced that there's a good solution for the problems,

for example, our activity, I think I really believe that it is part of a solution for a lot of problems here, especially poverty and access. And I think if you expose well to the community the advantages of our model and our way to produce, I think it would help as well to convince people instead of arriving there and enforcing them. And saying them this is good for you. But showing them, really and starting little by little as well." - stakeholder

[92] "Dans les autres villages qui constatent les résultats, Il y aura une motivation. Il invite les organismes à définir ses idées, à faire un exemple aussi ici chez nous, parce que ça, c'est un bon exemple." - stakeholder

Another sub-theme mentioned was the collaborativeness of communities when it comes to **integrating migrants** and other ethnicities and that generally people have the attitude that the ocean belongs to everyone.

Inclusion in Decision-making

Tightly connected to the theme of collaboration is the **inclusion in decision-making**. A representative from a private company told me about their method of having voluntary contracts with farmers and their inclusion in decision-making through **constant contact** and **consultation**.

[93] "And we have to for that kind of public consultation, the thing that we need is the presence of people from different sectors. For example, representatives of the fishermen and the hotels and the transportation people and maybe other aquacultural companies. So everybody has a representation in that kind of meeting. It depends on the meeting, but usually we organise with the chef Fokontany or the mayor, and we try to have a lot of presence over there and then we officialize it with some paperwork and everything. So we try to do it in a good way, not imposing everything or not forcing anything, but mostly consulting the communities and being always in touch with the NGOs to be sure that we're not invading, like national parks or anything. We work a lot with the communities and we listen first, what do they need, what do they want to do? We make public consultations before doing any actions to be sure we're accepted in the community and we're not forcing into it." - stakeholder

Also some community members I talked to during my participant observation elaborated on the process of decision-making (chef Fokontany notifies everybody about specific topics that need to be discussed and then, it is voted by raising hands) and that they generally felt included. Further, other NGOs make sure that for example women are included in other NGOs' or private companies' reunions

[94] "We work with the [NGO 1, 2, 3] within strong structures. And that's also a plus for me because it's almost part of, it covers almost the whole of the coastline of Madagascar, the south-west of Madagascar. And they are the ones who organise themselves by including women as much as possible, especially in the meetings when we go to the village. To open up the areas effectively. For example, the women participate, they give their opinion, and we take into account the women's opinion on the opening date. How we're going to proceed and above all." - stakeholder

Moreover, NGOs and private companies stated how they included communities for resolving conflicts of space, for example through their inclusion in the **creation of coastal management**

plans and **community maps** or through activities such as ecological **monitoring**. Some community members supported this statement.

> *[95] "Par rapport à la gestion des conflits, souvent, on fait des consultations aux différents acteurs au niveau de la zone qui utilise la mer ou l'océan. On essaye de faire des participatory mapping avec eux et décider qu'est ce qu'on va faire, quelles sont les zones qui seront utilisées pour certaines activités, quelles seront les zones qui seront utilisées pour d'autres activités et les zones à protéger. C'est par rapport à la décision des acteurs que nous faisons le plan d'aménagement et comment les gérer." - stakeholder*

> *[96] "Je pense qu'ils sont très intéressés, surtout quand on forme des équipes communautaires qui font de la suivi écologique et que ces équipes font vraiment leurs tâches de suivi et fait aussi des retours au niveau communautaire. Je pense que ça a beaucoup apporté de bons résultats, surtout sur la mise en place de nouvelles mesures de gestion qui même y décident." - stakeholder*

In a focus group of male seaweed farmers, they also told us that there has been an improvement in women's involvement in domestic affairs beyond traditional gender roles, and that women's financial contribution to the household through seaweed farming work has been a major contributor.

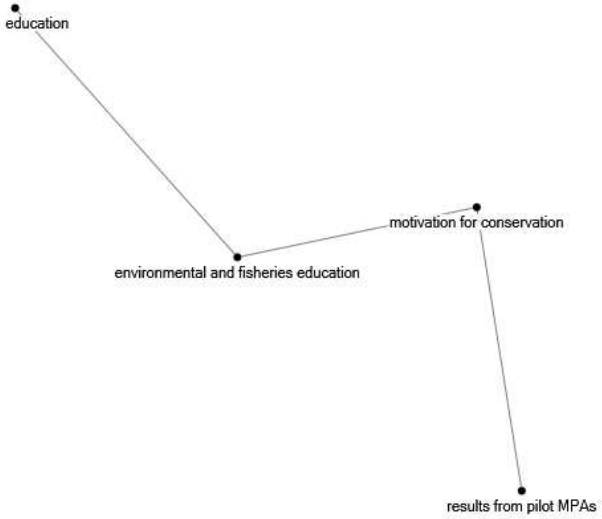
Regulation

Even though **regulation** has only been mentioned by one interviewee as a positive theme, I still took it as a separate theme. The interviewee stated that migrants would often **comply with laws** created by the community concerning the prohibition of destructive fishing practices.

> *[97] "There are also others who use nets, which are small knitted clothes or mosquito nets. But to solve this, there are already laws that the communities have made. The fishing communities here on the coast, they try to make newcomers aware and apply regulations if necessary." – stakeholder*

7.4.4. Opportunities

Figure 12.
Themes Opportunities Coastal Management



Note. This figure was produced using NodeXL. Own work.

In terms of opportunities, two main themes have emerged that offer promising prospects for the future, namely the **positive results of the pilot MPAs** and **environmental and fisheries education** that both enhance community **motivation for conservation**.

8. Discussion

This section provides an analysis and synthesis of the research findings linking them to the outlined research questions and their implications for the PaMo project. It shows the complexity of the PaMo project itself and the context in which it operates.

First it addresses how the co-production of knowledge is understood by the PaMo organiser team and what might be differences in understanding. Second, I elaborate on the strengths, weaknesses, opportunities and threats (SWOT analysis) of co-production of knowledge in the PaMo project and highlight the most important issues as well as discrepancies between different perspectives. By connecting my findings to wider literature, I provide insights into potential adaptation strategies for the advancement of the project as well as food for thought on requirements for further investigation.

Third, it outlines strengths, weaknesses, opportunities and threats concerning the current state of coastal management in Madagascar, as well as perceptions of inclusion in decision-making processes. Illuminating the most important issues and conflicts should further support the PaMo project in its adaptation to the local context.

However, it has to be mentioned that the context in Madagascar is very broad and with my work I only touched the surface of underlying dynamics. Additionally, due to the limited availability of empirical data regarding the context of Mafia Island, I won't elaborate on this and further research is required to capture the contextual implications for the PaMo project.

8.1. Co-production of knowledge in the PaMo-project

From its origins in social research (Pereira & Rappaport, 2022), primarily participatory action research, the use of co-production of knowledge became increasingly important, even normative in the realms sustainability science. However, the definition of the concept often lacks clarity and empirical studies on its practical implementation are still scarce including the lack of evidence for facilitating and limiting factors (Sorrentino et al., 2018, p.278). My research presents a small contribution to this gap drawing on findings from empirical data collection. Considering the high context-dependency of the co-production of knowledge, applying semi-structured interviews, including open-ended questions in questionnaires as well as conducting participant observation turned out to be a fruitful approach to grasp the complexity of the concept and having more nuanced insights into limiting and facilitating factors.

8.1.1. Understanding of co-production by the PaMo-team

Co-production of knowledge requires the creation of a shared understanding among stakeholders, and in the context of a project, especially among its organising team members. Not only is it required in terms of common definitions of key concepts, but also in the

formulation of a joint vision (Norström et al., 2020, p.5). In this section I will explore how the PaMo organisers understood the concept of co-production of knowledge, in how far they were able to create a common understanding and what the problems and disagreements in the process were.

The PaMo team indicated that they were making use of a guide on co-design provided by the MeerWissen initiative. Besides a definition of co-design, it further included the most important points to make the process as efficient as possible.

In the section "How we understand and support Co-Design", drawing on the work of Mauser et al. (2013) a definition was provided. It states that "During the co-design phase stakeholders and academic participants work in a coordinated, integrated way to best establish a common understanding of the research goals, to identify the relevant disciplines, participants and the scientific integration steps necessary to approach the topic, and to agree on the roles the different groups have in advancing towards the research" (Ferse et al., 2022, p.6).

It clearly delimits itself from traditional scientific approaches saying: "The MeerWissen Initiative is aiming to support a new kind of science that supports societal transformation. This is not your usual research project! Here, emphasis is placed on partnership and societal impact." Furthermore it makes a clear distinction between co-design and co-production, seeing co-design as the first stage of a co-production process (Ferse et al., 2022, p.6).

Through interviews and especially the LeNa Shape workshop, I was able to get to know the organiser's perception about co-production of knowledge as well as their visions for the project, which is interlinked. All organisers referred to the project as having some kind of societal impact which is in line with the demands of the guide and general themes and reflections connected to the co-production of knowledge.

Further themes connected to reflections of other scholars were:

- **Mode 2 knowledge production and Scope 2 outcomes**, aiming for a societal transformation and questioning existing power dynamics (Gibbons et al.,1994, 2-3; Jagannathan et al. 2020, p.23). Organisers underlined the importance of local actors in decision making and how specific enablers or barriers could affect the process and project impacts. Another topic discussed was the openness to change among the different actors. All of these reflections align with the **theory of change** (Schneider et al., 2019, p.33).
- **Managing boundaries** (Guston, 2001, p.400-401): even though the term itself wasn't mentioned, organisers made reflections of seeing themselves in a position of mediation and translation between different groups, especially at the science-policy interface. Also, reflections were made about the long-term relationship between different actors.
- **The inclusion of local and traditional knowledge** (Cash et al., 2003; Djenontin & Meadow, 2018): organisers mentioned that one objective was to learn about local knowledge and include it into the different model scenarios. However, it hasn't been

discussed yet, how exactly this will happen and which knowledge is considered relevant.

- **Goal orientation** (Howarth et al., 2022, p.6)**:** Although there were no clearly formulated goals, the organisers actively participated in deliberations, which focused on the formulation of the prospective goals.
- **Context and usability of outputs** (Vincent et al., 2021, p.38): in the LeNa shape workshop but even more in informal conversations, organisers reflected on how adapted the project is to the local context, especially if participatory modelling might be relevant for local actors. They also stated that, after having spent time in the contexts and conversing with local actors, they had to make changes in the original project proposal.
- **Co-leadership:** when reflecting about their own roles and responsibilities within the project, organisers stated that the roles weren't clearly distributed. While representatives from ZMT expressed that they wouldn't want to assume a major leadership role, there was also a certain reluctance from the other partners to engage in leadership.

However, the organisers themselves indicated in the questionnaire that they didn't have the same understanding of the concept of co-production and throughout my fieldwork I could detect differences between the representatives of the different countries, but also between individuals of the same country. I hesitate to make a statement about what might be related to country affiliation or personal characteristics, as this would require a more broad investigation.

However, one point which might require consideration is that the above framing of co-production of knowledge comes from the sphere of public service delivery, primarily described in the global North with early works of Ostrom et al. (1979) pointing out the limits of bureaucracy and the authoritarian state in effective policing. Accordingly, much of the normative thinking of co-production in state-society engagement has been informed in particular by social conditions and ideas such as democracy of the global North (World Development, 1996, as cited in Mitlin & Bartlett, 2018, p.653) Only later, it entered the spheres of development and projects engaging in North-South collaborations.

Co-production of knowledge clearly demarcates itself from traditional science including a one-way transfer of knowledge and technology from the global North to the global South, and is described as a decolonising approach. To illuminate this dynamic, Maclean et al. (2022, p.334) draw on the concept of Positionality, which refers to intersectional factors that create identity (e.g. economic status, gender, political power etc.) While in traditional science, "researcher Positionality influences the collection, representation and production of knowledge" without further reflections, decolonising approaches require researchers to reflect upon their Positionality and how it might influence the research outcome (Muhammad et al. 2015, as cited in Maclean et al. 2022, p.334).

However, the question arises, when considering the concept of co-production's history, in how far the use of the concept in North-South partnerships itself represents a form of eurocentrism

and in how far it is imposed on research partners from the global South. To this end, I would like to add two lines of thought:

First, in the co-production of knowledge, reconciling power differentials can be either a byproduct of the process or a normative endeavour. In either case, existing power differentials should be challenged.

While acknowledging that co-production of knowledge is also rooted in indigenous knowledge and social movements in the global South, such as the work of Fals Borda, there might be contexts in which strong structures of co-production might not be present (especially in academic circles). In this case, researchers from ZMT may have come to local contexts with certain assumptions about co-production of knowledge that have a more Western/European undertone (for example notions of power and democracy) that local partners may not have been exposed to before or may not align with their perceptions. For example, there was a moment, where it became clear that a representative from IMS didn't have the same understanding of co-production of knowledge. But even though researchers from ZMT didn't agree with some aspects of the workshop organisation and expressions of hierarchy, they restrained themselves from directly intervening and imposing their own understanding of co-production and how it should be done "correctly". Also the MeerWissen guide on co-design proposes that although transparent communication is important, it may not be appropriate in all cultural contexts to expect the same "academic culture of debate" (Ferse et al., 2022, p.18). Such dynamics are also reflected in Hall's Model of communication and its reflections about the explicit direct way of communication in low-context cultures which might meet with dissent in "high-context" cultures (Hurn & Tomalin, 2016, p.7).

Second, even if there are stronger structures of co-production and participation present or have been present in the past, the (re-) introduction of specifically co-production must be approached carefully, as the specific Western perception or ideology of co-production might not fit the context, and be perceived as paternalistic or even colonial. A similar problem has been described in the case of ideologies connected to "community management". In an example about tank irrigation development in South India, Mosse (1999, p.333) argues how the concept of "community management" is based on a simplified and idealised view on rural society which ignores the complexity, diversity and history of local social relations and institutions. He states that instead of reviving traditional forms of communal management, it legitimises certain forms of intervention and control over water resources in rural development. These considerations also raise the question of the concept's universal applicability.

With regards to the PaMo project and the context of Madagascar, organisers mentioned how they initially weren't familiar with the concept of co-production of knowledge, but in exchange with their German partners, they realised that they have been practising something similar before. One of the representatives even mentioned that co-design and co-production was already part of Malagasy culture, but still indicated that the common understanding of the concept wasn't given. The extent to which the local conception of co-production corresponds

to that of the project and whether it can be compared to the second point I raised before, cannot be assessed at this point in time but will be of importance in the future.

What will be important is the adaptability of the project engaging in an iterative process to make sure the project is still in line with local needs and wishes. This is also explicitly mentioned in the MeerWissen guide on co-design (Ferse et al., 2022, p.5). Further, it states that even if countries from the global North are often the funding source while countries from the global South provide the research site, it is all the more important that project partners engage in co-leadership, even with regards to funding. Moreover, the guide distinguishes co-design from what is often referred to as "parachute" science. In "parachute" science, scientists, typically from higher-income countries, conduct field research in lower income countries and gather data without further collaboration or creation of long term relationships with local partners (Stefanoudis & et al., 2021, as cited in Ferse et al., 2022, p.6).

However, extractivism science is a more accurate and reflexive term emphasising the one-sided exploitative nature of such research. It draws a parallel between the type of research and the concept of extractivism in the context of (neo)colonialism where natural resources, but also cultures and people are extracted without regard for the well-being of local communities and environment. In extractivism science also culture and knowledge fall victim to extraction and assimilation without regard for the people that produced it, converting it into economic and symbolic capital. In an interview with Leanne Betasamosake Simpson, a renowned Michi Saagiig Nishaabeg scholar, writer and artist and one of the most compelling indigenous voices of her generation, she contributed important reflections on extractivism science, including its role in sustainability science and its alternatives (Klein, 2013):

> *"My land is seen as a resource. My relatives in the plant and animal worlds are seen as resources. My culture and knowledge is a resource. My body is a resource and my children are a resource because they are the potential to grow, maintain, and uphold the extraction-assimilation system. The act of extraction removes all of the relationships that give whatever is being extracted meaning. Extracting is taking. Actually, extracting is stealing—it is taking without consent, without thought, care or even knowledge of the impacts that extraction has on the other living things in that environment. That's always been a part of colonialism and conquest. Colonialism has always extracted the indigenous—extraction of indigenous knowledge, indigenous women, indigenous peoples."*
>
> *"It's the idea that traditional knowledge and indigenous peoples have some sort of secret of how to live on the land in an non-exploitive way that broader society needs to appropriate. But the extractivist mindset isn't about having a conversation and having a dialogue and bringing in indigenous knowledge on the terms of indigenous peoples. It is very much about extracting whatever ideas scientists or environmentalists thought were good and assimilating it."*
>
> *"The alternative to extractivism is deep reciprocity. It's respect, its relationship, it's responsibility, and it's local."*

Accordingly, it will be important for the PaMo project to address this issue and find a way to valorise knowledge as well as the people who hold it, and how a meaningful and lasting relationship can be built.

Although most of the visions were seen as going hand in hand, the most discussed vision was **economic development**. It was discussed whether including local knowledge should be a goal in itself or whether it wasn't enough and there should be an improvement of the economic situation. While some organisers clearly stated that there should be more concrete impacts such as the improvement of the economic situation (especially poverty alleviation) or increased law enforcement and that this was also expected by the local stakeholders, others stated that it should stay in the realms of science and knowledge production which then would be used to inform policies. Poverty alleviation usually is not a specific goal in co-production definitions. Jagannathan et al. (2020, p.25) for example state that increased engagement rather than solely being a strategy to achieve other outcomes can be a goal in itself.

Moreover, it was also concluded that a different approach would be taken in the two contexts. While in Mafia Island the focus was laid more in the realms of the inclusion of local knowledge, in Madagascar the focus was laid more on addressing problems local stakeholders were sharing and from that, proceed with defining project objectives.

Another point raised was the discrepancy of the original research proposal which was adapted to the funding agency's requirements, including the topics of participatory modelling and **nature-based solutions**. While the principle of participatory modelling has been well received and the organisers are set to implement it in the advancement of the project, more critical statements were made towards the concept of nature-based solutions, especially from the side of the German representatives. They clearly stated that engaging in the carbon market has never been the intended outcome of the PaMo project, but that it should be more "alternative". The concept has been criticised among other things for using sustainability jargon while justifying pollution of higher-income countries which can offset their own emissions by buying carbon credits. Also, there are several examples of projects involved with carbon credits that have been accused of pushing indigenous and local communities off their land or preventing them from accessing resources important for the provision of their livelihoods for the creation of green spaces (Hogenboom & Baud, 2015, p.265-296; Moreno et al., 2016, p. 62).

8.1.2. SWOT of co-production

Recent academic discourse underscores the significance of co-production of knowledge for addressing the so-called "wicked problems" of our time, especially in sustainability issues. This approach aims to fundamentally change the conventional research paradigm into an increasingly participatory and inclusive process. However, co-production also entails various obstacles, some of which can be easily overcome and others, which may persist and hinder the effectiveness and legitimacy of co-production (Pohl et al., 2010; Malmborg et al., 2022; Djenontin & Meadow, 2018).

In this thesis, I explored the limiting and facilitating factors of co-production of knowledge in the co-design phase of the PaMo project. Using a SWOT analysis, I was able to identify the different perceptions of the stakeholders as well as the organisers in terms of strengths, weaknesses, opportunities and threats of co-production of knowledge in the PaMo project. In this section I will elaborate on the main findings and their relevance for the project, highlight opposing perceptions and illuminate the complexity of specific issues. By connecting them to supporting literature I will situate them within a broader discourse and stimulate reflections and ideas for the advancement of the project.

One main characteristic of the co-production of knowledge is the blurring of boundaries between disciplinary, even **epistemological boundaries.** In contrast to traditional science that separates itself

from non-science, co-production of knowledge distances itself from positivistic approaches and aims at doing justice to the diversity of knowledge by embracing epistemic pluralism. This has been praised as improving the holistic understanding of complex issues while empowering participants and creating co-ownership (Howarth et al., 2022, p.8). However, reconciling different ontologies can prove difficult. This difficulty was experienced by the organisers, and it became particularly evident during the workshop on Mafia Island. While some aspects of traditional knowledge, such as traditional ecological knowledge, were considered compatible with the project, another type of epistemology, such as the contribution of faith and religion to fishing outcomes, was initially questioned as to whether it was knowledge at all, and if so, how it could be effectively incorporated.

Alexander et al. (2019, p.3-6) for example, reviewed how indigenous and science-based knowledge in coastal and marine research, monitoring and management projects has been integrated. They labelled this endeavour as indeed challenging. An example introduced by Alexander et al. (2019, p.3-4) illustrates how the incorporation of indigenous knowledge into a predominantly scientific and bureaucratic framework resulted in its decontextualization and compartmentalization, as it had to be into forms that were compatible with the existing bureaucratic structure. In doing so, it resulted in the gathering of merely factual data about the environment without recognising the associated cosmological and value-based context.

While recognising the risk of simplification when talking about these knowledge systems and recognising their interconnection, Alexander et al. (2019, p.2) refer to the indigenous knowledge as "A cumulative body of knowledge, practices, and beliefs, evolving and governed by adaptive processes and handed down and across (through) generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Díaz et al., 2014, as cited in Alexander et al. (2019, p.2) and science-based knowledge as "with roots in Greek philosophy and the Renaissance, are a fluid and evolving body of knowledge that tends to favour objectivity and reductionism (Mazzocchi, 2006, as cited in Alexander et al. (2019, p.2). To bridge these systems, the integrity of the respective knowledge system should be preserved while enabling a mutual exchange and the creation of a common understanding (Alexander et al., 2019, p.21).

Similarly, Freire (1996 p.109) describes how "Religious knowledge is not only a knowledge of God, but also a knowledge of the world, of history, of culture, of human beings. Religious knowledge is not a separate or isolated knowledge, but a knowledge that dialogues with other knowledges, that learns from them and teaches them." Also the case of the fisherman complaining about how fish stocks decreased because the younger people wouldn't pray to Allah anymore, reveals much more than his religious beliefs, but it also reveals perceptions about intergenerational tensions including the sharing of knowledge from elders to younger generations, respectively the non-acceptance of younger generations of traditional and religious knowledge, the change in practices, effects of globalisation and increasing access to other types of knowledge. Additionally, in the context of Madagascar, although stemming from religious knowledge so-called "fady" (for example fady places, where fishing isn't allowed) or the perception of the ocean as a place belonging to everybody have direct consequences for coastal management and conservation. But, to not risk falling into the pattern of decontextualising knowledge, and only taking up parts which are perfectly reconcilable with particularly Western science-based knowledge, also the social, religious and cultural meaning of the shared information has to be taken into account. Such insights further underline the value of co-production and its ability to improve projects' adaptation to local contexts, reverse colonial research structures, empower local stakeholders and value their knowledge, perspectives and experiences (Schott & Tengö, 2020, p. 1650; Zurba et al., 2022, p.445).

This context dependency of bridging different kinds of knowledge has the important implication of what might work in one place might not fit to another place or community and that therefore organisers should be able to continuously adapt the project to newly received inputs (Alexander et al., 2019, p.21).

Also ZMT's guide on co-design addresses need for adaptation of the pre-proposal after a joint vision has been defined, while an agreement must be reached within the organising team and the funder as to how far the proposal may deviate from the original (Ferse et al., 2022, p.8).
The issue of **institutional settings** in the co-production of knowledge has largely been theorised (Norström et al., 2020; Verwoerd et al., 2022; Gustafsson & Lidskog, 2018). In the case of the PaMo project, stakeholders and organisers mostly referred to it as a weakness or threat that eventually can be overcome.
Vorwoerd et al. (2022, p.3) proposed two ways of how to deal with unconductive institutional settings, either by negotiation normative and relational norms or by modifying co-production features. In negotiation, organisers should proactively change unfavourable organisational and policy dynamics to create space for co-production. In contrast, in modification, organisers pragmatically take into account specific limitations and adjust their own approach even if it deviates from the ideal concept of co-production (Vorwoerd et al., 2022, p.3). In the case of the PaMo project, organisers for example engaged in modification due to a limitation set by a funding institution, namely the requirement to come up with a project proposal that included topics such as participatory modelling and nature-based solutions in order to receive project funding. Even though some organisers saw the ideal case of co-production as asking communities if and what kind of project was needed and if there was any motivation to participate at all, organisers accepted this modification as a pragmatic solution to make the project possible.

As the project is only in its starting phase, organisers haven't come across concrete institutional barriers for the implementation of specific measures yet. Nonetheless, they described potential threats and that in order for the project to succeed political will is needed. Hence, in the future they might need to engage in negotiation for overcoming such potential barriers and power imbalances and while lower level institutional settings might be easier to change, especially as the administration is involved in the project, higher levels might be more difficult to address. (Vorwoerd et al., 2022, p.3) further mentions that investing in organisers' skills in recognising unfavourable structures to knowledge co-production is essential for the negotiation of the needed co-production space. Consequently, the alignment between the contextual structures including norms and rules that determine how knowledge is produced (traditionally in a linear way) and the ideal of co-production could come together in a what Vorwoerd et al (2022, p.2) call a **normalisation process**, in which co-production becomes the new normal.

Further consideration regarding institutional settings should be directed to the so-called **boundary organisations** that operate at the intersection of different social groups and, most commonly in the case of knowledge co-production projects, between science and policy (Vorwoerd et al., 2022, p.3). Although initially the term "boundary work" was developed to explain how scientists intentionally defend the boundaries between science and non-science (Gieryn, 1995, as cited in Guston, 2001), today it is also used as a means of creating permeable boundaries of knowledge (Jasanoff 1990, as cited in Guston, 2001). Guston (2001) shows that while boundary organisations are involved in principal-agent dynamics where they stabilise a boundary and try to meet the needs of principals on both sides of the boundaries, in practice this boundary is constantly re-negotiated offering the space for co-creation of knowledge and social order (Guston, 2001, p.400-401).

Although it's conceptual meaning has changed, and the concept of boundary organisation does not refer to any specific form of organisation, Gustafsson & Lidskog (2018, p.5-6) state that nowadays, it is mostly used as an empirical label and by this works performatively and contributes to the organisation's identity formation. While there are different approaches on how to use the concept empirically, Gustafsson & Lidskog (2018, p. 5-6) identified the most frequently mentioned feature, namely boundary organisations' main objective being the facilitation of interactions and creation of common understanding among different stakeholders. This allows them to at the same time stabilise and dissolve boundaries, stabilising by maintaining meaningful negotiations and mutual understanding between stakeholders and dissolving by changing the perceptions of boundaries. This change in perception can either refer to single actors or the shaping of a broader collective understanding. Vorwoerd et al. (2022, p.3) illustrate how studying boundary organisations offers valuable insights into how the space of co-creation is negotiated.

For example, ZMT's role quite aligns with Gustafsson & Lidskog (2018, p.5)'s description of empirical characteristics such as the facilitation of interactions between groups. It has a very central position in the project, although not actively involved in the local context, mediating between funding agencies, their team members and the involved stakeholders. This could be interpreted as a form of **stabilisation**. When analysing it from a principal-agent perspective, ZMT is at the intersection of two principals with potentially different needs and intentions. Gustafsson & Lidskog (2018, p.4-5) describe that "what characterizes a successful boundary organization is successful negotiation strategies to create balance between the different poles in the landscape of tension".

Yet, since labelling an organisation as boundary organisation shapes its identity, this also comes with a set of expectations from the different groups which are sometimes contrasting. Gustafsson & Lidskog, 2018, p.5) describe four such tensions namely "(i) is disciplinary and interdisciplinary, (ii) has a long-term and a short-term focus, (iii) provides basic and applied research, and (iv) aims for autonomy and consultancy". During my research I could especially identify two such tensions, namely the tension between long-term and short-term focus and the provision of basic and applied research. The tension of long-term and short-term focus aligns very well with reflections about **sustainability** and continuity of the project. Stakeholders but also organisers expressed their expectation that the project will continue, including frequent interactions between the stakeholders and that project methods and outputs will further be used which is in tension with the time frame of the project, especially because of funding, and the threat of not being able to **transfer ownership**. I could further identify the tension between basic and applied research to which I referred to as the issue of **research vs. development**. While many stakeholders and even some organisers expressed their expectation of development, other organisers expressed their perception of the project as being "only research".

Through these tensions, power relations are shifted, and roles and expectations are re-negotiated. Accordingly, the balance isn't stable but dynamic. Gustafsson & Lidskog (2018, p.5) compare it to a balance board which is in constant motion and rarely stays in one position for long. This unstable balance creates a dissolution of boundaries and eventually creates the space for co-production. In the case of the PaMo project, the involvement of ZMT might have shifted expectations towards the project, towards their role but also towards other groups. Bringing together research and administration, for example, might have shifted the expectation of stakeholders regarding the theme of research vs. development or implementation. Also, one of the organisers has mentioned how there is a great opportunity of funding agencies increasingly recognizing the value of co-production projects and hence adapting their way of allocating their money. This is very much related to the presence of positive and effective project examples and hence, successful boundary organisations that are able to mediate

between groups, shifting power balances and consequently actively creating the (financial) space for co-production.

However, despite ZMT's characteristics of a boundary organisation, a concrete statement of whether they are actually perceived and have the **legitimacy** as such by local stakeholders, funders and other organisers, and how these perceptions would shape their identity cannot be made yet at this stage of the project. Moreover, in how far they are able to shift prevailing dynamics or mediate between contrasting perspectives is research which has to be done in the advancement of the project. Further questions that remain open are, which other organisations or actors are or could be perceived as boundary organisations and how they could be integrated into the local context once the project ends to to keep interactions and communication going. Such considerations could also be relevant for the selection of stakeholders in the next workshops. The case of Toliara is special as there are a lot of actors working at the intersection of different groups. There certainly are organisations which reveal certain boundary organisation features such as for example, NGOs facilitating interactions between research organisations, funding agencies, communities, administration and private companies or fisheries associations mediating between communities, NGOs and administration etc. These possibilities, and the ways in which they may or actively stabilise and permeate boundaries and their agency to create spaces of knowledge co-production are topics worthy of further exploration.

Also, the **LeNa shape** workshop on ex-ante impact pathways revealed insights from a different angle into the project. All organisers who participated agreed on its usability. Also literature confirms that a focus on impact in co-production of knowledge can help for the communication to funders, building more resilient solutions and finally more relevance (Howarth et al., 2022, p.6). For the PaMo project it provided useful insights on potential enablers and barriers for impact generation, including reflections about local actors, institutions and intervention strategies needed for achieving change in the specific actors. Besides these positive aspects it also raised questions which haven't properly been addressed by the organising team and challenged organisers to think about their own **skills**, resources, **experience,** their own **role** in the project and the general goals of the project.

Subsequent interviews and the questionnaire revealed further discrepancies connected to these points. While organisers had a vague idea about their position and responsibilities, they agreed on the generally unclear distribution of roles. However, apart from this confusion, they also expressed their perspectives on which role they should or would want to assume which resulted in contradictions, especially in relation to how **leadership** should be distributed. While it is generally agreed that in co-production of knowledge leadership should be shared in terms of co-leadership in order to achieve a more horizontal and democratic process (Yua et al., 2022, p.4; Djenontin & Meadow, 2018, p. 886), there is no clear guideline on how this should be achieved either within the organising team or between organisers and stakeholders. Polk (2015, p.119-120) described how in five transdisciplinary projects at Mistra Urban Futures greater self-reflexivity and a clear delegation of tasks among co-leaders generally led to a higher degree of co-production and the reduced risk of one perspective monopolising the process. She stated that the generation of common frames for discussion and analysis, for example in the form of monthly leadership meetings, promoted the integration of knowledge and expertise of the project participants. As mentioned in an interview, the acknowledgement of the so-called double co-production process where organisers, instead of jumping right into the organisation of project activities, logistic and funding aspects, come together to discuss their roles and responsibilities, is essential for creating a common understanding and facilitating teamwork. Godemann (2008, p. 632) refers to this process as the creation of "**meta-knowledge**" and how without that, it is virtually inevitable to reach a consensus and a mutual ground within the group. The LeNa Shape workshop initiated such a meta-discussion, which was widely

appreciated by the interview and questionnaire respondents, and hence provided food-for-thought that most likely will be beneficial in future PaMo workshops. Nonetheless, not all organisers were able to assist in the LeNa Shape workshops and it will be of importance also for them to engage in said meta-discussion. In this way, any concerns expressed about the organisers' sufficient skills and experience in co-production and the possible need to bring in an external specialist can also be addressed and a solution agreed upon. Also the MeerWissen guide on co-design suggests the involvement of additional partners in case the initiator's expertise isn't sufficient (Ferse et al., 2022, p. 7). Another issue to which this could also apply as a solution is the disagreement within the organisers of which actors should even be included in the organising team. This needs transparent and honest communication.

However, contrasting these reflections, Polk (2015, p.118) also described an example in which this wasn't the case and where "a lack of project organization paradoxically created a higher degree of inclusion and in-depth collaboration". Moreover, such discussions are time-intensive as mentioned by organisers, which might make it more difficult for the team to engage in them when occupied with other projects and tasks. Polk (2015, p.120) states that this especially applies for practitioners and suggests that the consistent assessment of how tasks and roles are delegated align with the overall work context of the organisers. Another factor that has to be taken into account when aiming for the creation of mutual responsibility and commitment is the creation of a shared purpose or goal (**clear goal definition**). A common goal or sense of direction and a clear distribution of leadership roles can reinforce each other in a positive feedback loop. Consequently, if one is absent, the other is negatively affected as well (Howarth et al., 2022, p.6; Polk, 2015, p.118).

Although the issue of **leadership** and **ownership** at the level of the participating stakeholders cannot be evaluated yet at this point of the project, organisers already expressed concerns but also confidence about its future development. In line with Yua et al. (2022, 4)'s findings, organisers expressed the importance of the availability of funding to support stakeholder's ability to participate and engage in leadership.

Another issue related to the distribution of roles that caused disagreement within the team was the selection of the organising team itself, which accordingly appeared in all sections of the SWOT analysis. For example, while the involvement of the administration was seen as a strength by some organisers, as they are familiar with the stakeholders and thus have a greater potential for successful implementation of the project outcomes, others were more critical and feared that they might not be neutral and have their own interests, and thus categorised them more as a stakeholder group.

Generally, the **selection of stakeholders** resulted in disagreement, not only between organisers, but also between organisers and stakeholders, even leading to the interruption of an organiser meeting by an enraged local actor. While some regarded the selection of stakeholders as a strength, others regarded it as a weakness. Some drawbacks in stakeholder inclusivity were related to contextual barriers such as weather, time, or other logistical factors that prevented certain stakeholders from attending the workshops, for example, mothers who could not attend due to care work. The MeerWissen guide on co-design suggests the creation of multiple events to enable stakeholders with limited possibilities to participate flexibly and improve inclusivity accordingly (Ferse et al., 2022, p.11). Besides these contextual and barriers,the active decision of who to invite created more social tensions and hence, requires further consideration.

Generally **inclusivity** in co-production of knowledge is perceived as the inclusion of all relevant and affected parties in the process of generating, sharing, and applying knowledge in a respectful, equitable, and meaningful way. Relevant often refers to actors who have a specific interest or influence in the project or who might be affected (benefit or be disadvantaged) by the project's result. Inclusivity also often implies that different backgrounds and experiences related to intersectionality (age, gender, ethnicity, socioeconomic background etc.) as well as different forms of knowledge (scientific, indigenous, local, experiential, tacit, cultural, domain-specific etc.) are included (Gibbons et al., 1994, p.6).

The MeerWissen Guide on co-design's definition of stakeholders and their roles is very similar: "anyone affected by or able to act on a particular issue regarding the research project. Their potential roles and engagement should be considered early on, particularly with regards to the necessary resources. Stakeholders may be engaged to varying degrees in the co-design process (e.g. to integrate perspectives and receive feedback, to develop a joint vision, or to identify other stakeholders)." It also addresses the importance of intersectional inclusion such as gender (but not merely regarding numbers, they also need to speak and be heard in the process), age and different types of knowledge and the advantage of including actors with different interests and perspectives as well as early career scientists which may act as catalysts for the project while acknowledging diversity's potential for the creation of conflicts and misunderstandings which need to be bridged. It further states the necessity of understanding the stakeholder's motivations and relationships towards the project and the eventual creation of a SWOT analysis (Ferse et al., 2022, p.17-24). The Guide further provides suggestions of methods on how to identify and select stakeholders such as a snowball approach, starting from the team members and extending through their wider networks and connections, through interviews and field visits or the so-called "salience model" which prioritises stakeholders holding more power and legitimacy (Ferse et al., 2022, p.16).

In case of the PaMo project the selection of stakeholders was left to the local partners who were already familiar with the local actors. However, none of the proposed approaches was conducted with the whole project team. Certain topics such as motivation or interests of stakeholders were only discussed at a later stage within the LeNa Shape workshops. Having had this discussion before the workshop certainly would have helped eradicate potential disagreements. Nonetheless, there are more workshops to follow and organisers still have the chance to discuss more in detail about the stakeholder selection.

But besides trying to be inclusive, there are other factors worth mentioning when it comes to selecting stakeholders especially with regards to effective collaboration. Godemann (2008, 634-636) provides relevant reflections about the effectiveness of the knowledge integration process in transdisciplinary projects depending on the group composition. Drawing on other literature she identified five factors that affect group processes: 1) the degree of cooperation experience (Steinheider and Burger 2000, as cited in Godemann, 2008, p.634) , 2) the (hierarchical) status of group members and the alignment of their behaviour with other group members' expectations (Moreland and Myaskovsky 2000; Stasser, Taylorand Hanna 1989; Thomas-Hunt, Ogden and Neal 2003, as cited in Godemann, 2008, p.634), 3) power structures (Brodbeck and Frey 1999; Ridgeway 2001, as cited in Godemann, 2008, p.634-635) 4) differences in communication forms depending on "otherness" and intersectionality (Stone 1995, as cited in Godemann, 2008, p.635), and 5), and the level of familiarity between the group members (Argote, Gruenfeld and Naquin 2001;Hollingshead 2000; McGrath 1984, as cited in Godemann, 2008, p. 635).

With regards to the PaMo project, my fieldwork in Toliara confirmed a high degree of cooperation experience among the workshop stakeholders. In an interview, one of the local organisers even referred to it as being ingrained in the local Malagasy culture and collaboration has been mentioned several times as a strength.

Godemann (2008, p.63)'s second point might be a bit more challenging in the case of the PaMo project. In interviews the assumption was mentioned that ZMT (for example) might have more flat hierarchies compared to the local partner organisations and that roles weren't as clearly defined as might be the case in other circumstances and projects. This and the active attempt to balance power differences (**power balance**) and engage in co-**leadership** might result in a discrepancy of the stakeholders' expectations towards the organisers' behaviour and their actual behaviour (**expectations management/ role distribution**). Additionally, referring to the works of Burt (1992) and Ibarra (1995), Godemann (2008, p.634) states that "group members who are expected to play a significant role in achieving the group objectives or with a greater density of social ties are accorded higher status". In relation to this statement, something similar happened in the context of the workshop in Toliara. The administration was described as having many social ties and higher status and that this leads to higher expectations of stakeholders regarding the project implementation. However, because of limited empirical evidence, I refrain from making concrete assertions related to these points. In order to get to the bottom of the topic of hierarchy and role attribution, further research is needed and could, for example, deal with concrete questions about stakeholders' expectations regarding the role, behaviour and actions of other stakeholders, how these are or aren't met, how behaviours and power statuses are changed over time and how all of this affects the collaboration within the group instead of only exploring expectations regarding the project itself.

This is also connected to (Godemann, 2008, p.63)'s third point about power structures within the group and how different roles influence each other.

Investigating Godemann (2008, p.63)'s fourth point is interesting regarding the selection of stakeholders as well as regarding the distribution of stakeholders in the **discussion groups** during the workshop and the creation of the **workshop structure**. While the work of Thomas-Hunt and Phillips (2004) mentioned by Godemann (2008, p.63) for example explored the influence of individuals connected to their gender and hierarchy (revealing that within groups, having expertise was relatively positive for men, while women generally didn't have that advantage, and expertise didn't ameliorate gender effects in work groups), while Phillips et al. (2004, p.508) investigated the impact of congruence between social and knowledge ties on performance. Interestingly, Phillips et al. (2004, p.508) argued that the mere presence of a diversity of knowledge does not guarantee an increase in group performance, but that information must be shared and integrated in group discussions to be able to influence group decision. The readiness to share and use this knowledge depends on various factors such as having unique or shared information (knowledge ties), being a social in- or outsider (social ties), being brought in temporarily as an expert or being permanent part of the group. Phillips et al. (2004, p.508) showed that "information is more likely to be used if it is held by a social outsider, especially if he or she is alone" in contrast to the more common idea that unique information is more likely to be used if shared by more than one insider. Accordingly, for projects working with different stakeholders the question of "who knows what" and who are social in- or outsiders might help increase work performance (Phillips et al., 2004, p.508). During my field work, it wasn't possible for me to identify these aspects due to language but also time limitations. Although during both workshops, group discussions were held within stakeholder groups where people might have known each other and carry similar knowledge,

this doesn't mean that within these groups they essentially were social insiders or that they didn't carry unique knowledge. Furthermore during the plenary session, such dynamics might have changed again.

Closely connected to these reflections is also Godemann (2008, p.63)'s fifth point. Generally I could identify a rather high level of familiarity between the stakeholders and organisers in Toliara, which according to some of my interviewees' perspectives led to an increased trust, more active participation and accordingly, an increased courage to share their knowledge.

Additionally (Godemann, 2008, p.63-64) describes how increased social cohesion, favoured through the "attractiveness" (related to a sense of belonging) and homogeneity of the group, friendly relationship between the members of the group and the attractiveness of group tasks (the participants' motivation towards the task), improves group performance and promotes the maintenance of strong bonds within the group. This social cohesion could be an important factor for the sustainability of the project as strong bonds within the group might also favour individual responsibility towards the group. Regarding my observations, for example, in the case of Mafia Island, the group seemed rather homogenous with mostly representatives of fishermen and women. Yet, not all of them had a sense of belonging to each other and tensions arose. Concerns were raised of which village might be favoured more by the project. While social cohesion might be beneficial, Godemann (2008, p.64) draws attention to certain drawbacks. For example, she describes the so-called phenomenon of "group think" where the quest for consensus within cohesive groups restrains group members from innovative and controversial thinking. Additionally, common norms might further intensify that through the standardisation of acting and thinking. In groups that are more heterogeneous, this might be less of a problem, but in order to still generate more social cohesion, the improvement of the "attractiveness" of the group task is important. She even underlines that among the social cohesion factors this is the most important for the process. Therein, it is essential that sub-tasks are linked to the overall question requiring a clear goal definition to keep group members motivated. She further draws on insights from motivational psychology underlining the importance of the creation of mental models. Mental models provide a collective understanding or shared perception about a specific task. Having a shared mental model can enhance motivation and performance of groups and leads to a more cohesive group effort. The lack of a **clear goal** and a **common understanding** concerning which direction the project will develop were a common concern within the organising team.

8.2. Current state of Coastal Management

With its increasing importance in sustainability science, co-production of knowledge also found its way into coastal management promoting a deeper understanding of the intricate relationships between human activities and coastal environments. Co-production of knowledge aims at societal transformation, but for this, first of all it is necessary to assess the complexities of said society and context in general. In this section, I describe different perceptions about the state of coastal management in South West Madagascar and the inclusivity into decision-making across multiple scales. Furthermore I elaborate on how the PaMo project relates to the local context and which issues specifically need to be taken into consideration by the organisers.

8.2.1. SWOT - Coastal Management

In this chapter I discuss the main findings about stakeholder's perspectives on strengths, weaknesses, opportunities and threats of the current state of the local coastal management in Atsimo-Andrefana. In doing so, I expound on the main themes which I identified through the qualitative content analysis, compare them to findings of different authors and assess how far these issues were reflected during the workshop and how they should be addressed in the advancement of the project.

During the workshop in Toliara, three main issues were identified in the plenary session which should be addressed in the advancement of the PaMo project. First, the conflict of space, which needs a clearer demarcation of use zones for the actors operating in the maritime domain, second, the non-valorization and lack of sharing of available data, and third, the non-compliance and application of legislation. All of these issues also came up during informal discussions, in interviews and participant observation. However, I was able to identify additional themes, which stakeholders perceived important, but weren't reflected in the summarised points, namely the issue of migration and the inclusion in decision-making. Within these, I also dove deeper into economic, political and gender-related themes as well as their connection to much wider, even global issues (e.g. international investments, climate change). Furthermore, I could identify tensions between local actors and contrasting perceptions about certain issues. For example, while some actors rated collaboration with other actors as a general strength, others criticised it and the same counts for regulation. These will hopefully help the advancement of the PaMo project and allow for a greater embeddedness in the local context. However, all of these issues need deeper investigation, especially local power structures as I only got a rough overview of them.

Migration

A theme which was more prominent in the interviews and informal conversations than in the workshop was migration. The prominence of this theme once more highlights the necessity, when talking about coastal issues, to also discuss their interrelation to problems of inland regions and wider, even international dynamics. Although solving these broader issues might not lay in the realms of the PaMo project, it is still important to take them and their implications for coastal issues into consideration in the advancement of the project.

According to interviewees the main reasons for migration are climate change resulting in a lack of rainfall, accordingly increased incidents of intensive droughts, and consequently a lack in agricultural activity, lack of income and undernutrition.

While the lack of rainfall in the South of Madagascar is a widely acknowledged issue, authors argue whether it can be attributed to climate change or natural variability. Harrington et al. (2022, p.19) found that while climatic variability has a significant impact on crop and live-stock production, such variabilities can mostly be attributed to natural climate variability (including el Nino Southern Oscillation) and not human-induced climate change. The authors

highlight how especially poor infrastructure and the dependence on rain-fed agriculture plus a lack of structural investments are the main drivers of vulnerability to food insecurity. However, Harrington et al. (2022, p.19) referring to the Intergovernmental Panel on Climate Change (IPCC)'s Sixth Assessment Report (IPCC, 2022, p.13-15), also stress that increasing global warming, especially when exceeding 2°C, result in a medium confidence that events of droughts will increase in frequency across Madagascar. While some of my interlocutors were familiar with the topic of climate change in accordance with a more widely accepted perspective, there is definitely a discrepancy to other understandings. For example, one of my interlocutors (but who wasn't present in the workshop) assured me that in his opinion, increasing temperatures resulted from the installed solar panels next to the village. In any case, this points to the importance of creating a common understanding within the workshop participants. During my fieldwork, I wasn't able to assess whether within the workshop everyone had the same understanding of climate change or further environmental processes. It is important - though not necessarily unique to climate change - to illuminate the different views on the issues being discussed to ensure that everyone agrees on what is being talked about.

As indicated by Harrington et al. (2022, p.19), also an interviewee reflected about the l**ack of investment** in the South of Madagascar, or, in case of the presence of investments, they would rarely penetrate to the lower social classes. A similar problem has been described by Browne & Razafiarimanana (2022, p.18) in relation to climate adaptation finance. They argue that who benefits from (including financial benefits) the internationally financed adaptation project was strongly connected to the political connectivity of a household to individuals holding formal or informal positions of power. As a consequence, households which were already in a better situation, benefited disproportionately, leading to an exacerbation of the structural inequalities. Besides elite capture they further mentioned the uneven dissemination of information and resources through kinship networks, and land ownership as factors intensifying power asymmetries (Browne & Razafiarimanana 2022, p.18). The problem of elite capture is also a concern that has been raised in relation to co-production of knowledge projects and once again underlines the need for a careful assessment of existing power structures in the PaMo project (Turnhout et al., 2020, p.16).

A further issue mentioned in relation to migration was the increase of the coastal population, the contribution of migration in numbers, but also in practices and the migrants' affiliation to a certain cultural identity. Due to the above mentioned issues, there is a sustained immigration from inland people to coastal villages. Migrants mostly consist of Tanalana, Mahafaly, Tandroy, Masikoro, Bara or Sakalava. A comparison of surveys from 1994 and 2006 shows that the percentage of Tanalana and Mahafaly significantly increased in comparison to the Vezo in a number of villages south of Toliara. While these groups are generally described as agro-pastoralists moving to the coast either temporarily or permanently, also seasonal migrations of Vezo to the inland have been described (Cripps, 2008, p.140).

A further issue mentioned in relation to migration was the cultural identity of migrants, which was described as being connected to their understanding of climate change as well as their

disinterest in coastal issues. To understand how certain dynamics between migrants and local fishermen and women might arise, it is worth taking a look at how cultural identity is formed and lived (and how it might affect certain dynamics. This is only a small glimpse of the problem and further research is needed on this topic.

Financial **poverty** and food insecurity are not only a problem in the Malagasy inland. Also on the coast people are facing financial hardships. As one of my interviewees pointed out, conservation efforts sometimes reach their limits when confronted with the need to safeguard local livelihoods.

While in many discussions the main cause of environmental degradation is seen in the unsustainable practices of local small-scale fishers, they are often the main target of conservation projects. Yet, such discourses can lead to an increased marginalisation of the economically poor. Again, Leanne Betasamosake Simpson offers a valuable insight into this issue (Klein, 2013):

> *These same communities are also continually shamed in the mainstream media and by state governments and by Canadian society for being poor. Shaming the victim is part of that extractivist thinking. We need to understand why these communities are economically poor in the first place*

As some of my interlocutors pointed out, this sole focus on economically poor communities by conservation projects can prevail larger sustainability issues such as climate change, or specifically in the case of South West Madagascar, the presence of large-scale international fishing fleets. For example, White et al. (2022, p.4-7) found that within Madagascar's Exclusive Economic Zone, 82,8% of industrial fishing vessels were of international origin (or so-called distant water fishing nations: DWFN) and that in a number of instances, foreign fishing vessels were even operating within close-to-shore marine protected areas. Further they argue that even if DWFNs negotiate licensing agreements with countries such as Madagascar, these agreements are often predatory and less beneficial to the "host" countries, and that there still remains a high degree of unregulated fishing activities. These dynamics clearly undermine local conservation efforts and are usually not addressed enough.

In summary, such dynamics must be taken seriously when talking about conservation. So, instead of merely seeing economic poverty as an obstacle for conservation, more questions should be asked about responsibilities and power imbalances.

Cultural identity is an important topic in Madagascar and has been described extensively especially in the case of the Vezo. According to Astuti (1995, p. 464), the identity of the Vezo is primarily performative, i.e. their identity does not necessarily depend on their ancestry, but is closely linked to their activities and way of life, which in their case is centred on fishing. However, a report from Blue Ventures describes, how the formation of ethnicity is more intricate and individuals can either express their ancient belonging to the Vezo group or a loss of memory of their true lineages (*Vezo pira* vs. *Vezo vatane*), or one can hold more than one

ethnicity, for example *Vezo* and *Tanalà* or *Vezo* and *Sakalava*. Furthermore there is another group which identifies as fishers, namely the Sara, who differ from the Vezo in various ways (*Vezo fa Sara* vs. *Vezo pira*) (Pascal, 2008, as cited in Cripps, 2008, p.17-18).

During my fieldwork and in one of my interviews, it was further described to me that generally the Vezo perceive the ocean as belonging to everybody ("riake tsy mana tompon" = "the sea has no master") and, accordingly, were very welcoming towards other groups (also described in: Chaboud, 2006, p.199). This Vezo "softness" has also been illustrated in literature. It is described that this softness can be perceived in their way of speaking, how they treat their children or in the fact that they wouldn't carry weapons (Astuti, 1995, p.63-65). However, although some of my interlocutors confirmed these statements they should be taken with a grain of salt. There is in fact other literature that suggests that migrant integration is "always difficult and never complete" and that migrants generally have less power and rights and are not included in local decision-making and that the sea indeed is appropriated to differing degrees (Pascal, 2008, as cited in Cripps, 2008, p.18-19).
Generally, two opposing perceptions were presented to me; one, in which migrants were using violence against local communities, used unsustainable fishing techniques, such as *laro*, didn't comply with rules and were not interested to participate in reunions concerning coastal issues (even though actively invited by NGOs) and another, where it was described that migrants would generally respect the rules with a few exceptions, and be interested in coastal issues, but were met with rejection from the local population. Both tendencies are described in literature and reports and no generalising conclusion can be made (Cripps, 2008, p.20). The issue is proving to be very complex and more research is needed to explore the intersections of migration, cultural identity, fishing practices and inclusion in decision-making processes or power relations. Nevertheless, the PaMo project should keep such dynamics in mind and consider including perspectives of both migrants and representatives of local communities.

Regulation

Although most of my interlocutors told me that there weren't sufficient regulations, I also heard that there were laws, especially at the community level. The insufficient engagement of the national government in on-the-ground fisheries management has also been found in other works (Rakotoson & Tanner, 2006, as cited in McClanahan et al., 2014, p.2).

For example, proposals to increase management efforts consisted in the creation of marine protected areas, but due to a lack of funds and weak control on the side of the national government, NGOs such as for example Madagascar National Parks had to step in. Also, considering this limited state capacity to enforce rule of law outside the capital and its environs, also in the case of marine resource management, the promotion of locally managed marine areas (LMMAs) gained prominence (Marcus, 2016, as cited in in Browne & Razafiarimanana, 2022, p.3; McClanahan et al., 2014, p.2).

Although decentralisation can lead to empowerment at the local level, increases civic engagement and generally improves accountability, it can also lead to state disengagement. An article by (Marcus, 2007, p.205-206) describes how decentralisation measures for water

resource management has led to increased water scarcity as a result from increased costs of water delivery and infrastructure development for the communities, ill-preparedness of communities to carry out the imposed municipal functions, and the often inappropriate technologies used in donor-funded projects (Marcus, 2007, p.205-206). These tendencies also align with what interlocutors told me about the lack of police presence, as there aren't enough financial resources in local communities to afford police services and hence, resulting in insufficient law enforcement. Marcus, 2007 (p.203) even claims that this "local empowerment" reinforces neopatrimonial structures through limited transfer of power and choosing local institutions which serve central interests According to Marcus (2010, p.117), neopatrimonial approaches entail that even though leaders' interaction with the state is different from patrimonialism in so far that officials have formally defined bureaucratic positions, the patrimonial form of blending public service and private relationships and property remains.).

But besides the lack of certain laws, there are also shortcomings in the implementation of laws. For example Long et al. (2021, p.6-7) describe how although there has been a law since 1997 that requires fishers to have a licence to target specific marine species, the law has never been implemented (Arrêté 10404/97, as cited in Long et al., 2021, p.6). Generally rule enforcement of the Malagasy government is considered to be limited. There has been a wave of decentralisation in Madagascar, accelerated when President Marc Ravalomanana came to power in 2002 (Marcus 2010, p.117)

Long et al. (2021, p.7) describe how management rights can be transferred from the national level to local communities through the so-called "Gestion Locale Securisée" (GELOSE). The GELOSE is often connected to the use of Dina in the establishment of local management rules. Dina are a set of traditional laws which are decided upon and enforced by *fokonolona* (local community). Fokonolona roughly corresponds to *Fokontany*, the smallest administrative unit of a state, which is led by *Chiefs fokontany*, sometimes together with village elders called *tangalamena*. Generally three types of Dina have been described: one that is not written and only passed on orally, one that is in alignment with national laws and one that is legally created by specific institutions. That Dina sometimes contradicts or takes precedence over national laws points to the lack of coordination between different levels of legislations (Scales, 2014, as cited in Long et al., 2021, p.7). This has also been mentioned by interviewees in the case of the timing of MPA closures and openings.

Further examples of problems with the implementation of Dina are presented by (Andriamalala & Gardner, 2010, p. 468-470) in the case of the Velondriake LMMA. One is related to the notion of *fihavanana*, which can be translated to social cohesion. It describes the attachment and loyalty between people, especially those coming from related clans. If someone breaks a rule, it is likely that someone from a related clan wouldn't betray that person. This poses problems with Dina enforcement. Another is connected to the different levels of legislation. If certain activities are forbidden by national law, the Dina cannot permit the illegal activity. Further examples are the lack of consensus due to a relative heterogeneity of the community with individuals disagreeing with the rules, the disagreement about the amount of fines, the

lack of knowledge about Dina contents, the non-compliance of migrants, and the loss of confidence due to a lack of enforcement and consequences for rule-breaking.

Considering the above mentioned dynamics, for the PaMo project it can be of interest, which Dina are currently in place, how they interact with national laws, but also how power dynamics on different legislative levels might affect local coastal management.

When it comes to **collaboration and inclusion in decision-making** processes, opinions were divided. On one side, the collaboration especially between **NGOs and communities** following a decentralised management of the commons was appreciated and pointed out as a source of inclusivity and equity of access to resources and benefits as well as decision-making. These were described as taking the forms of inclusion in coastal planning meetings, the creation of community maps and the local community's involvement in monitoring. Also the creation of associations representing the needs and preferences of the communities was aimed at balancing out power asymmetries and generating greater participation.

Indeed, following the global shift towards decentralisation and increased community participation in environmental decision-making in 1996, the Malagasy government formulated corresponding laws paving the way for community-based resource management initiatives. These initiatives were implemented with the help of international conservation organisations, such as Blue Ventures (BV), World Wildlife Fund (WWF), and Wildlife Conservation Society (WCS) (Mayol 2013) in the form of locally managed marine areas (LMMAs). Especially the formation of MIHARI, a marine conservation network comprising 219 LMMAs, accelerated the process (Baker-Médard et al., 2023, p.3).

However, despite the positive environmental and socio-economic impacts of LMMAs, the benefits are not evenly distributed, nor is everyone equally involved in decision-making. Research has shown that there are wealth-, and gender-related differences in the inclusion in decision-making (Baker-Médard et al., 2023, p.3).

In terms of gender differences in particular, Baker-Médard (2017, p.727) provides an impressive figure, stating that women are 17 times less likely than men to be involved in decision-making regarding marine resource management. But where does this difference stem from? A reason that was communicated to me was that women did not have the right to vote in village meetings and generally wouldn't attend them. This has far-reaching consequences for their involvement in decisions regarding LMMAs. Westerman & Benbow (2013, p.127) explain that, for example in the case of Velondriake, decisions related to fisheries closures of certain areas are made at the village level, and while some women attend such meetings, most do not have the time, desire or support of their families and husbands to attend. Furthermore, the LMMA Association together with commercial buyers makes the final decision of the length and date of closure. Considering that in the case of Velondriake, the Association is heavily male-dominated with women only representing 16% of the members and no women present in a higher leadership position, female voices are strongly underrepresented. Additionally, female association members were reported to be significantly less vocal than their male counterparts

further exacerbating the gender-gap (Westerman & Benbow, 2013, p.127) . One of my interviewees and the women focus group discussion associated this phenomenon with the Malagasy traditional gender roles.

These findings reflect a general condition of women in Madagascar. A major financial gender gap can be found nationwide. Although there is an improvement of women's earnings with respect to those of men, in 2010, women's earnings were still 34 percent lower than those of men despite holding the same position. The improvement is largely attributed to the Madagascar Action Plan which promotes "gender equality and empowerment of women" (World Bank, 2014, p.111)

These findings underline the need to take into consideration gender- and wealth related power asymmetries, and elaborate ways in how to better include these marginalised groups in the co-production process.

While collaboration between private companies and local communities has made a positive contribution to coastal management, different viewpoints have emerged. On the one hand, private companies involved in aquaculture have been perceived as contributing to the creation of alternative livelihoods while supporting conservation efforts through the creation of economic incentives. On the other hand, challenges have emerged in communication between private companies and communities, characterised by controversial discussions about financial issues (timing of payment, non-payment), changing contracts (for sea cucumber farming) and space distribution.

Ocean Farmers, an aquaculture company for example states that with its model of "agriculture villageois contractuelle" it allows farmers to decide themselves about their level of involvement, that it works without intermediaries which results in a greater revenue for the farmers, that it gives access to communities to social (for example training in conflict resolution, support in social organisation, creation of multi-actor partnerships including NGOs, research institutes and local LMMA associations) and environmental projects (coral restoration, beach cleaning, that it provides technical support, monitoring and evaluation), and that it guarantees a regular purchase of products with a fixed price (Ocean Farmers, n.d.). Funk et al. (2022, p.4) describe how the integration of aquaculture projects in already established LMMAs was generally well received by the communities in Velondriake. They specifically refer to the aquaculture project as community-based, since it was co-developed by the Velondriake Association and the NGO Blue Ventures. Also, Velondriake was described as a positive result with regards to the creation of a Dina. It is described as being well aligned with community aspirations through the participatory approach in its creation. Andriamalala & Gardner (2010, p. 470) argue that Dina imposed by external agencies can lead to non-compliance with rules if it is not in line with community aspirations and general local norms. Although the implementation of aquaculture requires private access, whereas traditionally, the ocean is perceived as accessible for everybody, increased financial benefits including a more predictable income generation, were found to outweigh the loss of access to traditional fishing grounds. The increase in income and improved stability were also expressed during a focus

group discussion with seaweed farmers. Furthermore, aquaculture projects often present themselves as creating economic opportunities, especially for **women** leading to improved gender equality. This has been confirmed to me in a discussion with a group of female seaweed farmers. They further added that the more stable income from seaweed farming would enable them to save money, access loans, make little investments and send their children to school, which wouldn't be possible with the unstable income from fishing. A focus group of male seaweed farmers added that their perception of why more women were involved in seaweed farming was that they could notice the impacts on their living standards more, because men would tend to spend the extra earned money for alcohol and be less productive the next day.

However, there are also certain shortcomings related to aquaculture endeavours and the collaboration between companies and communities. On the one hand, the perspective of companies, theft of materials, conflicts in the use of space and corruption were described. On the other hand, in the case of Velondriake, research participants described barriers to access to capital (e.g. for buying a pirogue) and material (stated that pirogues should be supplied by company) making it increasingly difficult for marginalised community members to participate, the lack of financial buffers (Funk et al. 2022, p.12). The lack of a financial buffer was mentioned to me especially in connection with sea cucumber farming. Sea cucumbers need to grow to a certain size to become saleable. Financial pressure on the side of the farmers leads to the wish of shorter growing times, which can further exacerbate discussions between the buying companies and farmers. Another issue which was mentioned to me was the non-respecting of local norms and rules on the side of companies. Such a problem has been described in the case of shrimp farming, underlining the importance of respecting traditions to gain community support and finally social sustainability (Gruzen, 2005, p.5). This issue is very complex. Funk et al. (2022, p.12-13) describe how working with the customary institutional rules and the existing clan system may influence who has access to farming and thereby, at times, exacerbate existing power imbalances. Individuals holding power might be involved in the setting of the rules and the selection of farmers, hence might perpetuate or even amplify existing biases based on social and gender norms. These are also very important reflections when deciding which stakeholders to involve in the PaMo project.

A more extreme case of conflict happened between a community in Androaka and the Chinese company MaproSud. While my interlocutors only told me that MaproSud was a competing aquaculture company, an article published in L'Express gave insights into the gravity of the conflict. The company was accused of land grab, the violation of local customs and reef destruction in their seaweed farming endeavours. The conflict escalated to the point where the local community, with the support of the mayor, forbade MaproSud employees access to drinking water in their community (Mare, 2022).

9. Conclusion

Knowledge permeates every area and every phase of everybody's life. We acquire knowledge or knowledge is imparted to us by others, and we also impart knowledge to others and be it only how we are feeling today. We remember knowledge that we had once acquired, we forget unintentionally or we want to forget, some knowledge is freely accessible to us while some is only accessible to us under certain conditions or only to selected individuals, common knowledge can unite or divide. Knowledge is omnipresent and yet, we usually do not actively deal with it. Often we do not even deal with it in science, although exactly there these processes as just named should actually run much more consciously.

Knowledge is complex and there are so many components involved in the production of knowledge that if we wanted to cover all aspects of it, we might have to have several lifetimes. But how should we approach complex issues like sustainability if not with complexity? Not without reason, more and more people and entire organisations are wondering about the same question.

While the co-production of knowledge offers a wide range of benefits and allows for the combination of a diverse set of perspectives, in the form of epistemologies, ontologies and all the other -ologies and to grasp certain events and phenomena more holistically, its complexity including its vague definition and great context dependency also present obstacles which can be overcome to varying degrees, but as with most complex things, there is no recipe.

That co-production of knowledge is complex has also been realised by the organisers of the PaMo project. The complexity of co-production of knowledge unfolds even more when it should be performed and doesn't only sound good in theory. The PaMo project organisers had to face many such realities from international, -cultural, - disciplinary collaboration, differences in language, familiarity with other actors, power structures, expectations, motivations etc. which finally led to an adjustment of their ambitious goals.

So, instead of listing the numerous themes that appeared in the SWOT analysis I will use this section to summarise the most important themes and reflections for the advancement of the project.

There are several rather practical aspects which require further consideration on the side of the organisers and could be achieved through the creation of so-called meta-knowledge Godemann (2008, p. 632). Organisers should form a common understanding of the different concepts being used in the project, but also their roles, especially when it comes to leadership. This requires an increased (self-)reflexivity but also clear communication. Also, since there were different visions for the project outcome, organisers should agree on one, and even better with the involvement of stakeholders since they know their context, needs and wishes the best. The utilisation of "theory of change" can hereby be of help (Schneider et al., 2019, p.27). Having a common vision can also help coordination of tasks and roles within the organising team, but

also among stakeholders and increase co-ownership (Vorwoerd et al., 2020, P.8) and facilitate expectations management (Vinke-de Kruijf et al., 2022, p.403).

Besides such more practical aspects there are also contextual aspects which require further consideration. To ameliorate inclusivity certain measures can be undertaken. In this, stakeholder selection, which also led to disagreements, can be of importance. First of all, it needs to be understood how the general setting of inclusion in decision-making is to assess which stakeholder groups might be generally underrepresented and need to be empowered. This further requires to take into account local power structures and how these are either disrupted, perpetuated or even amplified. As outlined in the discussion, varying degrees of involvement in local decision-making were found according to gender, economic status (also paying attention to possible elite capture), personal affiliation, and immigrant background (Baker-Médard et al., 2023, p.3). To further investigate this, the use of the power cube approach can be a good option (Gaventa 2006, p.23-25).

Furthermore, when thinking about the implementation of project outputs, an assessment of the institutional setting as well as the legal framework should be done. As outlined in the discussion, in the case of Madagascar, special attention needs to be paid on the different levels of legislation, where they are used and whether they are generally respected or not, or what could be done to reach a greater compliance (for example creating awareness of laws etc.)

Also, reflections about different concepts which have been brought up in the literature review as well as in the course of the discussion, can offer fruitful insights for the project advancement. Among these, are for example, conscientization, boundary organisations and work, objectivity versus subjectivity and social constructivism, Hall's model of communication, radical reflexivity, psychological ownership, theory of change, homo- versus heterogeneity of discussion groups, the creation of spaces for co-production of knowledge (invited versus claimed spaces), visibility of power or knowledge decontextualisation.

10. Recommendations for Future Research

Analysing the PaMo project has revealed many of the complexities of co-production of knowledge, but also the local contexts in which it operates. However, it also revealed how many aspects are still left unexplored or require a more in-depth analysis.

Regarding the PaMo project, exploring the following aspects could offer valuable insights:

First of all, as I only analysed the co-design phase of the PaMo project, it could be interesting to follow the advancement of the project, whether organisers change certain strategies and how for example the inclusion of new stakeholders provides new perspectives on the discussed issues or new ones, or which kind of knowledge organisers integrate in the project and how they proceed with it. One could also look at the outcome and impact generation of the project

and identify factors which have particularly contributed to this. Also, since many of my insights about co-production come from organisers' perspectives, it could be of interest to illuminate the side of the stakeholders more.

Additionally, since I was only able to do field research in Madagascar, further research is needed to assess the perceptions of participants in Mafia Island about the project as well as the current state of coastal management and inclusion in decision-making. This could be particularly fruitful, since most of the available literature only refers to the Marine Park and rarely conducts research beyond its borders.

Another aspect worth exploring could be the identification of local boundary organisations, how they engage in boundary work and finding ways of how they could be included in the project, respectively, how they could influence the project. Especially the case of Toliara revealed the presence of many actors operating at the intersection of various groups and it could be investigated, in how far they stabilise or permeate boundaries, what their agency to create spaces of knowledge co-production is.

Also questions of hierarchy and role attribution should be explored. This could, for example, address specific inquiries regarding stakeholder's expectations concerning the roles, behaviours, and actions of other stakeholders, whether these expectations are met or not, how behaviours and power dynamics evolve over time, and how these factors collectively influence collaboration within the group.

However, the work has also brought me closer to concepts that could provide stimulating directions for general research about co-production of knowledge beyond the PaMo project.

One such approach could be analysing international co-production of knowledge projects with a theoretical lens of Hall's model of communication. Although the model has been applied extensively in the spheres of international business, less so for co-production of knowledge.

Bibliography

Adelman, C. (1993). Kurt Lewin and the Origins of Action Research. *Educational Action Research*, *1*(1), 7-24. 10.1080/0965079930010102

Aga, D. A., Noorderhaven, N., & Vallejo, B. (2017). Project beneficiary participation and behavioural intentions promoting project sustainability: The mediating role of psychological ownership. 527-545. DOI: 10.1111/dpr.12241

Alexander, S. M., Provencher, J. F., Henri, D. A., Taylor, J. J., Lloren, J. I., Nanayakkara, L., Johnson, J. T., & Cooke, S. J. (2019). Bridging Indigenous and science-based knowledge in coastal and marine research, monitoring, and management in Canada. *Environmental Evidence*, *6*(36), 2-24.

Andriamalala, G., & Gardner, C. J. (2010). L'utilisation du dina comme outil de gouvernance des ressources naturelles: leçons tirés de Velondriake, sud-ouest de Madagascar. *Tropical Conservation Science*, *3*(4), 447-472. ISSN 1940-0829

Astuti, R. (1995). *People of the Sea: Identity and Descent Among the Vezo of Madagascar*. Cambridge University Press.

Astuti, R. (1995). “the Vezo are not a kind of people”: identity, difference, and “ethnicity” among a fishing people of western Madagascar. *American Ethnologist*, *22*(3), 464-482. https://doi.org/10.1525/ae.1995.22.3.02a00010

Atsimo-Andrefana (Region, Madagascar) - Population Statistics, Charts, Map and Location. (n.d.). City Population. Retrieved July 31, 2023, from https://www.citypopulation.de/en/madagascar/admin/51__atsimo_andrefana/

Azamifrei, L. (2016). Knowledge is Power. *The Journal of Critical Care Medicine*, *2*(2), 65-66. DOI: 10.1515/jccm-2016-0014

Bacon, F. (1597). *Meditationes sacrae*. Excusum impensis Humpfredi Hooper.

Baker-Médard, M. (2017). Gendering Marine Conservation: The Politics of Marine Protected Areas and Fisheries Access. *Society & Natural Resources*, *30*(6), 723-737. https://doi.org/10.1080/08941920.2016.1257078

Baker-Médard, M., Rakotondrazafy, V., Randriamihaja, M. H., Ratsimbaz, P., & Juarez-Serna, I. (2023). Gender equity and collaborative care in Madagascar's locally managed marine areas: reflections on the launch of a fisherwomen's network. *Ecology and Society*, *28*(2), 1-13. https://doi.org/10.5751/ES-13959-280226

Barnes-Mauthe, M., Oleson, K. L.L., & Zafindrasilivonona, B. (2013). The total economic value of small-scale fisheries with a characterization of post-landing trends: An application in Madagascar with global relevance. *Fisheries Research*, *147*, 175-185.

Berg, B. L. (2001). *Qualitative Research Methods for the Social Sciences* (4th ed.). Allyn and Bacon.

Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management*, *90*(5), 1692-1702. https://doi.org/10.1016/j.jenvman.2008.12.001

Bernier, A., Ferraris, J., & Mahafina, J. (2011). Participatory assessment of the Toliara Bay reef fishery, southwest Madagascar. *Madagascar Conservation & Development*, *6*(2), 60-67. http://dx.doi.org/10.4314/mcd.v6i2.4

Bernstein, J. H. (2015). Transdisciplinarity: A Review of Its Origins, Development and Current Issues. *Journal of Research Practice*, *11*(1), 1-20.

Blackmore, C. (2007). What kinds of knowledge, knowing and learning are required for addressing resource dilemmas?: a theoretical overview. *Environmental Science & Policy*, *10*, 512-525. doi:10.1016/j.envsci.2007.02.007

Bremer, S., & Meisch, S. (2017). Co-production in climate research: reviewing different perspectives. *Wiley Interdisciplinary Reviews: Climate Change*, *8*(6).

Browne, K. E., & Razafiarimanana, C. (2022). Adaptation finance failing to reach the most vulnerable: A multi-level model of household political power in Madagascar. *PLOS Climate*, *1*(12), 1-23. https://doi.org/10.1371/journal. pclm.0000050

Bruggemann, J. H., Rodier, M., Guillaume, M. M.M., Andréfouët, S., Arfi, R., Cinner, J. E., Pichon, M., Ramahatratra, F., Rasoamanendrika, F., Zinke, J., & McClanahan, T. R. (2012). Wicked Social - Ecological Problems Forcing Unprecedented Change on the Latitudinal Margins of Coral Reefs: the Case of Southwest Madagascar. *Ecology and Society*, *17*(4). http://dx.doi.org/10.5751/ES-05300-170447

Brundtland, G. (1987). Report of the World Commission on Environment and Development: Our Common Future. *United Nations General Assembly document A/42/427*.

Bryceson, I., Jiddawi, N., Kamukuru, A., Kulindwa, K., Mwaipopo, R., Onyango, P., & Sebastian, M. (2006). Fisheries study in Tanzania coastal waters: The effects of trial export of finfish from Mafia Island on social-ecological resilience and vulnerability. *Report to the ministryof Natural Resources and Tourism and Norwegian Embassy, Tanzania*.

Burt, R. S. (1992). Structural Holes: The social structure of competition. *Cambridge, MA: Harvard University Press*.

Carson, T. (1990). What kind of knowing is critical action research? *Theory Into Practice*, *29*(3), 167-173. https://doi.org/10.1080/00405849009543450

Cash, D. W., Clark, W. C., Alcock, F., Dickson, N. M., Eckley, N., Guston, D. H., Jäger, J., & Mitchell, R. B. (2003). Knowledge systems for sustainable development. *PNAs*, *100*(14), 8086-8091. 10.1073/pnas.1231332100

Cash, D. W., Patt, A. G., & Bork, J. C. (2006). Countering the Loading-Dock Approach to Linking Science and Decision Making: Comparative Analysis of El Niño/Southern Oscillation (ENSO) Forecasting Systems. *31*(4). https://doi.org/10.1177/0162243906287547

Chaboud, C. (2006). Gérer et valoriser les ressources marines pour lutter contre la pauvreté. *Études rurales*, *178*, 197-212.

Coombs, S. J., & Smith, I. D. (2003). The Hawthorne effect: Is it a help or hinderance in social science research? *Change: Transformations in Education*, *6*(1), 97-111.

Cripps, G. (2008). Understanding migration amongst the traditional fishers of West Madagascar. *Blue Ventures Conservation Report*.

Cunliffe, A. L. (2003). Reflexive inquiry in organizationalresearch: Questions and possibilities. *Human Relations*, *56*(8), 983-1003.

Cvitanovic, C., Hobday, A. J., van Kerkhoff, L., Wilson, S. K., Dobbs, K., & Marshall, N. A. (2015). Improving knowledge exchange among scientists and decision-makers to facilitate the adaptive governance of marine resources: A review of knowledge and research needs. *Ocean and Coastal Management*, *112*, 25-35. https://doi.org/10.1016/j.ocecoaman.2015.05.002

Denzin, N. K. (2009). *The Research Act: A Theoretical Introduction to Sociological Methods* (N. K. Denzin, Ed.). AldineTransaction.

DeWalt, K. M., & DeWalt, B. R. (2011). *Participant Observation: A Guide for Fieldworkers* (Second Ed. ed.). AltaMira Press.

Díaz, S., Demissew, S., Carabias, J., Joly, C., & et al. (2014). The IPBES conceptual framework—connecting nature and people. *Current Opinion on Environmental Sustainability*, *14*.

Djenontin, I. N. S., & Meadow, A. M. (2018). The art of co-production of knowledge in environmental sciences and management: lessons from international practice. *Environmental Management*, *6*(61), 885-903.

Fals Borda, O. (1986). *Historia doble de la costa: Retorno a la tierra* (4th ed.). Universidad Nacional de Colombia.

Ferse, S., Fujitani, M., & Lahl, R. (2022, August). *Co-Design in collaborative marine research projects - a guidance with examples* (2.0). Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Freire, P. (2000). *Pedagogy of the oppressed* (30th anniversary ed.). The Continuum International Publishing Group Inc.

Funk, L., Wilson, A. M. W., Gough, C., Brayne, K., & Djerryh, N. R. (2022). Perceptions of access and benefits from community-based aquaculture through Photovoice: A case study within a locally managed marine area in Madagascar. *Ocean and Coastal Management*, *222*, 1-17. https://doi.org/10.1016/j.ocecoaman.2022.106046

Funtowicz, S., Shepherd, I., Wilkinson, D., & Ravetz, J. (2000). Sci- ence and governance in the European Union: a contribution to the debate. *Science and Public Policy*, *27*(5), 327-336.

Future Earth. (2020, January 21). *Principles for Successful Knowledge Co-production for Sustainability Research*. Future Earth. Retrieved August 28, 2023, from https://futureearth.org/2020/01/21/principles-for-successful-knowledge-co-production-for-sustainability-research/

Garland, M., Axon, S., Graziano, M., Morrissey, J., & Heidkamp, P. C. (2019). The blue economy: Identifying geographic concepts and sensitivities. *Geography Compass*, *13*, 1-21. https://doi.org/10.1111/gec3.12445

Gaventa, J. (2006). *Finding the Spaces for Change: A Power Analysis*. in: Eyben, R., Harris, C., and Pettit, J. Exploring Power for Change, IDS Bulletin 27.6, Brighton: IDS.

GEA Project. (1997). A Critical Evaluation of Global Environmental Assessments: The Climate Experience. *Calverton, MD: CARE*.

GEF Targeted Research - Centers of Excellence (COEs). (n.d.). GEFCoral. Retrieved June 9, 2023, from https://gefcoral.org/publications/coeprofiles/coe_profile-ims.pdf

Gibbons, M., Limoges, C., Nowotny, H., Schwartzmann, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. SAGE Publications.

Gibbons, M., Nowotny, H., Schwartzmann, S., Scott, P., & Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* (C. Limoges, Ed.). SAGE Publications.

Gieryn, T. F. (1995). *Boundaries of science. In Handbook of science and technology studies*. Thousand Oaks, CA: Sage.

Gieryn, T. F. (1999). *Cultural Boundaries of Science: Credibility on the Line*. University of Chicago Press.

Godemann, J. (2008). Knowledge integration: a key challenge for transdisciplinary cooperation. *Environmental Education Research*, *14*(6), 625-641. DOI: 10.1080/13504620802469188

Gruzen, R. B. (2005). Report: Shrimp Aquaculture and Urban Growth in Madagascar: Sustaining Societies and Conserving Coasts?

Gustafsson, K. M., & Lidskog, R. (2018). Boundary organizations and environmental governance: Performance, institutional design, and conceptual development. *Climate Risk Management*, *19*, 1-11. https://doi.org/10.1016/j.crm.2017.11.001

Gustavson, K., Kroeker, Z., Walmsley, J., & Juma, S. (2009). A process framework for coastal zone management in Tanzania. *Ocean & Coastal Management*, *52*, 78-88. doi:10.1016/j.ocecoaman.2008.10.008

Guston, D. H. (2001). Boundary Organizations in Environmental Policy and Science: An Introduction. *Science, Technology, & Human Values*, *26*(4), 299-408. http://www.jstor.org/stable/690161

Hacking, I. (1990). *The Taming of Chance*. Cambridge University Press.

Hall, E. T. (1989). *Beyond Culture*. Anchor Books, Doubleday.

Harrington, L. J., Wolski, P., Pinto, I., & Mamiarisoa, A. (2022). Limited role of climate change in extreme low rainfall associated with southern Madagascar food insecurity, 2019–21. *Environmental Research: Climate*, *1*, 1-21. https://doi.org/10.1088/2752-5295/aca695

Harvey, B., Cochrane, L., & Van Epp, M. (2019). Charting knowledge co-production pathways in climate and development. *Environmental Policy and Governance*, *29*, 107-117. DOI: 10.1002/eet.1834

Hayward, C. R. (1998). De-Facing Power. *Polity*, *31*(1), 1-22.

Healy, T. (2017). *World Bank*. The Deep South - Socio-economic, historic, cultural, political, anthropological and environmental analysis of Madagascar's southern Region. Retrieved July 27, 2023, from https://documents1.worldbank.org/curated/en/587761530803052116/pdf/127982-WP-REVISED-deep-south-V27-07-2018-web.pdf

Hogenboom, B., & Baud, M. (2015). *Gobernanza ambiental en América Latina* (F. de Castro, Ed.). ENGOV, Gobernanza Ambiental en América Latina y el Caribe.

Howarth, C., Lane, M., Morse-Jones, S., Brooks, K., & Viner, D. (2022). The 'co' in co-production of climate action: Challenging boundaries within and between science, policy and practice. *Global Environmental Change*, *72*, 102445. https://doi.org/10.1016/j.gloenvcha.2021.102445

Hurn, B., & Tomalin, B. (2016). *Cross-Cultural Communication: Theory and Practice*. Palgrave Macmillan UK. DOI 10.1057/9780230391147

Ibarra, H. (1995). Race, opportunity, and diversity of social circles in managerial networks. *The academy of Management Journal*, *38*(3), 32-38.

Independent Group of Scientists appointed by the Secretary-General. (2019). *Global Sustainable Development Report 2019: The Future is Now - Science for Achieving Sustainable Development*. United Nations, New York.

IPCC. (2022). In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. *Cambridge University Press*, 3-33. doi:10.1017/9781009325844.001

Jagannathan, K., Arnott, J. C., Wyborn, C., Klenk, N., Mach, K. J., Moss, R. H., & Sjostrom, K. D. (2020). Great expectations? Reconciling the aspiration, outcome, and possibility of co-production. *Environmental Sustainability*, *42*, 22-29. https://doi.org/10.1016/j.cosust.2019.11.010

Jasanoff, S. (1990). The fifth branch: Science advisers as policy makers. *Cambridge MA: Harvard University Press*, *26*, 393-418.

Jasanoff, S. (Ed.). (2006). *States of Knowledge: The Co-production of Science and Social Order*. Routledge.

Jones, J. P.G., Andriamarovololona, M. M., & Hockley, N. (2008). The Importance of Taboos and Social Norms to Conservation in Madagascar. *Conservation Biology*, *22*(4), 976-986. DOI: 10.1111/j.1523-1739.2008.00970.x

Kates, R., Clark, W., Corell, R., Hall, J., Jaeger, C., Lowe, I., McCarthy, J., Schnellnhuber, H., Bolin, B., Dickson, N., & Facheux, S. (2000). Sustainability Science. Research and Assessment Systems for Sustainability Program Discussion. *Belfer Centre for Science and International Affairs, Harvard University*, 2000-2033.

Kincaid, K. B., Rose, G., & Mahudi, H. (2014). Fishers' perception of a multiple-use marine protected area: Why communities and gear users differ at Mafia Island, Tanzania. *Marine Policy*, *43*, 226-235. http://dx.doi.org/10.1016/j.marpol.2013.06.005

Klein, J. T. (1990). *Interdisciplinarity: History, Theory, and Practice*. Wayne State University Press.

Klein, J. T. (2001). he discourse on transdisciplinarity: An expanding global field. In J. Thompson Klein, W. Grossenbacher-Mansuy, R. Häberli, A. Bill, R. W. Scholz, & M. Welti, (Eds.), Transdisciplinarity: Joint problem solving among science, technology, and society: An effe.

Klein, N. (2013, March 6). *Dancing the World into Being: A Conversation with Idle No More's Leanne Simpson*. YES! Magazine. Retrieved September 4, 2023, from https://www.yesmagazine.org/social-justice/2013/03/06/dancing-the-world-into-being-a-conversation-with-idle-no-more-leanne-simpson

Kock, D., & Stanley, W. T. (2009). Mammals of Mafia Island Tanzania. *Mammalia*, *73*(4), 339-352. doi:10.1515/MAMM.2009.046. S2CID 83780678

Latulippe, N., & Klenk, N. (2020). Making room and moving over: knowledge co-production, Indigenous knowledge sovereignty and the politics of global environmental change decision-making. *Environmental Sustainability*, *42*, 7-14. https://doi.org/10.1016/j.cosust.2019.10.010

Lewin, K. (1997). *Action research and minority problems, inResolving social conflicts ; &, Field theory in social science*. American Psychological Association.

Long, S., Jones, P. J.S., Randriana, Z., & Hadj-Hammou, J. (2021). Governance analysis of a community managed small-scale crab fishery in Madagascar: novel use of an empirical framework. *Marine Policy*, *127*, 1-12. https://doi.org/10.1016/j.marpol.2017.11.022

Lupp, G., Zingraff-Hamed, A., Huang, J. J., Oen, A., & Pauleit, S. (2020). Living Labs - A Concept for Co-Designing Nature-Based Solutions. *Sustainability*, *13*(1), 188. https://dx.doi.org/ 10.3390/su13010188

Maclean, K., Woodward, E., Jarvis, D., Turpin, G., Rowland, D., & Rist, P. (2022). Decolonising knowledge co-production: examining the role of positionality and partnerships to support Indigenous-led bush product enterprises in northern Australia. *Sustainability Science*, *17*, 333-350. https://doi.org/10.1007/s11625-021-00973-4

Malmborg, K., Wallin, I., Do, T., Lodin, I., Neset, T.-S., Norström, A. V., Powell, N., & Tonderski, K. (2022). Knowledge co-production in the Helge a catchment: a comparative analysis. *Ecosystems and People*, *18*(1), 56665-582. https://doi.org/10.1080/26395916.2022.2125583

Marcus, R. R. (2007). Where Community-Based Water Resource Management has Gone Too Far: Poverty and Disempowerment in Southern Madagascar. *Conservation & Society*, *5*(2), 202-231. https://www.jstor.org/stable/26392881

Marcus, R. R. (2010). Marc the Medici? The Failure of a New Form of Neopatrimonial Rule in Madagascar. *Political Science Quarterly*, *125*(1), 111-131. https://www.jstor.org/stable/25698957

Marcus, R. R. (2016). *The Politics of Institutional Failure in Madagascar's Third Republic.* Lexington Books.

Mare, M. S. (2022, December 6). ANDROKA-AMPANIHY - Les Chinois de MaproSud privés d'eau potable. *L'Express de Madagascar*. https://lexpress.mg/06/12/2022/androka-ampanihy-les-chinois-de-maprosud-prives-deau-potable/

Matza, D. (1969). *Becoming Deviant*. Englewood Cliffs, NJ: prentice Hall.

Mauser, W., Klepper, G., Rice, M., Schmalzbauer, B. S., Hackmann, H., Leemans, R., & Moore, H. (2013). Transdisciplinary global change research: the co-creation of knowledge for sustainability. *Current Opinion in Environmental Sustainability*, *5*(3-4), 420-431. https://doi.org/10.1016/j.cosust.2013.07.001

Mazzocchi, F. (2006). Western science and traditional knowledge. Despite their variations, different forms of knowledge can learn from each other. *EMBO Rep.*, *7*(5), 463-6. doi: 10.1038/sj.embor.7400693

McClanahan, T. R., Cinner, J., Kamukuru, A. T., Abunge, C., & Ndagala, J. (2009). Management preferences, perceived benefits and conflicts among resource users and managers in the Mafia Island Marine Park, Tanzania. *Environmental Conservation*, *35*(4), 340-350. doi:10.1017/S0376892908005250

McClanahan, T. R., Cinner, J. E., Abunge, C., Rabearisoa, A., Mahatante, P., Ramahatratra, F., & Andrianarivelo, N. (2014). Perceived Benefits of Fisheries Management Restrictions in Madagascar. *Ecology and Society*, *19*(1). https://www.jstor.org/stable/26269474

MeerWissen. (n.d.). MeerWissen - African-German Partners for Ocean Knowledge. Retrieved June 8, 2023, from https://meerwissen.org/

Miller, C. A., & Wyborn, C. (2020). Co-production in global sustainability: Histories and theories. *Environmental Science and Policy*, *113*, 88-95. 10.1016/j.envsci.2018.01.016

Ministry of Livestock and Fisheries Development. (2011). Mafia Island Marine Park: General Management Plan. 1-65.

Mitlin, D., & Bartlett, S. (2018). Editorial: Co-prduction - key ideas. *Environment & Urbanization*, *30*(2). https://doi.org/10.1177/0956247818791931

Moat, J., & Smith, P. (2007). Atlas of the Vegetation of Madagascar. *Kew Publishing*.

Moreno, C., Speich, D., & Fuhr, L. (2016). La métrica del carbono: ¿el co2 como medida de todas las cosas? *Fundación Heinrich Böll, México, Centroamérica y El Caribe*, 1-76.

Moser, S. C. (2016). Can science on transformation transform science? Lessons from co-design. *Environmental Sustainability*, *20*, 106-115. https://doi.org/10.1016/j.cosust.2016.10.007

Moshy, V. H. (2016). The effects of social-ecological changes on the livelihoods of fishing communities in Mafia Island, Tanzania. *Norwegian University of Life Sciences (NMBU)*, 1-58.

Mosse, D. (1999). Colonial and Contemporary Ideologies of ‘Community Management’: The Case of Tank Irrigation Development in South India. *Modern Asian Studies*, *33*(2), 303-338. DOI: https://doi.org/10.1017/S0026749X99003285

Nicolescu, B. (2010). Methodology of Transdisciplinarity - Levels of Reality, Logic of the Included Middle and Complexity. *Transdisciplinarity Journal fo Engineering & Science*, *1*(1), 19-38.

Norström, A. V., Cvitanovic, C., Löf, M. F., West, S., Wyborn, C., Balavanera, P., Bednarek, A. T., Bennett, E. M., Biggs, R., de Bremond, A., Campell, B. M., Canadell, J. G., Carpenter, S. R., Folke, C., Fulton, E. A., Gaffney, O., Gelcich, S., Jouffray, J. B., Leach, M., & Österblom, H. (2020). Principles for knowledge co-production in sustainability research. *Nature Sustainability*, *3*(3), 182-190. https://doi.org/10.1038/s41893-019-0448-2

Nowotny, H. (2003). *Re-Thinking Science: From Reliable Knowledge to Socially Robust Knowledge in: Lepenies W., Entangled Histories and Negotiated Universals*. Campus Verlag GmbH Frankfurt/ New York. https://books.google.ch/books?hl=de&lr=&id=fbu_qMKJJCwC&oi=fnd&pg=PA14&dq=nowotny+agora&ots=xlZSk0JuT-&sig=5pxNiWcnFZZfao5ymMGQbLW8fc0&redir_esc=y#v=onepage&q&f=false

Ocean Farmers. (n.d.). Ocean Farmers - La mer est notre futur. Retrieved September 2, 2023, from https://ocean-farmers.com/

Orr, K., & Bennett, M. (2009). Reflexivity in the co-production of academic-practitioner research. *Qualitative Research in Organizations and Management*, *4*(1), 85-102. DOI 10.1108/17465640910951462

Ostrom, E., Parks, R. B., Percy, S. L., & Whitaker, G. P. (1979). Evaluating police organization. *Public Productivity Review*, *3*(3), 3-27. https://www.jstor.org/stable/3380231

Pascal, B. (2008). De la "terre des ancetres" aux territoires des vivants. Les enjeux locaux de la gouvernance sur le littoral sud-oueste de Madagascar. *these de doctorat, Muséum National d'Historie Naturelle*.

Pereira, A., & Rappaport, J. (2022). *The Participatory Research of Orlando Fals Borda*. Participatory Methods. Retrieved May 21, 2023, from https://www.participatorymethods.org/resource/participatory-research-orlando-fals-borda

Phillips, K. W., Mannix, E. A., Neale, M. A., & Gruenfeld, D. H. (2004). Diverse groups and information sharing: The effects of congruent ties. *Journal of Experimental Social Psychology*, *40*, 497-510. doi:10.1016/j.jesp.2003.10.003

PIC2. (2016). *Inventaire et études de faisabilité de sites propices a l'algoculture, l'holothuriculture, la gestion de l'exploitation de poulpes et crabes dans la region atsimo andrefana* [Rapport final].

Pierce, J., Kostova, T., & Dirks, K. (2001). Toward a theory of psychological ownership in organizations. *Academy of Management Review*, *26*, 298-310. https://doi.org/10.5465/amr.2001.4378028

Pohl, C., Rist, S., Zimmermann, A., Fry, P., Gurung, G., Schneider, F., Speranza, C. I., Kiteme, B., Boillat, S., Serrano, E., Hadorn, G. H., & Wiesmann, U. (2010). Researchern's roles in knowledge co-production: Experience from Sustainability Research in Kenya, Switzerland Bolivia and Nepal. *Science and Public Policy*, *4*(37), 267-281. DOI: 10.3152/030234210X496628

Polk, M. (2015). Transdisciplinary co-production: Designing and testing a transdisciplinary research framework for societal problem solving. *Futures*, *65*, 110-122. https://doi.org/10.1016/j.futures.2014.11.001

Pollner, M. (1991). Left of Ethnomethodology: The Rise and Decline of Radical Reflexivity. *American Sociology Review*, *56*(3), 370-380. https://www.jstor.org/stable/2096110

Rakotomahazo, C., Ravaoarinorotsihoarana, L. A., Randrianandrasaziky, D., Glass, L., Gough, C., Todinanahary, G. G. B., & Gardner, C. J. (2019). Participatory planning of a community-based payments for ecosystem services initiative in Madagascar's mangroves. *Ocean and Coastal Management*, *175*, 43-52. https://doi.org/10.1016/j.ocecoaman.2019.03.014

Rakotoson, L. R., & Tanner, K. (2006). Community-based governance of coastal zone and marine resources in Madagascar. *Ocean & Coastal Management*, *49*(11), 855-872. http://dx.doi. org/10.1016/j.ocecoaman.2006.08.003

Rappaport, J. (2020). Cowards Don't Make History: Orlando Fals Borda and the Origin of Participatory Action Research. *Durham and London: Duke University Press*, 554-556. 10.1017/tam.2022.59

Reason, P., & Bradbury, H. (Eds.). (2008). *The SAGE Handbook of Action Research: Participative Inquiry and Practice* (Second Ed. ed.). SAGE Publications.

Redman, S., Greenhalgh, T., Adedokun, L., Staniszewska, S., & Denegri, S. (2021). Co-production of knowledge: the future. *BJM*. https://doi.org/10.1136/bmj.n434

Rose, S., Canhoto, I., & Spinks, N. (2015). Management Research - Applying principles. *Routledge*.

Scales, I. R. (2014). *Conservation and Environmental Management in Madagascar* (I. R. Scales, Ed.). Routledge. https://doi.org/10.4324/9780203118313

Scales, I. R., Glass, D. A., & Ravaoarinorotsihoarana, L. (2017). Rural livelihoods and mangrove degradation in south-west Madacascar: lime production as an emerging threat. *Oryx*.

Schneider, F., Giger, M., Harari, N., Moser, S., Oberlack, C., Providoli, I., Schmid, L., Tribaldos, T., & Zimmermann, A. (2019). Transdisciplinary co-production of knowledge and sustainability transformations: Three generic mechanisms of impact generation. *Environmental Science and Policy*, *102*, 26-35. https://doi.org/10.1016/j.envsci.2019.08.017

Schott, J. M., & Tengö, J. M. (2020). Knowledge coevolution: generating new understanding through bridging and strengthening distinct knowledge systems and empowering local knowledge holders. *Sustainability Science*, *15*(6), 1647-1665.

Sorrentino, M., Sicilia, M., & Howlett, M. (2018). Understanding co-production as a new public governance tool. *Policy and Society*, *37*(3), 277-293. https://doi.org/10.1080/14494035.2018.1521676© 2018 The Author(s). Published by Informa

UK Limited, trading as Taylor & Francis Group.This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License(http:

Stefanoudis, P. V., & et al. (2021). Turning the tide of parachute science. *Current Biology*, *31*(4), R184- R185.

Stoddart, K. (1986). The presentation of everyday life. *Urban Life*, *15*(1), 103-121.

Tanzania Sensa. (n.d.). *2002 Population and Housing Census*. https://web.archive.org/web/20070610180829/http://www.tanzania.go.tz/census/census/districts/mafia.htm

Tebes, J. K. (2018). Team Science, Justice, and the Co-Production of Knowledge. *American Journal of Community Psychology*, *62*(1-2), p. 13-22. https://doi.org/10.1002/ajcp.12252

Thompson Klein, J., Welti, M., Bill, A., Scholz, R.W., Grossenbacher-Mansuy, W., & Häberli, R. (Eds.). (2001). *Transdisciplinarity: Joint Problem Solving Among Science, Technology, and Society: An Effective Way for Managing Complexity*. Springer Basel AG.

Trimble, M., & Berkes, F. (2013). Participatory research towards co-management: Lessons from artisanal fisheries in coastal Uruguay. *Journal of Environmental Management*, *128*, 768-778. http://dx.doi.org/10.1016/j.jenvman.2013.06.032

Trimble, M., & Lázaro, M. (2014). Evaluation Criteria for Participatory Research: Insights from Coastal Uruguay. *Environmental Management*, *54*, 122-137. DOI 10.1007/s00267-014-0276-0

Turnhout, E., Metze, T., Wyborn, C., Klenk, N., & Louder, E. (2020). The politics of co-production: participation, power, and transformation. *Environmental Sustainability*, *42*, 15-21. https://doi.org/10.1016/j.cosust.2019.11.009

UMOH. (n.d.). *Edward Hall's Classification of High and Low Context Cultures*. Libary.net. Retrieved August 29, 2023, from https://1library.net/article/edward-hall-s-classification-high-low-context-cultures.qmew474z

Vaismoradi, M., & Snelgrove, S. (2019, September). Theme in Qualitative Content Analysis and Thematic Analysis. *Forum: Qualitative Social Research*, *20*(3), Art. 23.

Verwoerd, L., Brouwers, H., Kunseler, E., Regeer, B., & Hoop, E. (2022). Negotiating space for knowledge co-production. *Science and Public Policy*.

Vincent, K., Carter, S., Steynor, A., Vismann, E., & Lund Wågsæther, K. (2020). Addressing power imbalances in co-production. *Nature Climate Change*, *10*, 877-881. https://doi.org/10.1038/s41558-020-00910-w

Vincent, K., Steynor, A., McClure, A., Visman, E., Lund Waagsaether, K., Carter, S., & Mittal, N. (2021). Co-production: Learning from Contexts. In: Conway, D., Vincent, K. (eds) Climate Risk in Africa. *Palgrave Macmillan, Cham.*, (https://doi.org/10.1007/978-3-030-61160-6_3), 37-56. https://doi.org/10.1007/978-3-030-61160-6_3

Vinke-de Kruijf, J., Verbrugge, L., Schröter, B., den Haan, R.-J., Cortes Arevalo, J., Fliervoet, J., Henze, J., & Albert, C. (2022). Knowledge co-production and researcher roles in transdisciplinary environmental management projects. *Sustainable Development*, *30*(2), 393-405. https://doi.org/10.1002/sd.2281

Von Köppen, M., Kümpers, S., & Hahn, D. (2022). Co-Production of Knowledge and Dialogue: A Reflective Analysis of the Space Between Academic and Lay Co-Researchers in the Early Stages of the Research Process. *Forum: Qualitative Social Research*, *23*(1), Art. 3. ISSN 1438-5627

Vorwoerd, L., Brouwers, H., Kunseler, E., Regeer, B., & de Hoop, E. (2022). Negotiating space for knowledge co-production. *Science and Public Policy*. https://doi.org/10.1093/scipol/scac045

Vorwoerd, L., Klaassen, P., & Regeer, B. J. (2020). How to normalize reflexive evaluation? Navigating between legitimacy and integrity. *Evaluation*, *2*(27), 229-250.

Wals, A. E.J., & Rodela, R. (2014). Social learning towards sustainability: Problematic, perspectives and promise. *NJAS - Wageningen Journal of Life Sciences*, *69*, 1-3. http://dx.doi.org/10.1016/j.njas.2014.04.001

Webster, L., & Mertova, P. (2007). *Using Narrative Inquiry as a Research Method: An Introduction to Using Critical Event Narrative Analysis in Research on Learning and Teaching*. Taylor & Francis.

Westerman, K., & Benbow, S. (2013). The Role of Women in Community-based Small-Scale Fisheries Management: The Case of the South West Madagascar Octopus Fishery. *Western Indian Ocean Journal of Marine Science*, *12*(2), 119-132.

White, E. R., Baker-Médard, M., Vakhitova, V., Farquhar, S., & Ramaharitra, T. T. (2022). Distant water industrial fishing in developing countries: A case study of Madagascar. *Ocean and Coastal Management*, *216*, 1-9. https://doi.org/10.1016/j.ocecoaman.2021.105925

Wood, M. (1994). Are handpumps really affordable? *Paper presented at the 20th WEDC Conference on Affordable Water Supply and Sanitation*. http://www.watsan.org/docs/Wood—are-handpumps-affordable.pdf

World Bank. (2014, March). Face of poverty in Madagascar Poverty, Gender and Inequality Assessment - Report No. 78131-MG.

World Food Programme. (2023). *Hunger Map LIVE: Madagascar insight and key trends*. Retrieved July 31, 2023, from https://static.hungermapdata.org/insight-reports/latest/mdg-summary.pdf

Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods*. SAGE Publications.

Yua, E., Raymond-Yakoubian, J., Daniel, R. A., & Behe, C. (2022). A framework for co-production of knowledge in the context of Arctic research. *Ecology and Society*, *27*(1). https://doi.org/10.5751/ES-12960-270134

Zurba, M., Petriello, M. A., Madge, C., McCarney, P., Bishop, B., McBeth, S., Denniston, M., Bodwitch, H., & Bailey, M. (2022). Learning from knowledge co-production research and practice in the twenty-frst century: global lessons and what they mean for collaborative research in Nunatsiavut. *Sustainability Science*, *17*, 449-476. https://doi.org/10.1007/s11625-021-00996-x

Appendix

Quotes from Interviews

[1] "Im Prinzip prägt das unsere Projekte schon ganz, ganz, ganz lange. Also das ist vom Ansatz her nichts Neues und von Wortwahl her mit Co-design war das 2018, als wir sozusagen sehr explizite Co-design Phase für ein anderes GIZ Projekt hatten" - organiser Germany

[2]Yeah, let's say the Co-design. The co-design concept was something I felt that co-design is something like sophistical like that needs special software, something like this. But when it was explained by the guys from the ZMT, it makes it clearer and simple. So this is something that I learned, something that impressed me because when I felt about co-design I have something in mind, something like sophistical something like software, high tech technology, something like this…Yeah, sure I will, because this is something that is really useful for us. But I think I need more training for this before implementing anything related to this.

[3] "I just feel that I understand it more. Yeah, also because of the participation of some specialists, some other specialist or some other point of view from other partners, such like [name], his presentation, for example. For example, to give you a concrete example, we've discussed I was explaining something, trying to explain to him what it should be. He explained to me the same thing before, but I didn't necessarily understand. And then when I explained my point of view, he said that's exactly the same thing. And there I understand. So that helps understanding more easily… So that's something also that I learned about co-designing. In fact, if you interviewed me before the workshop, I would say no, I didn't hear and I didn't participate into the co-designing or co-production. But now that I understand it more, I told you just before that I have been participating and I have been organising the same. It's only that we did not use the terms." - organiser Madagascar

[4] "Es ist beides. selbst wenn es Co-design ist, ist das ja nicht vollkommen loszulösen von den Leuten, die es organisieren. Und da spielt natürlich auch der lokale Kontext deutlich mehr rein. Und in Toliara sind es glaube ich anders als in Mafia, viele NGOs seit vielen Jahren tätig, wo halt dieses gemeinsame Arbeiten, das muss nicht Co-design sein, aber zumindest so ein gemeinsames Arbeiten eher im Vordergrund steht. Und das kann, da ist glaube ich die Erfahrung aus Mafia Island etwas geringer, obwohl da auch einige NGOs am arbeiten sind." -organiser

[5] weil es eben Co-Design sein soll, weil das ja eben gerade nicht dieses Typische sein soll, ja, die aus Deutschland kommen da mit den Ideen und dem Tagegeld und das.. Und es soll ja genau andersrum sein, als bottom up und aber auch, es soll genau andersrum funktionieren. Und da haben wir auch alle nicht so die Erfahrung, wie man den Prozess dann am besten leitet.

[6]"the whole point of including local knowledge is not end itself, but I also wonder, if there is also the idea of improving in some way the economic situation of local communities" - organiser

[7] "ich glaube schon, dass der Begriff immer weiter verbreitet ist und das immer mehr auch bei unseren Partnern ankommt. Auch als nette Verbesserung des Ansatzes quasi, wie Forschungsmittel vergeben werden und wie Forschung durchgeführt wird. Für mich bedeutet die Koproduktion von von Wissen, dass man sich zusammen mit seinen unterschiedlichen Hintergründen hinsetzt und dann quasi

Ergebnisse für die Projekte oder für Teile der Projekte oder Produkte, die versprochen sind, zusammen entwickelt und da einbezieht, dass wir von unterschiedlichen Hintergründen kommen, unterschiedliches Wissen mit einbringen, aus unterschiedlichen Disziplinen kommen und genau das zusammengeführt wird, ohne dass das vorher quasi entschieden wird, in welche Richtung das ganze gehen soll." - organiser

[8] "Je pense que pour elles, c'est vraiment un gros challenge parfois de pouvoir participer à une réunion, à prendre toute une journée pour assister à un atelier." - stakeholder

[9]"Mais les femmes sont parfois trop occupées par ce qui se passe dans leur foyer ou bien à s'occuper des enfants, surtout quand elles en ont plusieurs, quatre ou cinq. C'est dur à gérer et seules quelques femmes qui ont déjà peut être des enfants qui sont déjà grand, qui peuvent vraiment participer aux réunions communautaires. Donc si on veut améliorer quelque chose, il faut choisir les heures ou les femmes sont libres, comme par exemple le début de l'après midi entre 2 h quand les enfants vont à l'école, ou bien les maris, les maris sont déjà de retour de la pêche par exemple. Comme ça, comme ça, les femmes peuvent participer. " - stakeholder

[10] Je pense, c'est mieux de préparer, peut être envoyer des invitations si c'est possible un mois à l'avance ou quelque chose comme ça. Parce que des fois, les invitations, ils arrivent cinq jours ou trois jours de la réunion et les gens, ils habitent très loin. C'est est un peu difficile de rejoindre plus tard. - stakeholder

[11] "Gerade, was Mafia betrifft, ich mein, da sind sie sich auch noch nicht einig, welche Dörfer jetzt da profitieren sollen, dürfen und dabei sind, das könnte sich auch noch mal ändern. Ja und ich glaube, die Idee ist schon, das noch mal zu ändern. Da muss man jetzt ein bisschen gucken, dass es intern im Projektteam, wenn wir uns dann schon alle einig sind, dass das vielleicht noch nicht perfekt war, dann ist es schon mal der erste Schritt." - organiser
[12] "academy and administration should work together to identify the real problem"

[13] "Dieser Marine Park hat auch den Prozess sehr viel gesteuert. Ja, die Moderation war jetzt sozusagen da von der Uni. Aber so wie ich das verstanden habe, wurde jetzt, wer da jetzt eingeladen wird und so, das wurde eher vom Park gesteuert. Das heißt, Sie haben noch einen Stakeholder drin, der jetzt tatsächlich auch nicht offiziell Teil des Projekt-Konsortiums ist, der aber doch ganz wichtig ist, also es geht nicht ohne, Aber der irgendwie da auch ein bisschen eine komische, oder für mich noch unklare Rolle in der Projektorganisation hat… Und ich weiß auch nicht, wer da jetzt wen eingeladen hat, aber ich glaube, dass es schon das Selbstverständnis gibt, wir reden da mit. Aber die sind natürlich ja eigentlich ganz essenzieller Stakeholder, wenn es um das Management geht, da sind die ja eigentlich auch zentral, die sind halt Stakeholder, die sind eigentlich nicht Teil des Forschungsprojekts"

[14] "Virtuell war es schwierig, auch projektintern Termine zu finden, weil die Leute sitzen halt am Schreibtisch und es kommt immer jemand rein, der wichtiger ist und was möchte."- organiser

[15] "Diese ganze Meta-Diskussion, die haben wir eher nicht geführt, die ist auch ein bisschen komisch anzufangen. Also wenn man jetzt in so einem Kontext arbeitet, wo Leute das eh schon voll gut kennen und können, also dieses ganze transdisciplinary Dings und wenn du ein Projekt anfängst mit anderen Leuten, die da eh auch schon in diesem gleichen Space so unterwegs sind, natürlich macht man erst mal eine Reflektion und dann hier, du legst es halt so aus und man spricht über die Rollen, dann ist es halt so ganz normal in dieser Nische, aber allgemein in der Wissenschaft ist halt nicht normal. Das

heisst, du musst mit Practices ankommen, die eigentlich komisch sind und weisen auch erst mal vielleicht Lücken auf" - organiser

[16] "But it didn't happen because there was this problem with the arrangement between the organiser, I mean myself, and the institute, with the [funding organisation]. So at the last time of the workshop, the [funding organisation] refused to finance the project, especially the preparation and the logistic" - organiser

[17] "I think the constraint would be really administrative points because it always takes time, the procedures always take time. And I think it would be very difficult for us to organise the workshop if we did not already have most of the materials and equipment that was needed. And we also had some kind of, let's say, money that we can advance for the expenses of the workshop. But yeah, we could avoid problems, we could go ahead with the workshop, but if we did not have that capacity to anticipate some stuff, that would be the biggest constraint." - organiser

[18] "Und natürlich würde Co-Design natürlich, wenn man ganz kritisch auch ist und das perfekt machen möchte, wäre es halt, ohne irgendwas in die Communities zu fahren und zu fragen, ob sie überhaupt Interesse haben, an einem Projekt mitzuarbeiten. Das wäre halt die ganz logische Konsequenz, wenn man das durchzieht bis zum Ende. Ob sie überhaupt Interesse haben, an so einem Projekt mitzuarbeiten, das haben wir natürlich vorausgesetzt, die Partner haben das bestätigt. Von daher war das für uns in Ordnung, aber das wäre natürlich was, wenn man das wirklich ernsthaft macht. Wenn irgendeine Art von Forschungslandschaft das hergeben würde, die sagt, hier habt ihr einen Blankoscheck, fahrt in das Gebiet, sprecht mit den Leuten, fragt, ob sie Interesse an Forschungskooperationen haben und was dann die Bedingungen wären. Aber das ist, glaube ich. auch ein bisschen illusorisch umzusetzen" - organiser

[19] "Also wir haben uns schon so ein bisschen einbetoniert, mit eben gewissen Versprechungen, auch in dem Proposal und so, von dem wir nicht mehr so gut wegkommen…die [Förderungsorganisation] will ja auch so ein bisschen Digitalisierung und solche Sachen auch ein bisschen fördern, dann haben wir da natürlich auch in die Richtung ein bisschen geschrieben, ja, das Modell und dann machen wir ein Online Tool und so und das ist auch alles möglich. Aber niemand würde dein Online Tool nutzen, das passt nicht in den Alltag." organiser

[20] "faudrait que, à la présentation, même si on essaie de nous expliquer en Malgache, les présentations en anglais, parfois les personnes lisent les points et leur permettent d'avoir une idée sur les points écrits dans les points, et il serait mieux si la prochaine fois on essaie de traduire en Malagache" - stakeholder

[21] "C'est difficile, surtout pour les pêcheurs, ils ne comprennent pas la langue française et ils ne comprennent que le malagas. Et même pour la langue malgache, ils ne comprennent pas la langue malgache officiel, mais ils ne comprennent que la langue Vezo." - stakeholder

[22]"Also es wurde ja unterschiedlich gehandelt in beiden Workshops auch. Auf Mafia Island wurde gleich alles vorne übersetzt. Und in Toliara sind nur unsere englischen Sachen vorne übersetzt worden und alles andere, was Madagassisch war, haben uns ja persönliche Übersetzer und Übersetzerinnen versucht beizubringen. Aber das waren häufig nur Zusammenfassungen und die musste man auch immer ein bisschen ermuntern, dass sie mehr Details von sich geben. Also , das wäre mit Sicherheit auch mit Leuten, die flüssiger sprechen, einfacher." - organiser

[23] "Da ja bei den Workshops auch viel nicht mitgekriegt habe, was an der Seite geredet wurde, ist es schwierig einzuschätzen. Ich glaube, man hat aus irgendwelchen, ja auch dofen, Gründen natürlich als Projekt aus dem Ausland sozusagen so eine andere Rolle als Institutionen vor Ort da. Also, man wird anders gesehen als jetzt die Uni vor Ort, glaube ich immer. In welche Richtung das jetzt geht, ist schwer zu sagen. Persönlich glaube ich, haben wir eigentlich diese Legitimität noch nicht. Also als im Projekt nicht, und [istitution] auch nicht. Also nicht so direkt. Ich glaub, die Leute wissen noch nicht so genau, woran sie sind mit uns."

[24]"It was the first workshop and I hope that for the next workshop there will be time for a specialist or somebody qualified to explain more about the process. But for this workshop I think it's okay because the main goal of the workshop is to get an overview. It was an overview, so we get the overview and for the next step forward, I think we need this qualified person to explain everything in detail." - organiser

[25] "At the beginning of the workshop, because it was too technical. The word like Co-design, nature-based solution. This is the first time that people heard that kind of words. They were confused." - organiser

[26] "They know that we are not doing development project activities. They know that it's research. And most of the time people are not very motivated in participating in research. But since to me it is positive that they were motivated, even if they knew that it is about research, not to gain money, not to gain development activities, that's something new, something positive." - organiser

[27]"I think that they have, before they have their own expectation. But as it was led by the administration, the administration was present during the workshop, they expect more. They expect more, especially the follow up of the project. The follow up of the workshop….after the workshop, I think they have more expectation. Now. When we ask them about their expectation, they said something different, but now they have an idea of what we can do with this project." - organiser

[28]"Ich glaube, dass die Intention schon vermittelt worden ist. Ich bin mir aber nicht in allen Fällen sicher, ob sie genauso angekommen ist, wie wir das eigentlich wollten und ob da nicht sozusagen sehr viele konkretere Hoffnungen an Projekte, die Geld verteilen." - organiser

[29]"Und weil es sind halt Gelder aus dem Norden Europas. Und ich glaube, da sind auch schon viele deutlich größere Projekte hier gewesen, die was gemacht haben. Ich glaube, das weckt sofort Erwartungen, dass in sehr kurzer Zeit sehr konkrete Lösungen präsentiert werden. Und das zu managen ist immer ein bisschen schwierig." - organiser

[30]"I think my viewpoint as an administration is like oriented in fisheries management and governance, a problem that can be solved with the community. But in Tanzania they think differently academically, like an academic point of view, something like a knowledge, a data that can be used for further research." - organiser

[31] "Ich glaube, es war schon ein bisschen diese unklaren Rollen, die auch damit zustande kamen, dass halt nicht so klar war, wer jetzt da Projektpartner ist. Und allgemein ist ja immer noch nicht so klar, wer jetzt da den Lead übernimmt oder auch nicht. Und dadurch hat vielleicht ein bisschen das Commitment gefehlt von allen und auch so ein bisschen die Richtung. Alle haben so ein bisschen aufeinander gewartet, vielleicht. Aber keiner hat so richtig den Lead übernommen….Das mit dem

Leadership, ich weiß auch nicht, das ist vielleicht auch noch mal ein anderes großes Thema, wer jetzt in so einem Zusammenwirken, das man sehr auf Augenhöhe machen will, wie man da Leadership macht und wer den eigentlich macht, aus irgendwelchen Gründen hatte das ZMT ja so eine Art Leadership Rolle, hat die immer noch. Auch für [Fördereinrichtung], ich glaube, da habe ich schon mal so informell gesagt, die haben ja keinen Vertrag und trotzdem sind wir irgendwie verantwortlich. Was eigentlich so ein bisschen komisch ist, und vielleicht generell ist das eben nicht so klar wer jetzt hier.. Also irgendwie haben wir den Projectlead. Gleichzeitig wollten wir den auch vielleicht nicht so ganz annehmen, weil wir halt auch nicht so viel vorgeben wollen, weil es eben Co-Design sein soll, weil das ja eben gerade nicht dieses Typische sein soll" - organiser

[32] "I was pointed as the focal point of the project, and from the beginning, I was the person who organised, especially the participation of the stakeholders. So let's say I'm a little bit confused now. Yeah. Because there is the part of the[institution], the part of the [insititution]. We both collaborate together to make this project work. But yeah, I'm not sure I don't know exactly what my position is in this. Maybe I represent the [institution] for this project, but I don't know exactly what is my position." - organiser

[33] "So firstly, I'm the contact person. That's the first responsibility. And then we organised that workshop. But now we have to define everything again, because I'm the contact person. But I feel, and I'm convinced that [person] that, you know, is the man who fits better to the topics of the project and he is really interesting in the project. So I would say I was the coordinator of the project as organiser, but also involved in the scientific questions. But I would prefer for the next step of the project I will probably remain the administrative responsible of the project." - organiser

[34] "aber wenn ich jetzt fragen würde, das mal vielleicht auch aufzuzeigen, was er alles weiß, der es vielleicht gar nicht als Wissen überhaupt identifizieren würde. Und das auch aus Leuten, wenn nicht herauszukitzeln, aber das zu integrieren in unser Projekt könnte natürlich auch eine Herausforderung sein, so dass das gar nicht so wissentlich nämlich gelebt wird. Aber, dass es nicht so als Wissen definiert ist, sondern als Praxis vielleicht einfach." - organiser

[35] "On espère que la personne que va y participer de [stakeholder] a ce atelier va à participer et arrive à parler quelque chose, arrive a bien participer et vient à rapporter quelques problématiques ou la situacion de [stakeholder]…si elle arrive là bas et juste écoute et ne participe pas, ca devient dure pour nous. Nous voulons que la personne qui va participer nous dise la problématique… Elles n'ont pas encore l'habitude de prendre leur décisions directement. Elles ont l'habitude de demander a leur propre marie avant de prendre une décision" - stakeholder

[36] "Ich bin da noch sehr unsicher, was tatsächlich die Erwartung der Communities jeweils ist. Die kenne ich immer noch nicht so ganz genau, also was sie sich sozusagen erhoffen, gleichzeitig was leistbar ist, weil es ja auch einen gesetzlichen Rahmen gibt, den institutionellen Rahmen. Da kannst du ja nicht einfach das Forschungsprojekt machen , so wie du möchtest, das ist sehr eingebettet in gesellschaftliche Strukturen, die ja auch wichtig sind, und stark sind. Und dann die Rolle des Forschungsprojekts zu finden, ist nicht so einfach, glaube ich." - organiser

[37]"Es kann sein, dass es in bestimmten Regionen halt sehr hierarchisch abläuft und dann ist es natürlich schwierig, dass man eher so ein Bottom-up Approach fahren möchte, wo man eigentlich viele Leute an einer gemeinsamen Problemlösung beteiligen möchte. Und das muss natürlich auch politisch

gewollt sein. Und das ist etwas, worauf wir im Rahmen von so einem relativ kleinen Projekt auch wenig Einfluss haben." - organiser

[38] "Dass Projekte nicht immer nachhaltig sind, liegt nicht unbedingt nur an den Projekten selber, sondern oft auch an den Gegebenheiten und dass dann irgendwann das Geld fehlt und dass es nicht immer möglich ist, alles zu übergeben." - organiser

[39]"My first comment is that we had the chance for that workshop to work a lot for many years with the communities, which allowed us to have an easy communication with them." - organiser

[40] "we are used to organise such kind of thing and we know people, but I mean, the participants were positive when they know that it is organised at IH.SM, as I said, there is kind of trust." - organiser

[41] "And my feeling is that I've been participating to such kind of workshops and that time maybe because of our message at the beginning as well. But I can tell you that they really participated in the discussion. They did not hesitate to say what they want, even if it is something like against the general idea of working with the ministry, for example." - organiser

[42]Also ich glaube, was positiv war und was auch ein bisschen unterschiedlich zu anderen Meetings war, war, dass das in lokalen Sprachen stattgefunden hat. Das war zumindest so den Eindruck, der vermittelt wurde und dass da dadurch eine deutlich größere Teilnahme auch stattgefunden hat, als wenn es in Französisch oder Englisch im gewesen wäre." - organiser

[43]"So to me, that was also one of the reasons why we had very rich discussion and because we used the native language of people." - organiser

[44]"It's not because there was no restriction, but it was because, first of all, we told them at the beginning that they should not be afraid of telling their idea. That's one thing. "

[45]"Weil es für mich viel wichtiger ist, dass die Leute das Gefühl haben, sie können frei reden. Vielleicht auch, dass sie dann das Gefühl haben, sie stehen gar nicht so unter Beobachtung von den Gästen oder so, sondern dass sie einfach für sich das Thema besprechen, wie es am einfachsten ist. Vielleicht auch die Art, wie Sie es dokumentieren, erstmal so ist, wie es für sie am einfachsten ist." - organiser

[46] "L'atelier, c'était vraiment bien structuré et il y avait la participation de tout le monde." - stakeholder

[47] "Auf Mafia Island ja, da gab es ja auch eine Einteilung nach Stakeholdergruppen. Das hat natürlich Vorteile, dass die Gespräche vielleicht schneller in Gang kommen und dass Konflikte erst später raus kommen." - organiser

[49] "the students that worked with us were very good students and they were quite good in English as well. So we didn't have problems. - organiser

[50] "Es haben schon immer einzelne auch geäußert, dass sie sehr froh sind, gehört zu werden, dass sie auch froh sind, jetzt mal traditionelles Wissen einbringen zu können, das ist noch eine andere Baustelle, die wir auch machen können mit dem traditionellen Wissen und was man damit auch dann macht. Genau das hatte ich schon das Gefühl, dass die meisten eigentlich schon das gut fanden, gehört zu werden." - organiser

[51]"Aber ich hatte trotzdem das Gefühl, dass das schön war, quasi an dem Wissen teilhaben zu können, was die Leute haben und dass sie es eigentlich auch gerne geteilt haben. Ich hatte das Gefühl, dass in beiden Workshops das eigentlich ein neues Konzept war. Was sehr gut aufgenommen wurde, ist, dass sie auch an der Problemdefinition mitarbeiten durften und sagen konnten, wofür sie gerne eine Lösung hätten und auch, was sie selber von Wissen haben, um da dazu beizutragen." - organiser

[52] "So, first of all, he is very motivated and very glad to be invited to attend to this workshop because they sometimes notice that there is certain kind of gap or between academic knowledge as well as scientific knowledge and grounded knowledge or traditional knowledge" - stakeholder

[53]"und da war es primär, glaube ich so, dass ich das Gefühl hatte, von dem, was die Partner oder die Menschen von vor Ort, zu denen ich Kontakt hatte, erzählt hatten, ich das Gefühl hatte, dass das ein Projekt ist, wo man eigentlich den maximalen Impact noch haben kann, wo auch das Konzept so von lokalen marinen gemanagten Bereichen schon da ist und wo man mit dem Projekt viel erreichen könnte quasi" - organiser

[54]"But from Germany, I think what I've perceived is that you were learning a lot. I mean, they were learning a lot about this. The fact that while speaking to us, while discussing with us and during the workshop, people from Germany have, like, wow, understand something positive. It means to me that they learned a lot. It means to me that it's something new for them. " - organiser

[55]So this kind of concept, it's not because it's the first time I have attended or I have heard it, but it always interesting because it's kind of an approach that could be very relevant. Relevant to hear the actors, to listen, to listen the actor, to listen to the stakeholder from the best. Because we have also spoken about Nature based solutions. - stakeholder

[56]"Ja voll, und ich glaube, das finde ich immer interessant. Also, es erweitert ja dann auch den Horizont, dann wenn man dann immer merkt, was man halt ja selber nicht beachtet hat, und nicht kann, daran gedacht hat" - organiser

[57]"I attend the Lena Project the Lena workshop, the two days and I found it also interesting when we planned the project for the next project. We didn't think about the impact, but now we have an idea on how to improve what we have done before. So yeah, I think it was really useful."- organiser

[58]" super tolle Partner gehabt, die in sehr kurzer Zeit zwei sehr intensive Workshops auf die Beine gestellt haben, wo wir viel gelernt haben von den Situationen, von vor Ort." - organiser

[59]"Das war aus vorherigen Partnerschaften, aus auch aus Projekten aus der Meer Wissen Reihe. Da hatten wir eigentlich eine langjährige, sehr lange Kooperation mit dem Institute of Marine Science auf

Sansibar, die sehr konstruktiv ist, die auch schon sehr partnerschaftlich und immer auf Augenhöhe war." - organiser

[60] "wie wenig dieses lokale Wissen eigentlich tatsächlich oft, wenn man im akademischen Bereich tätig ist überhaupt nicht genutzt wird, aber auch akzeptiert wird als wirklich eine Form von Wissen, die über Generationen immer weiter gebracht wird und wo die Leute tatsächlich wahrscheinlich mehr wissen als, deutlich mehr wissen als wir über ihre Ökosysteme, wenn wir hier ankommen." - organiser

[61] "but I think the experience of Madagascar and all the stakeholders to work together to co design things, and it's actually some kind of cultural because in Madagascar, even for family events, co discussion, co design is kind of traditional way of working. So this is, to me, a very important point that will help us to attend the objectives of the project. But we have to understand that point." - organiser

[62] "and that's very important. And I can bring also my experiences from the field. I'm used to work with the communities and with discussion with them every day. Every day. They have lots of ideas that we are not necessarily aware of and that's important to hear from that" - organiser

[63]"Mais même si on en parle et s'ils ne sont pas conscients, et c'est ça le challenge et le challenge, c'est que il y a eu quelques problèmes de migrants avec les pêcheurs dans la zone sud ouest. Les pêcheurs essaient de dire au migrants vous ne pouvez pas faire ça, vous ne pouvez pas parfois faire ça et tout et tout. Et le migrants avec leurs moyens ils ont des pêches, des haches et tout et tout. Ils menacent même les villageois présents dans un village et il leur dit Qu'est ce que vous voulez, Vous voulez nous empêcher de pêcher? On va alors venir chez vous pour voler tout ce qu'il y a dans votre maison quelque chose comme ça." - stakeholder

[64] " Le problème c'est qu' ils pensent qu'ils sont des agriculteurs et quand on parle de quelque chose qui se tourne aussi vers la pêche, ils ne vont pas simplement." - stakeholder

[65] "par exemple, ils utilisent la technique de la pêche par poison. Il y a aussi d'autres qui utilisent des filets qui sont des petits maillot ou des moustiquaires." - stakeholder

[66] Il n'y a pas vraiment de loi qui interdit ces gens d'aller pêcher ou faire la pêche dans la région Sud-Ouest. Il y a simplement des lois qui empêchent, qui identifient des espèces spécifiques, des engins spécifiques pour eux qui détruisent la ressource marine. Mais pour les migrants, il n'y a pas d'interdiction et ce qui est aussi un plus, mais qui les populations, les pêcheurs VEZO sont des gens très pacifiques. Ils sont très accueillants. Il n'ont pas d'armes, ils sont très accueillants. Quand il y a des nouveaux venus, ils les accueillent. Et si cette personne veut pêcher, c'est dans leur tradition de dire que la mer appartient à tout le monde. "..."Et sur le DINA, je pense qu'ils sont au courant mais il font semblant de ne pas savoir. C'est seulement mon avis." - stakeholder

[67] "c'est un travail assez dur parce que si tu obliges un parent de ne pas chercher de l'argent pour permettre à ses enfants de manger c'est impossible. Je ne supporterai pas de voir mon enfant souffrir de la faim et penser à l'environnement. C'est impossible, " - stakeholder

[68] "Regarding some productive aspects, their members are using for now some archaic fishing tools and unsustainable, when they have to fish and to collect fishes, they are using nets that are not conventional. They can capture everything...Fisherwomen specifically. Cause here in the South West,

men are using canoe and can fish offshore. But women are fishing near shore, so they don't have too much productive tools and not selective. They use what is possible to get fish. So it is unsustainable." - stakeholder

[69] "Le plus gros problème, c'est le vol. C'est ça en premier..entre les fermiers. C'est ça le plus gros parce que là, il y a des fermiers qui ont perdu 12 lignes, 15 lignes… Ce genre de problème, nous les avons directement informés à Tuléar à la base que nous avions de tels vols. Parce que là, il faut les remplacer le plus vite possible pour que les fermiers gardent leur production. Parce que chaque fermier avait un objectif déjà fixé pendant la réunion mensuelle. Et donc, s'ils n'ont pas de corde, ils ne peuvent pas avoir une bonne production. Donc, ils n'atteignent pas leurs objectifs. Et à la fin, nous avons évalué combien de cordes nous avons perdus. Et après, il y a aussi avec les animateurs de sociaux-orga, nous avons fait une réunion avec les comités d'essayer de trouver, de mettre en place une stratégie pour délimiter et de stopper ce genre de vol. Parce que le vol, c'est le plus dangereux sur la production." - stakeholder

[70] "Ah, da hab ich jetzt nicht dran gedacht. Also zum Beispiel, dass Poaching so ein großes Problem ist von den Seegurken." - organiser

[71] "c'est bizarre dans la fermeture nationale...."Et on négocie la durée entre un mois et demi et trois mois. Et la période, c'est en discussions avec l'IHSM à l'époque, les plus tard et plus ou moins aux alentours du mois à partir du mois de juin et jusqu'à il faut intégrer juin.comme ça au milieu de la fermeture. Parce que décembre, c'est bizarre dans la fermeture nationale. D'après les scientifiques de l'IHSM Rabihary Daniel, il y a de PIC de de PIC, des recrutements et non les recrutements recruitment. Il y a deux périodes de recrutement tout au long de l'année et la deuxième période de recrutement c'est. C'est déjà couvert par la fermeture nationale 15 décembre jusqu'au 31 janvier. La deuxième fixée, c'est déjà là. Pas la peine de faire certains fermetures parce que toutes les zones seront fermées pour la poulpe et avant ça le premiere pic on a impliqué dans la décision en tenant compte des raisons scientifiques qu'il faut inclure les ces piques là, dans la période des fermetures. C'est pour chaque choix et à partir des??. Comme ça, si on arrive à caler cette période des premières piques, c'est une bonne idée. Mais on négocie aussi avec la communauté. À quelle date exactement ? Au. Où va commencer la fermeture ? L'ouverture, c'était en collaboration, en réflexion ensemble avec le collectif. C'est ça le rôle de la plateforme." - stakeholder

[72] "Mais au moment de l'ouverture, il y aura beaucoup des gens qui arrivent venant d'autres villages, alors que les gens n'a pas que sacrifié pour la fermeture. Et au moment de l'ouverture, même les gens qui ne font pas des sacrifices, il ils tirent des dérives, des craintes, des refus de visites dans l'endroit. Et c'est à ce moment là que les gens pêche se fâchent contre l'organisme de conservation. Pourquoi ? Nous sommes touchés, nous sommes perdants. On, on a consacré pendant plusieurs mois, mais une seule journée avec les autres, ça va arriver." - stakeholder

[73]"space conflict, because there is not really any amenagement, there's not MSP, marine spatial planification. There's no really a planification because all people want to use, want to exploit all the products that relate from the sea, from the marine, there is tourism, there are maritime transport, there are aquaculture...So up to now, this is one of the Ministry, this is one of the Ministry policy. But we are waiting for the implementation. Implementation at any region. At each region" - stakeholder

[74] "Par exemple, il y a l'algoculture, le seaweed farming. Cette pratique commence à se développer et occupe beaucoup d'espace dans la zone où les pêcheurs font la pêche. Donc, il y a un peu un conflit entre les pêcheurs qui veulent pêcher dans la zone où il y a le seaweed. Donc, des fois, il y a des conflits. " - stakeholder

[75] "Il y a des pêcheurs qui font aussi de l'algoculture, mais il y a d'autres pêcheurs qui ne font pas de l'algoculture. L'algoculture commence à se développer. C'est là où le problème commence."- stakeholder

[76] "Elle se fait par la pêche à pied et c'est une des défis de deux façons de pêche où les femmes excellent vraiment, et ce sont les femmes qui se braquent surtout sur la pêche à pied....Parce que surtout dans les coutumes Malgaches, ce sont surtout les hommes qui prennent les décisions, ce sont les hommes qui dirigent le village et les femmes s'occupent surtout des enfants et et ou du foyer. Et même si les femmes participent activement à un revenu de la maison, c'est en faisant de la pêche à pied, ce sont surtout les hommes qui prennent les décisions" - stakeholder

[77] "Mais ce qui est encore un petit ce qui manque à Madagascar, c'est vraiment le fait que les femmes osent vraiment dire ce qu'elles, ce qu'elles pensent. Parce que des fois, lorsqu'on fait une réunion, seule quelques femmes peut se démarquer des autres peuvent dire vraiment ce que ce qu'elles pensent. Mais ce sont surtout les hommes qui participent activement dans toutes les activités, même si on essaie activement d'inclure les femmes" - stakeholder

[78] "Jusqu'à maintenant je ne suis pas encore satisfaite avec la prise de décision de nom de notre femmes. Elles n'ont pas encore l'habitude de prendre leur décisions directement. Elles ont l'habitude de demander a leur propre marie avant de prendre une décision. - stakeholder

[79] "So basically our interviewees are mentioning that members of the association are reluctant or afraid to go to go in offices, so within the association they are sensitizing the members to visit offices and to discuss directly so to break the barriers so the ice" - stakeholder

[80] "They sometimes notice that there is certain kind of gap or between academic knowledge as well as scientific knowledge and grounded knowledge or traditional knowledge. So, for instance, he was taking the example of one fish, Fiantum, which scientifics here have explained that they are dying because they are eating some kind of sands or kind of that. But they have noticed that it's not because of sands, but because of the fact that these fish are swimming next to reefs or eating algae that may be poisonous for their metabolism." - stakeholder

[81] "But at the moment, where scientists come to fieldwork, they are exchanging with them and trying to explain some points that there is any discrepancies or defense to knowledge and can be dangerous. So with the example that he took earlier, it was just about fish. But the thing is, they are studying, for instance, the isolated case of one fish. While the case may extend to the all community also they have noticed that scientists also are interested to commercial fish and to the fate of commercial fish they treat it isolately the fate of commercial fish. But in the community there are another fishes that are useful for the ecosystem and for local needs. So they're trying to express their ideas through speaking with scientists who come to the fieldwork but they don't have any way to do like otherwise." - stakeholder

[82] "il y a eu quelquefois des difficultés, par exemple sur les niveaux de compréhension. Par exemple, moi j'ai un niveau universitaire par exemple et j'ai utilisé les outils et tout ça au niveau université. Mais en arrivant auprès de la communauté, ce n'est pas l'outil universitaire qui sera applicable avec. Avec. On doit trouver toujours des transformation. Comment on va présenter cette idée auprès de la communauté ? Et ça, c'est toujours euh, ça existe toujours, mais ce n'est pas vraiment des difficultés, mais c'est toujours à la charge des techniciens et trouver les moyens pour passer le message." - stakeholder

[83] "And here in Tulear, to be honest, is very difficult to find qualified people. But we try and we have found a really good RH, but most of it comes from Tana and for specific posts they hire Vazaha for example," - stakeholder

[84] "Yeah, we had a lot of difficulties. I think I wasn't here until the beginning, from the beginning, but I've heard, and I see as well in my job, some difficulties, that there are always difficulties with the people, especially if you're getting in there, especially if there's money involved, there's always that." - stakeholder

[85] "But right now it's getting difficult to work with [NGO] for example and [NGO] because they have a lot of activities that they have to do and to dedicate full time to Aquaculture is not possible for them. "- stakeholder

[86]"Comme nous en tant qu'organisme de conservation, organisme d'appui, assistance technique, on motive aussi les gens du village par exemple. À partir des suivis des captures, on a enregistré que ce monsieur ou la dame ou ou qui a capturé le plus grand poulpe des cette zone là. Et pareil pour les autres. Et à quel, à quel prix ? Au moment de la ouverture par exemple. La dernière fois c'était à 7 mil Ariary les kilos achetés par le collecteur et le produit déjà acheté par les collecteurs. Mais nous en tant qu'organisme d'appui on donne des primes petit primes par réserve les plus grands poulpes de cette reserve là. Parfois les pluies durent des kilos à l époque fois deux. Par exemple, il y a un certain pêcheur qui a capturé douze kilos des poulpes la dernière fois avec les prix de 7 mil ariary douze kilos 7 mil ariary foix deux. Ca c'est les primes que nous sur notre initiative pour motiver les gens d'en faire aussi l année prochaine. Ça c'est le système qu on a mis en place depuis plus de dix ans." - stakeholder

[87] "Dans les six villages il y a six fermetures temporaires et au moment de l'ouverture il y a une certaine augmentation des prix de la part des sociétés COPEFRITO. Tout cette augmentation des prix à 500 Ariary par kilo. Et ça, ça motive déjà les gens et motive aussi certains villages qui ne veulent pas les faire." - stakeholder

[88] "So the situation is sometimes husbands do not agree to the woman initiative, but regarding the institutional level, most of the time institutions are supporting women initiatives and they are opening doors. But there are also some situations where in general husbands are supporting women towards this initiative when it is socially well known. When it becomes famous, husbands are more supportive. Why? Because sometimes associations throughout this organisation women can get support, maybe financial support, so the household can benefit something from the association." - stakeholder

[89] "Normalement nous on est organisme de conservation, mais on constate que si on interdit tout simplement, il faut interdire, il ne faut pas faire ça, il ne faut pas faire là on arrive jamais à atteindre l'objectif de conservation. On devrait orienter l'approche. Faire l'activité de développement, par exemple comme l'algoculture. On donne l'algoculture à la communauté pour diminuer la pression sur

les ressources. Mais ce n'est pas nous qui sont capables de faire l'algoculture, mais c'est on ouvre la collaboration avec [company] par exemple, c'est ça en général pour répondre aux besoins des communautés, aux besoins de chacun." - stakeholder

[90] "C'est l'algoculture qui génère de potentielles activités génératrices de revenus potentiels pour le moment. Il y a aussi l'élevage et l'élevage moderne en collaboration avec la direction de l'élevage d'ici. Et bientôt il aura aussi d'autres activités génératrices de revenus. Mais pour le moment, c'est l'algoculture qui couvre tout le monde n'a pas besoin d'investissements des pesticides ou insecticides, non mais c'est juste l'entretien et la partie fermée et ça rapporte de l'argent pour les pêcheurs, ça diminue aussi la pression aux ressources parce que, au lieu d'aller pêcher 24h sur 24." - stakeholder

[91]"the way to do it, I think, is to consult the community and ask what they want and what they need and how they want to do it. And maybe if you're convinced that there's a good solution for the problems, for example, our activity, I think I really believe that it is part of a solution for a lot of problems here, especially poverty and access. And I think if you expose well to the community the advantages of our model and our way to produce, I think it would help as well to convince people instead of arriving there and enforcing them. And saying them this is good for you. But showing them, really and starting little by little as well." - stakeholder

[92] "Dans les autres villages qui constatent les résultats, Il y aura une motivation. Il invite les organismes à définir ses idées, à faire un exemple aussi ici chez nous, parce que ça, c'est un bon exemple." - stakeholder

[93] "And we have to for that kind of public consultation, the thing that we need is the presence of people from different sectors. For example, representatives of the fishermen and the hotels and the transportation people and maybe other aquacultural companies. So everybody has a representation in that kind of meeting. It depends on the meeting, but usually we organise with the chef Fokontany or the mayor, and we try to have a lot of presence over there and then we officialize it with some paperwork and everything. So we try to do it in a good way, not imposing everything or not forcing anything, but mostly consulting the communities and being always in touch with the NGOs to be sure that we're not invading, like national parks or anything. We work a lot with the communities and we listen first, what do they need, what do they want to do? We make public consultations before doing any actions to be sure we're accepted in the community and we're not forcing into it." - stakeholder

[94] "On travaille avec le [NGO 1, 2, 3] au sein des structures fortes. Et c'est un plus aussi pour moi parce que ça fait partie presque de, ça prend en totalité la presque totalité et la superficie de côtes de Madagascar, de sud ouest, de Madagascar. Et ce sont eux qui s'organisent en faisant inclure le plus possible les femmes, surtout dans les réunions, quand on va au village. Pour faire l'ouverture des aires effectivement. Par exemple, les femmes participent, ils donnent elles donnent leur avis, et on prend en considération l'avis des femmes sur la date d'ouverture. Comment on va procéder et surtout." - stakeholder

[95] "Par rapport à la gestion des conflits, souvent, on fait des consultations aux différents acteurs au niveau de la zone qui utilise la mer ou l'océan. On essaye de faire des participatory mapping avec eux et décider qu'est ce qu'on va faire, quelles sont les zones qui seront utilisées pour certaines activités, quelles seront les zones qui seront utilisées pour d'autres activités et les zones à protéger. C'est par rapport à la décision des acteurs que nous faisons le plan d'aménagement et comment les gérer." - stakeholder

[96] "Je pense qu'ils sont très intéressés, surtout quand on forme des équipes communautaires qui font de la suivi écologique et que ces équipes font vraiment leurs tâches de suivi et fait aussi des retours au niveau communautaire. Je pense que ça a beaucoup apporté de bons résultats, surtout sur la mise en place de nouvelles mesures de gestion qui même y décident." - stakeholder

[97] "Il y a aussi d'autres qui utilisent des filets qui sont des petites maillot ou des moustiquaires. Mais pour résoudre cela, il y a déjà les lois que les communautés ont fait. Les communautés de pêcheurs ici sur la côte, ils essaient de sensibiliser les nouveaux venants et appliquent des règlements si si nécessaire." - stakeholder