

**How Stakeholder Interactions Influence the Transitions between
Vulnerability and Viability in a Co-Management Setting: A Case-Study in the
Sundarbans, Bangladesh**

by

Akash Kar

A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirement for the degree of

Master of Environmental Studies

in

Sustainability Management

Waterloo, Ontario, Canada, 2025

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Authors Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Small-scale fisheries provide immense socioecological value to Bangladesh and exist as a significant component of the national economy. Despite their importance, small-scale fishers in Bangladesh remain amongst the most vulnerable populations in the world. Not only do fishers deal with food insecurity, poor water access, little education opportunity, limited access to healthcare, among a variety of other traits limiting the social mobility of fishers but fishing itself as a practice has become less viable over time. Small-scale fishers have been impacted by increased competition, decreased fish stock, poor regulation, a rapidly changing ecology, among other conditions which make small-scale fishing practices vulnerable. These conditions are consistent throughout the country, however, specifically in the Sundarbans they are amplified. Originally adopted to increase local participation in decision-making processes, community-based management institutions were introduced to Bangladesh in the late 1990's and officially came to the Sundarbans in 2009. This study aims to analyze stakeholder interactions in the current co-management structures present in Satkhira, the largest district of the Sundarbans, to better understand how the institutions work to impact small-scale fishers and their livelihood practices. Case-studies were conducted in four unions in Satkhira and a legal pluralism framework was applied in the fifth chapter to contextualize the relationships between statutory and customary institutions. This study found reach to be a relevant measurement when analyzing co-management institutions and further found a relationship between the factors of reach, transparency, and empowerment. The findings of this study further support that strong legal pluralism is unlikely through neoliberal conservation.

Key words:

Small-scale fisheries, co-management, Sundarbans, legal pluralism, vulnerability, viability

Acknowledgements

There are many people to whom I owe thanks for their help in supporting me through the development of this thesis. In no order, I would like to thank my family, both in Canada and Bangladesh. I would like to thank the villagers who participated in interviews, particularly a select few whom I have been fortunate to get to know better. I would like to thank Dr. Prateep Nayak for his supervision. Through the years he has introduced me to several concepts I now hold close, and this project would not have been possible without him. I would like to thank my host supervisor, Dr. Samiya Selim, and her team at ULAB for the warmth, hospitality, and most importantly, for the assistance in conducting this project. Their help was insurmountable. I would like to thank Dr. Sisir Pradhan and Dr. Derek Armitage for their support in my journey as a researcher, as well as for their work in making V2V what it is. I would like to thank V2V researchers, past and present, Yinghao Song, Nilushika Madhubhashini, and soon-to-be doctors, Ruyel Miah, Natasha Serrao, and Navya Nair. I hope that through reading this you are all able to understand a fraction of my gratitude.

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Chapter 1: Thesis Introduction

1.1 Thesis introduction and problem context

Fish is a significant aspect of Bengali diets, existing roughly as 60% of the nation's total animal protein (Islam, 2011). Not only is fish culturally significant in Bangladesh, but the industry also shapes a large part of the national economy, which is largely supported by small-scale fishers. Although a modestly sized country, Bangladesh remains a world leader in fish production and trade, producing over 4,621,000 metric tons of fish annually (Hossan, 2023). In the 2021-22 fiscal year, fish exports represented over 1% of Bangladesh's total export earnings, and in the fiscal year prior accounted for over 3.5% of the nation's total GDP. In this timespan, Bangladesh was ranked third globally in terms of stock of fisheries resources and harvesting, and exported fish or fish related products to over 50 different countries. While Bangladesh has gained an international reputation of fondness towards fish, fishing families are more often significantly socially neglected. For example, only about 14% of the full fishing population is literate (Diba et al, 2022). Small-scale fishers are increasingly marginalized through policy, management, and rapidly degrading environments and fish stock, while still acting as a backbone of the Bengali fishing industry.

This study specifically focuses on the Bangladesh part of the Sundarbans, which represents just over 60% of the largest mangrove forest in the world and is home to hundreds of animal species, including the endangered Bengal Tiger (Mondal & Debnath, 2017). The forest exists in the south-west corner of the nation, where the remainder spills into India. Originally formed through sediments travelling from the Himalayas through the Ganges, the unique climate is undergoing significant ecological change (Aziz & Paul, 2015). Factors such as erosion reduced the Sundarbans by over 2.5% from the 1990's to the 2000's (Giri et al., 2014). Beyond that, the growth of human settlements, industry and subsequent overexploitation of forest resources, both natural and man-made environmental catastrophes such as cyclones and oil spills, climate change and pollution have contributed to significant forest loss over the years (Rahman, 2009). These factors have seriously impacted the viability of resource collectors, which has forced the

migration of tens of thousands of resource-dependent people in the forest (Gunjal, 2024). The shrinking forest offers significant protection to Bangladesh from the Bay of Bengal, where mangroves act as a buffer-zone protecting the shoreline from storms, harsh waters, and natural disaster (Granek & Ruttenberg, 2007; Barbier, 2016; Badola & Hussain, 2005). Natural disasters have had a significant impact on the development of Bangladesh, especially when considering the geophysical make-up of the Bangladeshi coastline (Ali Akber et al., 2018; Murty & Neralla, 1992). Bangladesh's coastline is amongst the most dangerous in the world and has experienced over 70 major cyclones in the last 200 years (Saha, 2015). The Sundarbans represents tremendous ecological, economic, and cultural significance for Bangladesh, as such, the deforestation and deterioration of the Sundarbans should be considered a significant threat to the nation's safety.

Beyond the specific ecological complexities of the Sundarbans, the Sundarbans has garnered international attention for its significant deterioration as well as the conditions of resource-dependent people (Islam & Bhuiyan, 2018; Ela et al., 2021). The overexploitation of natural resources and anthropogenic presence in the forest has further highlighted extreme vulnerability in the Sundarbans, where millions remain dependent on forest resources for their survival (Rahman & Asaduzzaman., 2010; Hoq, 2007). The Sundarbans provides crucial livelihood benefits to the local people, while being a significant contributor to Bangladesh's global economy as the forest accounts for about 5% of the country's forestry sector (Shamsuzzaman et al., 2020; Roy & Alam, 2012). Despite the wealth that the Sundarbans provides, the forest hosts 3.5 million resource-dependent people throughout about a ten-kilometer strip of the forest (Islam & Shamsuddoha, 2018). These people predominantly exist as a mix of fishers, timber and honey collectors, among other livelihoods surrounded by forest resources or tourism and live in extreme poverty (Kabir & Hossain, 2008; Mozumder et al., 2018; Abdullah et al., 2016). As the forest further deteriorated and livelihoods became less viable, international pressures for Bangladesh to install conservation measures have been realized. This has led to the development of Protected Areas (PA's) and of various community-based governing tools in the Sundarbans, such as co-management. Co-management initiatives have been ongoingly utilized in the region since its implementation in 2009 (Begum et al., 2021). However, inclusion of the most local stakeholders, the small-scale fishers (SSF), has been underwhelming in institutions since (Rahman, 2022).

Some scholars argue that co-management initiatives require successful and equitable integration of the relevant stakeholders to achieve its best results as a collaborative problem-solving process (Jentoft & Bavinick, 2019; Plummer & Baird, 2013). This is due to various reasons, one being that the most local stakeholders often possess unique knowledge that contribute to the health and prosperity of an ecosystem (Titumir et al., 2020). Using the co-management institutions in the Sundarbans as a case study, this study intends to better understand how stakeholder dynamics and interactions can shape the formulations of a co-management initiative, specifically in reference to an initiative's trend towards vulnerability or viability.

1.2 Purpose statement

This research aims to contextualize the co-management institutions in the Sundarbans of Bangladesh to understand its effects on small-scale fishers. It attempts to understand specific vulnerabilities and viabilities of the co-management system and the respective impacts to small-scale fishers. The study's attempts to understand co-management in a wider governing context and determine means of limiting current and future vulnerabilities of small-scale fishers.

1.3 Objectives

This thesis attempts to cover the following three objectives:

1. To contextualize and conceptualize co-management in the Sundarbans to ultimately better understand how the in-place systems operate.
2. To understand vulnerabilities and viabilities in the co-management system, significant to small-scale fishing practices.
3. To define the relationship between statutory and customary institutions within the co-management institutions and determine steps which could promote stakeholder viability.

1.4 Literature review

A literature review was conducted and is available in chapter two. It overviews concepts such as small-scale fisheries, co-management, vulnerability and viability, as well as legal pluralism. The study uses current sources to determine a basic understanding of the relevant literature overviews concepts central to this project.

1.5 Research approach and methods

This thesis uses a phenomenological approach, in which composite descriptions were created in hopes to best represent the viewpoints of various stakeholders in the institutions (Creswell et al., 2007; Cilesiz, 2011). The analysis of in-depth interview data in order to find common themes between various stakeholders' groups further represents the data analysis process that may exist within a phenomenological study (Polkinghorne, 1989; Moustakas, 1994). This study attempts to use data to identify social phenomena or processes related to the co-management institutions ongoing in the Sundarbans, specifically in relation to their effects on small-scale fishers within the co-management institutions. Data analysis was manually done and was continuous throughout much of the thesis's writing process. Data was coded using Google Sheets. This thesis was written in six chapters, and methodologies used for the two objective chapters were consistent. However, the second objective chapter applied a framework found in chapter 2.

This study used 53 interviews from over four unions, namely Munshiganj, Gabura, Burigoalini, and Koikali. Interviewees consisted of fishers and non-fishers, as well as stakeholders who both were and were not affiliated with the co-management institutions. Interviews were semi-structured with all stakeholders, maintaining space for conversation and deeper inquiries surrounding the co-management institutions if the situation fit. Although semi-structured interviews were used for all stakeholders, stakeholder groups did get asked targeted questions. Semi-structured interviews are considered a norm in fisheries research, as it provides conversational flexibility with various stakeholders, which in turn provides immense insight towards stakeholder's positions within the co-management institutions (Barclay et al., 2017; Damiano et al., 2022; Young et al., 2018). A snowball sampling technique was used. As there was little information about the co-management institutions online, using stakeholders to find other relevant stakeholders was the best option to learn about the institutions. Beyond this, I travelled alongside a translator who was assisting me with translations. Ethical clearance was given by the University of Waterloo Ethics Office, recognized under case #45720. A more thorough overview of the research methodologies is available in chapter three.

1.6 Thesis overview

This thesis is split into six chapters, including an introduction, literature review, methodologies, two chapters dedicated to the three thesis objectives, and a final concluding chapter. While this primary chapter introduced the thesis, chapter two overviews the literature review and breaks down several literary areas related to the project. Chapter 4, the methodologies section, speaks to processes involved during data collection and analysis. Following this, the fourth and fifth chapters attempt to address the projects various research objectives. Finally, the thesis ends with a concluding chapter which summarizes the projects key findings in relation to the objectives and provides recommendations to promote the viability of small-scale fishers through co-management institutions.

Chapter 2: Literature Review

2.1.0 Introduction

This literature review was conducted throughout the course of this research project, which is a common practice in phenomenological studies. The process helped develop both preliminary and more thorough understandings of several topics relevant to the thesis. It was further significant in developing a guiding conceptual framework for this project. The literature review focuses on four areas related to this study, including small-scale fisheries, co-management, vulnerability, viability, and legal pluralism. After outlining the guiding frameworks used for this project, this chapter concludes by speaking to relevant research gaps.

2.2.0 Small-scale fisheries

Small-scale fisheries provide significant economic and cultural value to Bangladesh. A nation of over 700 rivers, over 17 million people depend on inland and marine fisheries for fishing, farm management, and fish processing (Bhowmik et al., 2021; Shamsuzzman et al., 2020; Sultana, 2019). Beyond that, the marine contribution to the nation's fish production is below 20%, emphasizing Bangladesh's current dependence on small-scale fisheries (Islam et al., 2017). Fishers near the coast, such as those in the Sundarbans, have unique access to both inland river systems as well as larger coastal bodies of water. Bangladesh's rich fisheries and abundance of fisheries workers allows the nation to be the 7th largest fish producer in the world, just ahead of the United States of America and Norway (worldbank, 2024). As such, the Bangladeshi fisheries sector is not only significant domestically but remains a world leader in production. As mentioned, the fisheries industry accounts for just over 3.5% of the nation's GDP and is a major export for the nation (Hossan, 2021). Despite the significance that small-scale fishers provide for Bangladesh and the national economy, they continue to be amongst the most vulnerable populations in the world. As mentioned, only about 14% of Bangladeshi small-scale fishers are literate, while food security, healthcare, infrastructure and clean water access remain significant issues for small-scale fishers throughout the nation. These conditions are amplified for small-scale fishers in the Sundarbans.

The socio-economic significance of fishing practices in Bangladesh should not be undervalued. Bangladeshi small-scale fishers collectively are responsible for expanding the national food supply, job creation, foreign trading, and raising nutritional levels among the national population (Diba et al., 2022). With that said, the increased international demand for Bengali fish stock has directly impacted the livelihoods of fishers in a negative fashion. Fishers live in increasingly marginalized situations, where fishing practices are less and less viable to provide for one's family (Tikadar et al., 2022; Islam, 2012). While the market price of fish increases across the world, fishers state that their returns on fish are not equivalent to past generations. The increasing globalization of common-pool resources, such as the small-scale fisheries in the Sundarbans, have expanded in such a way as to promote not only intense competition among fishers and a lack of regulation in management, but potentially the most devastating consequence of exists as the dwindling environment which was once a rich, treasured, and world-renowned forest (Aziz & Paul, 2015). Today, small-scale fishers in Bangladesh are considered among the most marginalized populations in the world. Fishers and other resource-dependent users in the Sundarbans are subject to further marinization due to the deep isolation and extreme conditions of the area.

2.2.1 Rationale for community-based management interventions for small-scale fisheries

The deterioration of small-scale fisheries alongside the marginalization of small-scale fishers has been a consistent trend in almost all, if not all countries in the world. While some countries have been more successful than others in instituting systems which protect small-scale fishing resources as well as the fishers themselves, much of the developing world continues to struggle in developing healthy small-scale fishing systems. Community-based institutions gained international popularity for their potential to relieve local stress by installing local input within larger management institutions (Lobe & Berkes, 2004; Wiber et al., 2004). As the world began and increasingly has been dealing with the effects of climate change, the emphasis for local knowledge integration within management systems has been amplified. World-wide, community-based management interventions have increasingly been implemented since the 1990's, and Bangladesh specifically began adopting community-based institutions as a means of interacting with larger governing systems in the late 1990's (Thompson et al., 2003). These institutions typically involve stakeholders from a variety of roles, including governing actors,

NGO workers, scientists, and local stakeholders such as agriculture or fishing workers. Through co-management institutions, stakeholders are meant to work together and combine their respective expertise to implement context dependent socio-ecological solutions. While there is no direct formula for producing an ideal community-based management institution, the purpose of community-based management exists to emphasize local input within management processes. Community-based institutions are not a solution in themselves and ultimately exist as the sum of its utilization. The utilization of a community-based institution is dependent on both internal, and external conditions of a co-management institution.

As small-scale fishers have increasingly faced marginalization to the point where most small-scale fishers in the Sundarbans cannot support themselves on fishing alone, small-scale fishing has increasingly lost viability as the sole means of income for Bangladeshi fishers. Beyond this, the Forest Department, which exists as the management authority for the Sundarbans, is significantly understaffed and unable to coordinate with all resource-dependent people surviving off the forest (Hussain & Hoq, 2010). When speaking to the deterioration of small-scale fisheries, and the respective effects on small-scale fishers, specific issues affecting a community will often be unique to the community, as they must deal with their own respective socio-ecological complexities. With that said, there are consistent problems found in fisheries around the world, and while all fisheries may not face the same specific issues, eight key legal issues surrounding small-scale fisheries were outlined by Nakamura et al., in their 2021 study. A 1) legal definition (or lack of), 2) tenure and labour rights, 3) participation of fishers within management processes, 4) access rights, 5) public financial mechanisms, 6) gender laws and policy, 7) climate laws and policy, and 8) representation of small-scale fishers in within institutional arrangements were all defined in the study as key legal issues that small-scale fisheries deal with. These factors defined by Nakamura et al., as well as the increased marginalization of small-scale fishers and the lack of manpower the Forest Department hosts, all reinforce a need for more structured and effective management, specifically at a community-based level.

While the inclusion of local input within management processes is often understood as a need for the sustainable management of a commons, community-based management is not without its

critiques. The effectiveness of community-based institutions is often criticized for several factors, primarily concerning topics such as determining an appropriate distribution of power relations between governing and non-governing stakeholders (the effectiveness of keeping some secrets from the public), corruption, and lack of local compliance (Kofinas, 2005; Nunan et al., 2018). Again, as all community-based institutions exist within their specific context and deal with their own respective issues, it may be helpful to imagine the effectiveness of community-based existing institutions on a scale. In Bangladesh, community-based governance structures have typically been implemented through various co-management schemes, which will be expanded upon in the following section.

2.3 Brief description of co-management

International pressure surrounding the development of community-based governance structures from the 1990's to the late 2000's, triggered a wave of such structures throughout the developing world. Although some countries have seen more success with community-based governance structures than others, this scale of success has forced researchers to acknowledge the fact that community-based governance is context dependent, and not all structures will be identical with one and other (Carlsson & Berkes, 2005).

Co-management is widely used as a governing tool to address local stakeholder needs in relation to a common-pool resource (Kofinas, 2009; Plummer & Fitzgibbon, 2004). Typically viewed as a bottom-up implementation, the success of co-management is often dependent on the validity of a respective institution (Welch-Devine, 2012). In reality, co-management implementations are often more functionally accurate with top-down structures (Beem, 2007; Natcher et al., 2005). With that said, co-management still attempts to put together state and non-state stakeholders, and in doing so creates the opportunity for stakeholders to come to mutually beneficial solutions (Carlsson & Berkes, 2005). Co-management attempts to highlight the linkages between different stakeholder groups in order to gain a stronger understanding of how to manage linkages and the respective problems that may occur (Wilson et al, 2006). Scholars argue that co-management initiatives require successful and equitable integration of the relevant stakeholders to achieve its best results as a collaborative problem-solving process (Plummer & Baird, 2013). The inclusion of local stakeholders promotes ecological potential when considering that resource-dependent

stakeholders often possess unique ecological knowledge that contribute to the health and prosperity of an ecosystem (Titumir et al., 2020; Shackleton et al., 2002). As the Sundarbans continues to go through massive ecological deterioration, an emphasis on local ecological knowledge in decision making can prove to be critical.

Throughout co-management processes, an ideal relationship between stakeholders can be difficult to realize and will further vary from institution to institution (Jentoft & McCay, 1995). In implementation, fishers often lack social capital to be meaningfully included in co-management institutions (Nenadovic & Epstein, 2016). The alienation of marginalized stakeholder groups like fishers is a common occurrence and regularly occurs within the Bangladeshi institutions (Pomeroy et al., 1998; Heylings & Bravo, 2007; Khan & Ahmed, 2017). While co-management has the potential to bridge common solutions between stakeholders, the alienation of stakeholders often prevents institutions from reflecting the needs of the most marginalized. As such, socio-ecological contexts need to be considered for an institution's most effective implementation.

Co-management is often understood in line with structures such as community-based management; particularly in the Bangladeshi context, co-management and community-based management are often used interchangeably (Singleton, 2000; Thompson et al., 2000; Newaz & Rahman, 2019). Although these institutions are oftentimes understood to be the same, this thesis defines a successful co-management institution as an institution which can provide respective resource-dependent users with governing tools to address issues pertaining to their livelihoods, while simultaneously establishing a sustainable use and relationship between a common-pool resource and the respective users. To achieve institutional success, institutions in the Sundarbans should aim to address the immense distrust that fishers have with governing authorities (Islam et al., 2018). Increased trust in the institutions is likely to make fishers more willing to comply with them (Silva et al., 2021). To build trust among stakeholders, co-management institutions must acknowledge factors such as legitimate participation for resource-dependent stakeholders, knowledge-generation, and transparency and their typical role in the success of a co-management institute (Jentoft & Bavinick, 2019; Puley & Charles, 2022; Berkes, 2009; de Vos & van Tatenhove, 2011). With that said, co-management institutions will vary depending on respective

stakeholder and ecological concerns, and different institutions will have different strengths and weaknesses (Cinner & Huchery, 2014). As such, the value and implementation of community participation varies greatly between co-management institutions. While institutions may vary on an extreme scale, a sustainable relationship between human stakeholders and a respective common-pool resource should be the underlying goal strived for by any conservation measure, regardless of the participation of marginalized stakeholders in a governing institution.

Co-management should be recognized as a governing tool which can support or address gaps in current governing structures. Co-management itself cannot be the focal point of a development process, because co-management is dependent on various factors that must be addressed for the success of the institution. Without addressing these factors, co-management is simply a tool that is working with whatever it has at hand. A resource management intervention should appeal to the specific socio-ecological needs of a commons.

2.3.1. Key elements

Co-management can be defined in many ways, and the defining elements of co-management will vary from institution to institution. As such, determining overarching key elements of co-management should be respective to an institution and its goals. Very generally, when considering the validity of resource management and the success of an implementation, factors such as building trust through collaboration, institutional development, and social learnings are shown to be traits of successful implementations (Armitage et al., 2008). Multi-scale ecological issues require complex solutions, often requiring specific needs tailored for a respective implementation (Berkes et al., 2008). This emphasized that there is no universal, one-size-fits-all blueprint which encompasses all the needs of resource management interventions. As such, the following elements are generally tailored for co-management institutions throughout Bangladesh and their needs, but more specifically relevant to the Sundarbans.

As different environments will harbour their own respective needs that will require specific focus, co-management stresses the importance of local knowledge systems and knowledge generation (Berkes, 2009; Moller et al., 2004). Knowledge generation, or knowledge-sharing is typically considered as a central element of co-management. A healthy co-management system

integrates local knowledge alongside scientific in order to develop solutions which suit all stakeholders, while simultaneously benefitting the long-term sustainability of the commons. The value of local ecological knowledge is oftentimes essential for the long-term sustainability of a commons. Local knowledge systems are typically built over multiple generations, and tailored to the environment it exists within. Local people who are constantly interacting with a specific environment, such as fishers or other forest-dwellers in the Sundarbans, often have an exclusive knowledgebase in relation to the environment.

Agency and empowerment are related concepts which are both central to co-management (Jentoft, 2005; MacNeil & Cinner, 2013). Agency can be understood as a pathway towards empowerment, while empowerment is a larger process. Specifically in the context of this research, agency refers to a stakeholder's ability to make managerial implementations beneficial to local livelihoods (Drydyk, 2017). Specifically in the context of co-management, agency can be understood as stakeholders having the ability to make decisions for themselves, while empowerment refers to becoming able to improve one's life (Drydyk, 2017). To make these decisions by themselves, in a manner that truly benefits current-day and future generations of small-scale fishers, fishers likely need improved social structures that will reinforce their decision-making processes in good kilter. Agency and empowerment cannot simply stem from nothing, and as mentioned earlier, a co-management institution is only as effective as its respective internal and external factors allow it to be. Small-scale fishers and their needs are often ignored in co-management institutions due to their typically low social-status, and policy favour for industrialized fisheries (Kolding et al., 2014).

It is no secret that in Bangladesh small-scale fishers lack social mobility (Mozumder et al., 2018). While fishers are increasingly moving to more urban areas in hopes of gaining livelihoods which can better support themselves and their families, fishers often lack formal education or connections to find adequate employment opportunities. There is a strong need to establish stronger social institutions around Bangladeshi small-scale fishing communities, such as schools, hospitals, and adequate roadways. Fishers for the most part lack agency in decision-making processes which would allow them to move upwards socially. Their livelihood situations continuously cripple them today while hurting their tomorrow. The establishment of these social

institutions should allow for preliminary growth in social mobility. Improving the social status of fishers will likely impact power dynamics to increase respect towards fishers, which may lead to their increased agency and empowerment. Increased agency is further understood as a positive contributor to increased social capital, creating something of a circular relationship (Krishna, 2001). Social capital is further recognized as a central aspect of co-management (Omstrom, 2009; Bodin & Crona, 2008; Pretty & Ward, 2001). Increased education, healthcare, and infrastructure should be seen as a means of reducing local poverty which could then reinforce the decision-making powers of fishers within co-management institutions. Empowerment of fishers should begin by addressing their needs, and their capacity to participate in management institutions will subsequently improve (Krishna, 2001).

Concepts such as transparency and corruption often act as two significant barriers to the success of co-management institutions. While the two elements are understood as separate entities, the relation between the two has been thoroughly researched (Han, 2015; Nunan et al., 2018; Skerritt, 2024). The lack of transparency within a governing institution is heavily tied to corruption, while increased transparency is proven to increase trust of stakeholders within a co-management institution (Guggisberg et al., 2022; Kooiman, 2002). While corruption is prevalent in almost all governments world-wide, corruption in Bangladesh has acted as a significant barrier in instituting bottom-up political change since the nation's birth. Transparency is specifically relevant to co-management institutions because it is a process which can reinstate local trust in governing institutions, which is likely to make locals more willing to engage and comply with the respective governing institutions.

2.3.2 Criticism

As mentioned, co-management initiatives typically include state and non-state actors, working together to govern a shared resource (Islam et al., 2018; Mollick, 2022). Co-management initiatives are typically implemented when a government may have a lack of control surrounding an area, and surrendering some elements of governmental control may prove to be favorable in terms of being able to regain control of a certain population (Islam et al., 2018). Co-management implementations are also favourable when attempting to maintain or work towards the sustainable development of a resource or ecosystem (Gelcich et al., 2006; Aswani & Hamilton,

2006). Combining local knowledge unique to an ecosystem or resources with that of governmental actors and powers has the ability to fill knowledge gaps regarding a resource or ecosystem. As such, on paper co-management is an extremely effective strategy. However, in practice and in academia, co-management is not without its critics (Gelcich et al., 2006).

A lot of criticism regarding co-management implementations speak to a lack of stakeholder inclusion on one level or another (De Vos & Van Tatenhove, 2011). On a wider level, criticism typically stem from issues such as power, scale, competition, learning, communication, and values, with more specific repercussions respective to each site (Ratner et al., 2012; Wilson et al., 2003). The corruption of governing bodies, as mentioned above, and a lack of compliance from local stakeholders are regularly considered as faults within a co-management system. These issues are not only contextualized to specific institutions, but often have complex relationships with one and other, further complicating potential solutions. Multi-scale ecological issues require complex solutions, often requiring specific needs tailored for a respective implementation (Berkes et al., 2008).

Beyond this, some critics state that co-management is a western concept, and does not adequately suffice in addressing issues in the global south (Stevenson, 2006; Fennell et al., 2008). Some scholars argue that the hierarchical governance and larger social structures that exist in many global south countries prohibit a successful implementation of co-management (Kimengsi, 2019). Particularly in countries that have exited from a caste system such as Bangladesh, elements of the caste system remain within certain social structures which works to limit the ability for lower-class individuals to effectively interact with governing structures (Ray & Bhattacharya, 2011; Ferdous, 2023). With that said, I think it is fair to say that there are marginalized people in every nation of the world who are discredited by their respective countries' policies. To take things further, some scholars argue that within a neoliberal economic system, effective co-management is not possible (Michaels, 2014). Regardless of the attempts to better align the ideals of both governing and non-governing stakeholders through co-management, neoliberal economies are unlikely to sacrifice a profit-oriented nature in order for the demarginalization of a group (Bogert et al., 2022). As such, within a co-management system, it is typical that the lowest level stakeholders, or the stakeholders with the least social powers,

are often the ones who are guided to make compromise (Jentoft, 2000; Castro & Nielsen, 2001; Plummer & FitzGibbon, 2004). It should be stressed that co-management is a governing tool, and like any governing tool it is not neutral and is typically representative of a larger political character (Ringeling, 2005).

2.3.3 Co-management institutions in the context of the Sundarbans

Although co-management was introduced to Bangladesh in the mid 1990's, it wasn't until 2009 that co-management had reached the Sundarbans (Mollick et al., 2022). Preliminary projects such as community-based forest management Phase I and Phase II, as well as Management of Aquatic Ecosystems through Community Husbandry (MACH) (1999-2008) project laid much of the groundwork in bringing co-management institutions to the Sundarbans (Thompson et al., 2003; Ali & Thompson, 2006). The Nishorgo Project (2003-2008), began building preliminary institutions in Satkhira towards the end of the projects existence, when the development of the Integrated Protected Area Co-Management (IPAC) plan took over in 2009 (2008-2013) (Siddique et al., 2024). The development of the Climate-Resilient Ecosystems and Livelihoods (CREL) project (2012-2017) marked the end of USAID funded co-management institutions in the Sundarbans, as all projects to this point were funded by USAID (Nishorgo, 2017). The Sundarbans Management Project (SMP) (2017-2022) was installed by the federal government and began the shift of co-management institutions ultimately being managed by the country's own federal powers (Worldbank, 2024). The SMP was initially met with limited success, as the project did not receive any funding until the Sustainable Forest and Livelihoods Project (SUFAL) (2019–2024). Following a multi-year pause between institutions, co-management institutions were reinstated in 2023. It should be further noted that during the shift to federally funded institutions from USAID-based institutions, Bangladesh installed the Protected Area Management Rules 2017, which outlines the desired functions of co-management institutions. Academics have criticized the Protected Area Management Rules 2017 for prioritizing profit-driven incentives (Siddique et al., 2024).

The institutions are meant to be split between a three-tiered hierarchy, however, in practice limited roles are realized (Mollick et al., 2022). Although these roles may have been realized in past institutions, the current institutions remain quite informal to the point where many

stakeholders are confused as to their own role within the institutions. The middle tier of the three-tiered hierarchy, referred to as the Peoples Forum, arguably has morphed into a single institution alongside the Village Conservation Group (VCF), which traditionally existed in the bottom tier of the co-management hierarchy and consists of the most localized, resource-dependent stakeholders. Members of the VCF group band together alongside forest staff to act as a Community Patrol Group or CPG. Together, they monitor the forest in attempts to ensure judicial justice as well as protection towards ecological threats. Within the institutions, some stakeholders have formal roles such as president, vice-president and cashier, which were traditionally roles of the PF. With that said, the institutions are supposed to be inclusive to all resource-dependent stakeholders, regardless of if they have an official position or not.

The highest tier of the institutions exists within its own hierarchy, as the tier consists of two groups where an executive and non-executive group come together to form a co-management committee (CMC). The CMC receives 50% of the Forest Offices tourism profits, then attempts to allocate this funding in accordance with what they determine as community needs.

Theoretically, executive and non-executive stakeholders meet and discuss conflicts that involve stakeholders in both groups. Historically, non-executive and even some executive members have lacked space in the institutions to engage in meaningful discussion (Siddique et al., 2023).

2.4 Common vulnerabilities and viabilities impacting small-scale fisheries

Small-scale fisheries face several key vulnerabilities that have been identified throughout a wide array of literature. Although not all small-scale fisheries face the same issues, Islam and Chuenpagdee's 2022 work outlined five key factors which drive vulnerabilities among small-scale fisheries; these factors can widely be generalized as biophysical, social, economic, technological, and governance. A deeper understanding of the specific vulnerabilities which impact a small-scale fishery would provide context towards relevant solutions and further provide justification for policy implementations. Understanding the socio-economic significance of fishing practices in Bangladesh, Bengali small-scale fisheries contribute significantly to the national food and protein supply, domestic job creation, and foreign trading (Diba et al., 2022). Understanding how elements relating to these respective fishing practices are impacting the viability, or vulnerability of SSFs provides context towards practices relating to the site itself.

It can be helpful to imagine a development process on a scale, with one extreme representing vulnerability, and another representing viability, while the movement in either direction being considered as a transitional period. It is important to acknowledge that one element of a system can trend towards vulnerability or viability independently, while related elements may trend the opposite direction. The viability of a system is understood through several facets, including economic, social, as well as ecological (v2v.com, 2023). The focus on a transition would be relevant to potential economic, as well as livelihood benefits for the most local stakeholders involved (small-scale fishers). Other factors are involved when considering the transition from vulnerability to viability for fishing communities, including the resilience of a respective ecosystem (Islam et al., 2021).

2.4.1 Factors which impact the vulnerability and viability of co-management

Each co-management institution's specific vulnerabilities will be contextualized to the institution. While specifications will be realized when studying a particular institution, generalizations still can be made when typical vulnerabilities that face co-management institutions. An understanding of several factors which drive a transition towards vulnerability or viability specified to the Sundarbans is available above, throughout section 2.2. Although section 2.2 poked at the general validity of co-management institutions in liberating oppressed stakeholders, it identified that a major criticism of co-management is the inclusion and participation of local stakeholders. This section will primarily focus on factors which limit participation in co-management institutions. Governance structure and decision-making, lack of economic motivations, lack of social motivations, and lack of ecological motivation have been noted as constraints to stakeholder participation within co-management institutions (Kimengsi et al., 2019).

It should be considered that many co-management institutions are effectively defective in their structure or decision-making process, should they fail to adequately encapsulate the views or generally communicate with fishers. As small-scale fishers exist among the most marginalized populations in the world, distrust in governing structures among small-scale fishers is not uncommon (Matera, 2016; Crona & Bodin, 2010). Beyond this, factors such as corruption and a lack of transparency increase dis-trust of local fishers in governing institutions. Small-scale

fishers typically have little reason to have faith in their governing institutions, as most countries' institutions often fail to properly account for the well-being of small-scale fisheries throughout their policy. Oftentimes, the lack of institution trust from locals exists as a significant contributor to a lack of fisher participation. If they do choose to participate, the reality is that many fishers do not see real benefits from co-management institutions. There could be an argument made that participating in or complying with some institutions may act as a detriment to a fishers economic well-being. Small-scale fishers, particularly extremely marginalized fishers, will typically interact with the institutions based on what they perceive will bring the most benefits (Siddique et al., 2023). Whether those benefits are complying with the formal governing institutions, or non-compliance with the institutions, fishers are likely to do what is perceived as best for them. This logic is typically consistent with perceived ecological benefits (Kimengsi et al., 2019; De Pourcq et al, 2015). As economic and ecological benefits are largely dependent on the ability for a co-management institution to organize and build itself to be resilient to internal or external factors which limits institutional viability, the organization and structure of a governing institution is integral and should be understood as a critical component for stakeholder participation.

Social motivations can be understood as the ability to improve a stakeholder's livelihood or social status or promote greater social cohesion among stakeholders (Kimengsi et al., 2019). With that said, social factors such as stakeholder demographics have shown to be a large factor in participation. Specifically, gender repeatedly has been shown to be a significant factor when considering local participation in co-management institutions (Smith, 2012; Nunan & Cepic, 2020). Many of these studies point to gender and domestic roles, a lack of education, training, and knowledge, as well as the in-place power dynamics act as a constraint to the involvement of women in the institutions. Women possess specific gendered knowledge which cannot be accounted for within co-management institutions without the participation of women. As such, an institution which fails to account for the participation of women will at best be inefficient. Beyond gender, factors such as age, caste, and economic class often obstruct social cohesion. Generally, aspects of a stakeholders identity which can contribute to discrimination often renders a stakeholder unable to adequately interact with a co-management institution. Aspects of stakeholder identity are key to concepts such as social capital and are representative of benefits

they may receive from governing institutions. Without adequate distribution of social capital, stakeholders are often powerless in co-management institutions, often rendering the institutions obsolete for them.

Factors which limit stakeholder participation are plentiful. I have generalized and broken several key issues down into two larger groups: factors relating to governing structure and organization, and factors relating to social capital. In contrast, drivers of participation are typically rooted within socio-cultural, economic, or political benefit (Coulibaly-Lingani et al., 2011; Ranjit, 2014). Cultural, financial, and ecological benefits, or other forms of incentivization are established drivers of participation (Islam et al., 2013; Raufirad et al., 2017). Co-management is often criticized due to its regular inability to promote adequate stakeholder participation. As research continues to investigate stakeholder participation, researchers typically come to the consensus that issues with governing structures, specifically involving the organization of institutions, financial and ecological incentives, or other issues surrounding social capital are plagues to the increased participation of local stakeholders.

2.4.2 Examples of national fisheries management that are recognized as successful

While most countries' small-scale fisheries increasingly deteriorate while simultaneously maintaining a strong economic dependence on the industry, there is a need to establish legitimate change in national global fisheries management. This section outlines examples of nations who built their fisheries industry to represent the demarginalization of small-scale fishers and sustainability of fishing resources while still existing as a major economic sector. I point to Norway and the former Soviet Union as examples of nations who built an economically prosperous fisheries industry while simultaneously demarginalizing fisher livelihoods and promoting ecological sustainability. These two nations supported the well-being of fisheries and fishers through various means, including the development of education, healthcare, infrastructure projects, and policy specified for small-scale fishers. These examples show the contrast of a market-based fisheries Norway, and a nationalized fisheries industry in Soviet Russia, in their respective paths to promote the viability of fishing industries. These two examples were chosen as they are widely regarded amongst the most successful fisheries management of their respective times.

Norway is considered a modern leader in fisheries sustainability and management (Melnychuk et al., 2017). In response to depleting fisheries resources, the nation installed a quota system to strengthen ecological and economic goals, while working to protect Norwegian fish stock (Alizadeh Ashrafi et al., 2023). The fishing industry remains highly profitable and is a central aspect to the Norwegian economy (Johansen et al., 2019). Young Norwegians are increasingly interested in entering the fisheries industry, a stark difference from most nations (Standal & Hersoug, 2023). Today, fishers in Norway earn more than the national average (Nielson et al., 2018). Beyond this, Norway has gained international notoriety for their strong social programs. Education facilities have adapted to meet the needs of rural Norwegians through the development of smaller schools, distance education and transportation access (Solstad & Andrews, 2020). While the Norwegian healthcare system isn't perfect, there is still universal coverage accessible in all rural areas across the nation (Straume & Shawb, 2010). Various legislation and institutional tools such as co-management have contributed to the demarginalization of Norwegian fishers' overtime (Fedreheim & Blanco, 2017). Today, the fisheries industry remains central to Norway's economy, as the seafood sector accounted for 2.3% of the nation's total GDP in 2022 (Lahiri, 2024).

Although today Norway is understood as a leader in fisheries management, they are not without fault. From the mid 80's to the mid 90's, Norway was going through significant economic turmoil which resulted in large shifts in various industries, including the fishing industry (Jakobsen, 1996). This only further accelerated Norway's trajectory which had increasingly been moving towards market-based fisheries management. During this transitional period, implemented quota systems and legislation favoured larger industrial fishers over small-scale fishers, a criticism which still affects the nation today (Johnsen & Jentoft, 2018). Over the years, fishing policy and institutions have continuously favoured larger industrial fishers, limiting the viability of Norwegian small-scale fishers (Hermansen & Dreyer, 2010). More recently, Norway has been criticized for disregard to fisher safety, limited market access, a lack of consideration in decision-making processes, disregard for female fishers, and land tenure remains an issue for the nations marginalized (Thorvaldsen et al., 2022; Gerrard & Kleiber, 2019; Jentoft et al., 2019).

Beyond these factors, Norway still struggles with overfishing, despite the quota system (Standal et al., 2022).

In comparison, the USSR fishing industry was heavily monitored to ensure that fishing practices met national demands. The Soviets developed an industry with an evident career structure and high pay-rates (CIA, 1975). They build secondary and post-secondary institutions near small-scale fishing communities to further support the industry. Healthcare was free of personal cost, basic health services were available in all rural areas, and specialized healthcare was available in over 98% of rural district centres (Balabanova et al., 2004; CIA, 2008). Cooperatives were incentivized for fishers and agriculture workers, mitigating issues with land tenure. Quota systems and other conservation implementations were introduced to respect aqua stock (Solecki, 1979; Ivaschenko, 2013; Jacobson & Weidner, 1989). The Soviet fishing industry remained a world leader in both production and national policy from the early 1970's till the fall of the USSR in 1991. In fact, Soviet Fisheries Aid programs contributed over \$115 million, or over \$803 million in 2025, for the development of fisheries industries around the world, specifically nations which bordered the Indian ocean (CIA, 1975).

It should be noted that following the fall of the Soviet Union, the fisheries sector collapsed, and modern Russia began rapidly industrializing their fisheries sector to become market-based (Osterblom & Folke, 2015; Nilssen, 2022; Nakhshina, 2016). This led to the direct loss of land tenure for many small-scale fishers, and the loss of centralized fisheries resources such as the provision of fisher marketing, equipment, and transportation (Shaw, 2020). During this time, private industries dominated, and many small-scale fisheries became unprofitable, and were forced to end their operations. Small-scale fisheries in modern-day Russia are now most commonly practiced by some northern Indigenous groups, however, they are largely diminished from what they once were, and unaccounted for in policy (FAO, 2022). Russia's industrialization of fisheries caused a massive loss of fishing cultures to the point where there is no federal legislation which recognizes small-scale fisheries.

No large-scale industry, especially a market-based industry, will be without fault and oversight. Both the former U.S.S.R. and modern-day Norway have been accused of overfishing and

significant resource exploitation. With that said, upon recognition of overfishing, the U.S.S.R. respected newly implemented quotas set by the International Whaling Commission among other international organizations, restocked their fisheries, and limited fishing practices. I point to Norway and the former Soviet Union as examples of countries who effectively supported small-scale fishers in improving qualities which directly impact quality of life, such as education, healthcare, increased earnings, and infrastructure. This was done while the fisheries industry remained as a significant contributor to each national economy. Although both nations implemented quotas and placed a high value on the education and healthcare for rural people, it should be recognized that Norway's fishing industry increasingly shifted to become market-based in 1991, while the Soviet industry remained nationalized until the fall of the USSR in the same year. Small-scale fishing was an extremely viable career path in the former Soviet Union and remains a somewhat viable career path in modern Norway. While small-scale fishers existed as a significant contributor to the Soviet economy and society, fishing in Norway has largely moved to favour larger industrial fisheries.

2.5 Legal pluralism

The validity of customary order has increasingly been recognized as an effective means of managing natural resources (Swenson, 2018). Customary order is noted for its ability to promote the viability of marginalized livelihoods, while promoting the long-term sustainability of a commons. Customary institutions are often considered to be more advanced than statutory order in promoting sustainability and legitimacy (United Nations Development Program et al., 2012). While customary order is often recognized as an effective and efficient means of promoting reflective community preferences, it is also recognized as a barrier to effective governance by some scholars (Harper, 2011; Farran, 2006). Legal pluralism refers to the co-existence of multiple legal orders applicable in one scenario (von Benda-Beckman, 2006). Legal pluralism typically refers to the coexistence of statutory and customary orders, where the former represents a formal legal system while the latter represents the often undefined social structures which societies historically used in forms of self-management. The general use of the concept has drastically increased in various management and legal studies since the turn of the 21st century, and in its application in fisheries research also gaining intensity.

That being said, most academic uses of legal pluralism exist in a theoretical realm, without application to real-life settings. There is a significant gap in theoretical knowledge of legal pluralism, and the application of legal pluralism (Swenson, 2018). Large bodies of research have been dedicated towards understanding the impacts of statutory and customary orders in reference to their relationship with one and other, and how the relationship led to the development of respective management institutions (Fukuyama, 2011; Merry, 1991). Legal pluralism is commonly used in research relating to colonization, where authors attempt to decolonize legal theories, institutions, and policies through a conceptual analysis (Benton, 2002; Seminario, 2024). While various authors have applied the concept of legal pluralism to small-scale fisheries management, it remains true that the application of legal pluralism has few case-studies. Beyond that, there is only one major framework for legal pluralism specifically applicable to small-scale fisheries (Bavinick & Gupta, 2014).

There is a lack of applicable legal pluralism frameworks available in literature. In his proposition for a new framework in a 2018 work, Swenson identified four different types of legal pluralism, described as 1. Combative, 2. Competitive, 3. Cooperative, and 4. Complementary. Through these definitions, Swenson hoped to highlight the different contexts in which customary and statutory orders may interact. He further identified five strategies international and national actors utilize to influence non-state stakeholders, particularly in a manner which demeans customary order. Swenson identified factors such as bridging, harmonization, incorporation, subsidization, and repression as strategies used by justice systems to repress customary order. His framework wishes to highlight the relationship between the identified types of legal pluralism and its own respective means of oppression.

Specifically designed for the context of aquatic regimes, Bavinick and Gupta in their 2014 work developed a framework to understand legal pluralism. The authors continued work of past scholars and through their application of the concepts of weak and strong legal pluralism to aquaculture governance. The concept of weak and strong legal pluralism was initially developed by Griffiths 1986 work, which exists as a seminal work in legal pluralism studies. While different scholars may have slightly different perceptions towards what strong and weak legal pluralism is and an understanding based on how the concepts have changed overtime, Griffiths

understood strong legal pluralism to be a true sense of pluralism where different legal orders are typically existent in harmony, where some contest between the order may still occur. Generally, weak legal pluralism refers to institutions which fail to recognize customary order, while strong legal pluralism exists as an institution which successfully recognizes customary order in its implementation of various policies, programs, or institutions (Woodman, 1998). While the concepts of weak and strong are commonly used in legal pluralism literature, Bavinick and Guptas framework allowed for the designation of either weak or strong legal pluralism specifically in scenarios involving aquatic governance. The authors further recognized the same four types of legal pluralism as Swenson, however attributed the concepts of weak and strong to the typologies.

When considering these four typologies, some management institutions may exist in the intersection between them. Characterizing specific typologies as automatically promoting strong legal pluralism may be inaccurate if the institution still fails in effectively promoting customary order in a means which represents sufficient mutual recognition of orders. This fails to fully portray what strong legal pluralism can mean in the promotion of the long-term viability of small-scale fishers. Generally, different authors' understanding of what strong legal pluralism is, and what it wishes to accomplish varies. This study specifically wanted to investigate Ralf Michaels' argument that strong legal pluralism is incompatible with market-based neoliberalism and state-based liberalism in the context of the co-management institutions in Satkhira. As such, the designed framework attempts to focus on management rules and activities in relation to various traits associated with 'strong' and 'weak' legal pluralism. These traits are based on common standards applied to community-based management, as well as traits central to a neoliberal-based market. They are described in more detail below.

Strong legal pluralism will reflect a society which has reduced conflicts amongst local people and the relevant governing or legal orders (Schmid, 2001). Neoliberalist economies favour transnational markets over state domination, which ultimately works to relieve legal interest from public goods and services to favour a global profit-oriented system (McKerracher, 2023). As such, conflict is often inspired by domination of a global economy which in itself exacerbates local lives and livelihoods (Arthur et al., 2021; Islam & Herbeck, 2013). In a similar light,

authors argue communication channels used in community-based governing structures are often leveraged to promote the interests of statutory order, which fail to reflect the interests of low-power stakeholders such as small-scale fishers (Tamanaha, 2008; Egan & Place, 2013; McKerracher, 2023). Poor tenure rights and soft corporate regulation are consequences of contemporary capitalism, where neoliberal markets promote the privatization of property which in many contexts leads to the loss of accessibility to a commons (Siddique, 2023; Culter, 2013; McKerracher, 2023). The relationship where private interests are favored over livelihoods and sustainable management of resources leads to increased crime and a lack of institutional compliance (Carothers & Chambers, 2012; Siddique et al., 2023). As defined for this study, evident traits which reflect weak legal pluralism exist as 1. poor tenure rights on behalf of fishers, 2. high crime rates or lack of institutional compliance, 3. the general degradation of a common-pool resource, and 4. poor or ineffective channels for communication. Traits reflecting strong legal pluralism are defined as 1. well defined tenure rights, 2. legal protections and recognitions of livelihood practices, 3. management promotes long-term sustainability of a commons or natural resource, 4. sufficient incomes, 5. supportive of both local and national economic stability, and 6. means of conflict resolution between stakeholders. All traits are identified within the designed framework, shown below in table 1. This framework is meant to represent the ability or inability for customary order to exist as equal to statutory within a neoliberal market.

Legal pluralism attempts to better understand the interactions between statutory and customary orders, which is the reason for its application in this study. It questions the extent and validity of different forms of law. As such, an understanding of the larger context that the law exists in may prove to be helpful. A legal pluralism framework was designed using aspects of past frameworks; however, it was adapted to represent two specific elements central to legal pluralism, which is the inclusion of local stakeholders, and the ability for an institution to succeed within its wider governing context. It identifies aspects of both market-based and nationalized fisheries management. The framework was applied to chapter 4 of this study to better understand the interactions between statutory and customary institutions. This framework was applied to both the management plan as well as the specific context of the newly imposed fishing restriction. This framework attempts to define a successful weak and strong legal

pluralism and identify representative aspects of each state. It hopes to outline differences of fisheries management in different economic contexts.

Table 1. Legal pluralism framework

Description of Legal Pluralism	Signs of Legal Pluralism
Weak Legal Pluralism: Weak legal pluralism is understood when a lack of recognition of legal orders promotes increased crime, environmental degradation, while simultaneously hurting the viability of long-term livelihood practices.	● Poor tenure rights ● High crime or lack of institutional compliance ● Environmental degradation and loss of natural resources ● Little to no avenues for effective communication
Strong Legal Pluralism: Recognition of multiple legal orders in a means which promotes the long-term sustainability of a commons as well as the respective livelihood practices	● <i>Defined tenure rights with respect to livelihood needs and ecological boundaries</i> ● Sufficient legal protections and recognition of livelihood practices ● Long-term sustainability and preservation of commons and natural resources ● Defined sustainable livelihood practices with <i>earnings which support full-time work in the industry</i> ● Supportive of local and national economic stability ● Mutual recognition between legal orders, where gaps in recognitions are addressed through a formal legal system

2.6 Gaps

The co-management institutions in the Sundarbans are relatively under researched, despite the ecological significance of the land and global significance of co-management. There is a further gap in an understanding of the respective challenges and opportunities in the Sundarbans (Rahman, 2022). The study hopes to better contextualize the institutions and understand the related vulnerabilities and viabilities in hopes of addressing these gaps. Beyond this, there is a need for better defined specifications for how strong legal pluralism can be achieved and what it means to achieve it. In the designed framework, I wished to express characteristics of what decolonial scholars considered as strong legal pluralism, while building on the works of Swenson, Bavinick and Gupta. Further, while legal pluralism is regularly analyzed as a theoretical concept, its application is still in the growing stage (Swenson, 2018). Application of concepts such as ‘weak’ and ‘strong’ legal pluralism is specifically lacking in fisheries research. Fisheries research, while regularly recognizing globalization as the key driver of the marginalization of small-scale fishers, rarely maintains a focus on globalization processes itself. As such, should globalization be understood as the driver of fishers’ marginalization, and neoliberal economies being recognized as providing a roadway for globalization, regular case-studies which recognize fisheries management as promoting weak legal pluralism may establish further justification for researchers to investigate the viability of sustainable fisheries being supported by neoliberal economies. This study further uses the co-management institutions in Satkhira as a case-study to better understand if strong legal pluralism is possible in a neoliberal setting or through neoliberal conservation.

Chapter 3: Study Site and Research Methods

3.1 Introduction

This chapter overviews and describes the methodological processes conducted in order to complete this research project. This chapter begins with an overview of the research site location, followed by various components of research methodology such as the literature review, semi-structured interviews, and observations. The chapter ends with respective sections for data analysis, project limitations and ethics approval.

3.2 Case study location and union criteria

This study aimed to represent the effects of co-management on the livelihoods of small-scale fishers. To do so, four criteria were determined in selecting study unions. Unions were selected based on if they had past and current co-management institutions, whether they hosted a significant small-scale fishing population, their proximity to both each other and the forest, and ease to travel. The four selected unions can be seen below on figure 1.

3.2.1 Brief description of study site (union selection)

The following section seeks to describe the four unions selected to represent the Bangladesh portion of the Sundarbans. The unions were predominantly selected for their identification with the current and past co-management institutions. The selection was confirmed after consideration of their geographical proximity to each other. As mentioned above, Munshiganj, Gabura, Burigoalini, and Koikali were the four unions focused on in this chapter. All four unions are attempting to deal with significant ecological change, while resource-dependent users are attempting to deal with respective livelihood impacts. Satkhira was selected as the range of focus for this study.

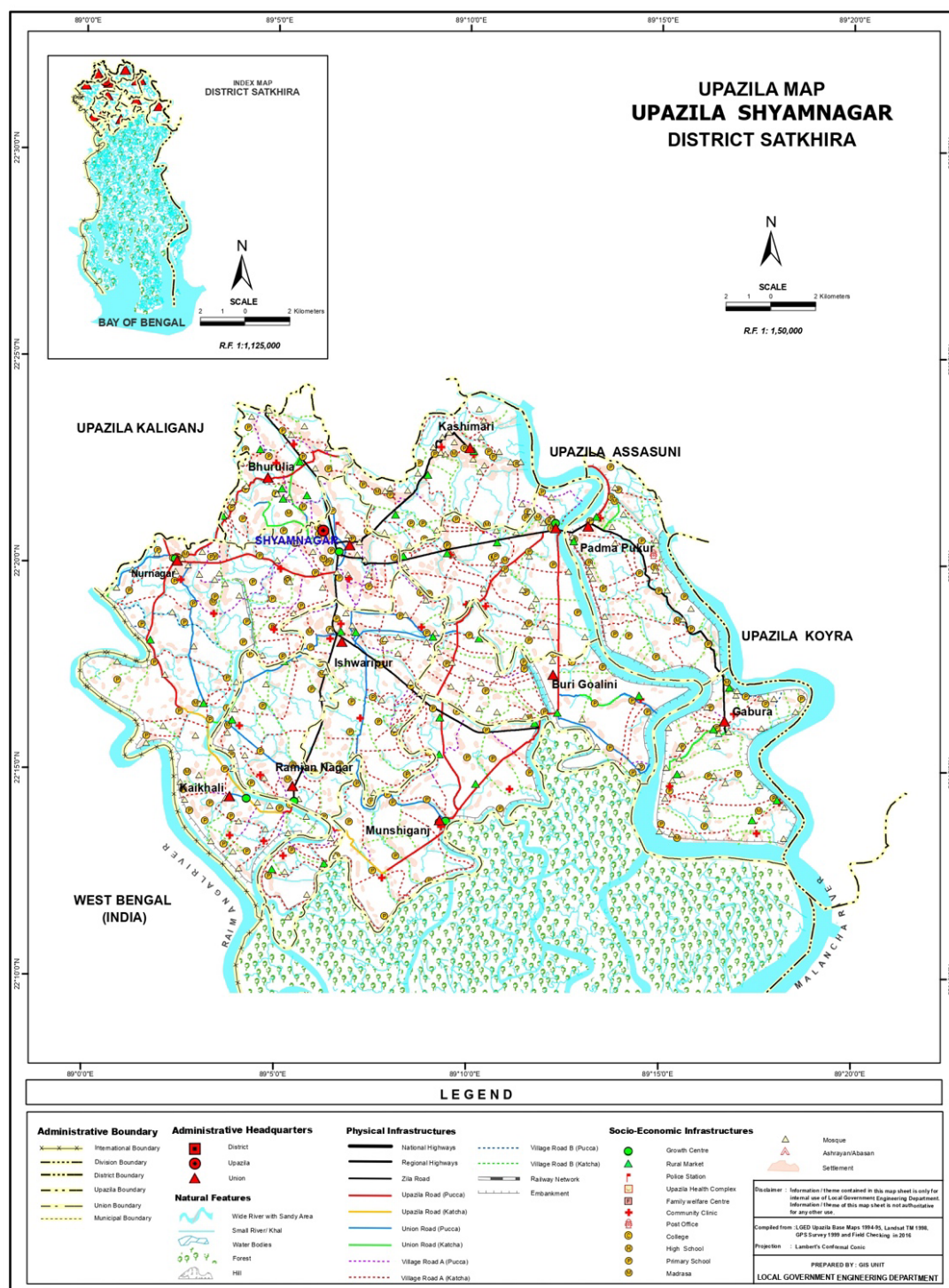


Figure 1. Shyamnagar upazila map, prepared by Local Government Engineering Department (2016)

3.2.2 Munshigonj

According to census data, Munshigonj union is home to over 31,000 individuals and has the largest population amongst all unions visited (BBS, 2011). Between all four unions, Munshigonj has the largest market and fishers often sell their fish in Munshigonj. Munshigonj hosts significant plant life and is the most easily accessible amongst the four unions (Ray & Mondal, 2018). Travel to Munshigonj is possible solely through on-ground transportation. Munshigonj is one of the largest unions in the Sundarbans and is a commonly used union for studies (Huq, 2022; Ray & Mondal, 2018; Getzner & Islam, 2013). The unique environment of the Sundarbans has favourites, however, Munshigonj is not one of them as they are amongst the most vulnerable to climate change within the Satkhira district (Hoque et al., 2013). High salinity in the forest has disproportionately impacted Munshigonj, impacting agricultural production and biodiversity. Munshigonj remains amongst the most affected unions when considering the ecological impact of the forest salinity. The southern edge of the union perches into the forest, while the top half exists as village areas. Beyond this, Hoque et al. found that most resource-dependent actors in Munshigonj have moved away from the traditional one job, and often change their occupation depending on season, among other factors. The area, like most unions in Satkhira, has undergone significant ecological change in recent history, and is likely to undergo further significant changes. This in combination with several other factors has led to a significantly declined fish catch for resource collectors in the Sundarbans. High salinity in the area further inspires adverse health effects.

3.2.3 Gabura

When considering the four selected unions, Gabura's environment is potentially the most unique and unforgiving. Gabura is a miniature island and is only surrounded by harsh waters. Although Bangladesh is amongst the rainiest countries in the world, coastal erosion, increased sea levels, increasing levels of temperature and heatwaves, and increased levels of rainfall have made Gabura specifically vulnerable (Mollick, 2024; worldbank, 2021). The extreme humidity further makes Gabura slightly warmer than the national average in Bangladesh, with a yearly temperature of 28.1 degrees Celsius (Hossain, 2023). The extreme environment makes Gabura very susceptible to natural storms, cyclones, floods, among other natural catastrophes. Gabura has been struggling in the face of severe ecological change and dealing with the respective

livelihood effects. Gabura has poor ecological and infrastructural support, which leaves them more vulnerable to natural disaster. For example, Gabura was hit hard by Cyclone Alia, with 28 villagers passing away, which accounts for almost half of the total deaths caused by the Cyclone in the forest. (Tajrin & Hossain, 2017). Gabura further has the lowest literacy rate among all four unions, with about 31% of its population of 31,000 being literate (Khalil et al., 2019). Shrimp farming was and remains significant in the area. Fishing, farming, and salt production are common livelihood means for those in Gabura. Women are regularly involved in maintaining and preparing paddy fields, although much of the paddy fields that used to rule the lands of Gabura are now non-existent (Moniruzzaman, et al., 2018). The further transformation of former agricultural lands into fishing lands changed the economic layout of the union for the worse, and in combination with raising land prices helped push resource-dependent people to migrate out of the union. The assisted an extreme loss of livelihood in the 1990's further placed economic tensions in the union. Political instability and violence are common in the union. In unions throughout the Sundarbans, Gabura account for the most tiger attacks, hosting just under 60% of total attacks (Ferdiousi & Khan, 2021). For these reasons, Gabura is considered amongst the most vulnerable when considering all unions falling inside the Shyamnagar district.

3.2.4 Koikali

Koikali exists as the border edge of the Sundarbans, acting as the last piece of Bangladeshi land prior to crossing into India. Due to proximity, the fishers may benefit from conservation measures implemented by their Indian counterparts. Simultaneously, fishers are dealing with the realities of living extremely deep into the forest, in an environment somewhat isolated amongst the resource dependent. However, similarly to Gabura, the extreme salinity of the water furthers extreme marginalization amongst stakeholders in Koikali, which specifically emphasizes the struggles of women and children (Rahman et al., 2020). The unique environment inspires further ecological catastrophe. Natural disasters such as the Sidr and Aila Cyclones significantly impacted the union and shaped subsequent development work (Tabassum, 2017). Koikali is further host to members of the Munda community, an Indigenous group which has been tied with the Sundarbans for hundreds of years (Roy, 2022). When compared to Gabura, a smaller but still significant portion of tiger attacks occur in Koikali (Ferdiousi & Khan, 2021). Between the four

selected unions, Koikali is the largest union by size, smallest by population, and exists with a predominantly female population (BBS, 2011).

3.2.5. Burigoalini

Like all other unions, Burigoalini remains vulnerable to climate change and increasing globalization. A single river separates the mangrove forest from the union, and land has largely shifted away from agricultural practices (van Schie et al., 2022). High saline levels have led to high pH levels in the Burigoalini soil, impacting agriculture production and livestock (Alam et al., 2017). High saline levels caused by rising sea levels has further negatively impacted fishing conditions as well (Dasgupta et al., 2016). While this impacts the entirety of the forest, excessive alkaline is found in the waters and soil of both Burigoalini and Gabura, damaging the integrity of the agricultural practices, water systems as well as the health of locals at a higher rate than other unions (Ashrafuzzaman et al., 2022; Islam et al., 2017). While various water cleaning measures exist, fishers remain vulnerable (Ansari & Roy, 2010). Due to the geographical relation and factors such as high pH levels in their soil and in their water, Burigoalini and Gabura regularly deal with the same ecological impacts. Cyclones and tidal floods also present a large concern in Burigoalini. Burigoalini remains highly vulnerable to socioeconomic processes and changes while showing an inability to adapt, forcing them to directly deal with the repercussions of a changing climate (Amin and Shammin, 2022; Didar-UI Islam et al., 2015; Tajrin and Hossain, 2017). A significant portion of the local industry in Burigoalini is dedicated to shrimp cultivation (Rezoyana et al., 2023).

3.3 Research methodology

Research methodology speaks processes involved with identification, collection, processing, and analyzing of information relevant to this study. This process is critical to the reliability and validity of a study. As mentioned earlier, this study is a phenomenological case-study. A qualitative approach was used for this study to identify social trends, such as stakeholder motivations, beliefs, and to better contextualize human behaviour and interactions in context with the changing environment and management institutions in the Sundarbans (Creswell & Creswell, 2018). As the purpose of the research exists, identifying social trends related to the co-management institutions and introducing respective recommendations, a qualitative study was

appropriate as it allowed to build an in-depth understanding of various social processes. Specifically, the qualitative approach is renowned for its ability to understand and describe the ‘what’, ‘why’, ‘when’, ‘where’, and ‘how’ of a research problem through its ability to understand various stakeholder roles in attempts to understand complex phenomena (Lim, 2024). Qualitative studies are noted for their ability to contextualize phenomena within their natural environments and gain an understanding of the respective human experience.

This research specifically utilized a phenomenological approach, which is described by Creswell & Creswell (2018) is a strategy where researchers identify human experiences regarding a phenomenon as described by study participants. It can be understood as the study of experiences, consciousness, structures, and essence respective to a stakeholder group(s) (Creswell, 2007). This research attempts to reflect stakeholders' real experience with a phenomenon, in order to describe the essence of all stakeholders culminated experiences. This approach offers researchers the ability to understand the meaning and analyze stakeholders' lived experiences, specifically within their naturally occurring setting (Johnson, 2019). Further, this study was conducted as a case-study to better understand the specific co-management institutions in Satkhira, rather than building a generalized understanding of co-management institutions.

Phenomenological research involves a three-step process which is known as 3 R's, which can be broken down into reduction or bracketing, reflection, and refinement or coding (Lim, 2024). The reduction or bracketing process consists of a temporary elimination of personal judgements and biases in order to collect direct, raw data (interview responses). Open-ended questions allowed for stakeholders to have flexibility when speaking to certain topics and guide them to speak respective to their perceptions of the topic. The reflection process involved an intuitive interpretation process, where time was spent reviewing the data to understand the essence of stakeholder responses. The refinement or coding process attempts to synthesize a variety of stakeholder input into common themes. This is done after reviewing the data, identifying common themes recurring within the data, and assigning respective stakeholder responses with the theme that is most appropriate. Specifically, this type of phenomenological study can further be understood as a hermeneutic phenomenology, where the study focuses on experience as a structure which impacts human life (Smith, 2003). This study was conducted as a phonological

case-study to specifically understand how stakeholders understand how fishers are impacted in accordance to how the co-management institutions.

3.3.1 Research methods

This subsection will overview the research methods conducted in order for the completion of this project. This section will overview the processes surrounding the literature review, the semi-structured interviews, and observations collected.

3.3.1.1 Literature review

As the study was conducted as a phenomenological case-study, the literature review only existed as a minor focus in developing an understanding of the study (Fry et al., 2017). Although phenomenological studies often forego a literature review altogether, a literature review was still conducted in order to better understand, contextualize, and related themes of co-management, vulnerability, viability, and legal pluralism (Wertz, 2005). The literature review is available to read in chapter 2. An initial literature review was originally conducted during the preliminary stages of research for the project but was ultimately re-adjusted towards the end of the project to reflect how the project changed since the initial phases of research and to better understand research themes this project interacted with. Beyond academic literature, media sources and government documents were also used in the literature review. Primarily, only articles concerning marginalized populations were considered, which led to a focus on fisheries primarily in South Asia, as well as smaller focuses Sub-Saharan Africa and regions of South America. Some articles, primarily in the context of legal pluralism, had a focus on Indigenous people in Canada. European fisheries, while not ignored, were only included if the respective small-scale fishers were socially marginalized in a way in which they are overlooked in policy or otherwise lack access to education, healthcare, or fishing lands.

3.3.1.2 Semi structured interviews

All stakeholder data was collected via semi-structured interviews. All interviews were conducted as semi-structured in order to allow participants to answer questions in whichever way they wished. Semi-structured questions were further chosen as to not imply any biases as a researcher and allow stakeholders to address each question in accordance with their own personal beliefs, a

common strategy used in phenomenological studies (Ng, 2025). A snow-ball sampling methodology was used to find relevant stakeholders to interview (Naderifar et al., 2017). Interview data was collected between October 2023-Janurary 2024.

A total of 55 interviews were conducted, 46 of them involving small-scale fishers. The remaining 9 consisted of NGO stakeholders, governing actors, and academics. All interviewees were small-scale fishers or in some capacity working with small-scale fishers. Not all interviewees were related or familiar with the co-management institutions, they predominantly existed as community members who at some capacity was related to small-scale fishing. A variety of open-ended questions were prepared for respective types of stakeholders which can be found in the appendix.

3.3.1.3 Observations

Observation of stakeholder's day-to-day activities, working conditions, living conditions, and governing structures were noted throughout the collection of stakeholder data. These observations were used to address gaps in data, which failed to fully encapsulate the lived experience of stakeholders (Pfadenhauer & Grenz, 2015).

3.4 Data analysis

As common with phenomenology studies, bracketing was utilized for data validity, analysis, and collection processes (Johnson, 2019). Bracketing is a methodological tool used in phenomenology research that attempts to suspend a researcher's judgement during the data collection and analysis processes (Thompson, 2023). A central idea behind the application of phenomenology studies is to mitigate and deter preconceptions the researcher may have, allowing for a collection of objective data, and a respective objective analytical process (Smith, 2003). The bracketing process allowed me to continuously identify themes that were found in the data representative of stakeholders' lived experiences throughout the research process. The on-going identification of data themes emerged as an important aspect of this study, as the uncovering of some themes led to the further identification of more themes.

Bracketing is commonly criticized due to complexities in eliminating a researcher's personal bias

(Creswell, 2007). The counter argument exists as recognizing your biases in order to adequately tailor the research to be objective, and reflective of the stakeholders' viewpoints (Baksh, 2018; Alvesson & Sköldberg, 2009). As such, the reflection and refinement period can exist as significant components of phenomenology research. The reflection process specifically asks the researcher to overview the raw collected data in order to identify initial themes. This was done through a thorough review of interview responses until various themes appeared prevalent. Once themes were prevalent, descriptions of themes were written. The final element was the refinement process, where common themes were found, analyzed, and reported upon within this thesis. The refinement process further involved defining different stages of various themes that were identified within the interview data. These stages are available to read in the reach, transparency, and empowerment sections of the 4th chapter.

Generally, bracketing can be accomplished through the utilization of various research tools. Bracketing was accomplished for this work through the creation of open-ended questions, which allowed stakeholders to guide their responses in whichever way they felt appropriate. This allowed for a collection of stakeholder data without the interference of researcher bias. Beyond data collection, to ensure the elimination of researcher bias during data analysis, reflection and refinement were integral to my phenomenological research process, as the repeated cycle of these two elements allowed me to build a holistic understanding of stakeholder experiences based on the collected data. As the generally loose structure of phenomenological studies can be taken advantage of by researchers, the compliance with the three R's was a significant aspect of the data collection and analysis processes. As mentioned, data analysis was continuous throughout the majority of the research project. Data was analyzed manually, using Google Sheets.

3.4.1 Validity and reliability

Validity and reliability are central components to qualitative research (Creswell & Creswell, 2018). Validity and reliability represent a process in which that data is collected and analyzed in attempts to reach objective and unbiased conclusions. Validity and reliability were realized through the process of conducting the 3 R's, which is referenced in section 3.3. Beyond this, data

was triangulated with multiple data sources to ensure reliable themes were emerging that were consistent with the human experience in the study region.

3.5 Limitations and positionality

There are several limitations to this study. Language and cultural barriers provide opportunity for bias. Interview responses are also up to the perceptions of respective interviewees. This was addressed through traveling with locals, asking open-ended questions, as well as having someone to translate. Future studies analyzing the similar types of interactions may speak to any bias prevalent in this study. Beyond this, at the time of data collection, the co-management institutions were in their infancy. Since then, the co-management institutions may have impacted or otherwise undergone change as Bangladesh experienced significant regime change.

As a researcher collecting data, I recognized that the questions and language I used and the manner of which I conduct myself will have significant influence on how stakeholders will interact with me. As such, leaving questions as open-ended, allowing stakeholders to speak and asking secondary questions proved to be significant aspects in attempts to receive unbiased stakeholder data. My positionality as a researcher is reflective of my own lived experience. As my interpretations of the study region prior to entering the site existed through word of mouth and via the image that the relevant literature painted in my head, the bracketing process was significant in mitigating researcher bias.

3.6 Ethics

Ethical clearance was given by the University of Waterloo Office of Research Ethics, granted under case #45720. As approved, this study was found to meet the standards of the Tri-Council Policy statement on ethical conduct for research involving humans.

Chapter 4: Contextualizing the Co-Management Institutions in Satkhira

4.1 Fisher description of institutions, understanding the fisher's role

This chapter deals with the first two of three research objectives considered for this thesis project and is split into two sections. The first section addresses objective 1: To contextualize and conceptualize co-management in the Sundarbans to ultimately better understand how the in-place systems operate. To understand the fisher's description of the institutions, three categories were evaluated. The first was the reach of the co-management institution. This concerns how far the news of the co-management institutions were reaching, and if fishers were adequately receiving information surrounding the institutions. The second measurement focused on the transparency of the co-management institutions. This was to further reinforce if fishers were receiving information, and to better understand how fishers felt, in terms of trust, towards the institutions. The final measurement was the fisher empowerment. This measures to understand the extent of powers fishers have within the institutions. The chapter further looks at various social factors named by stakeholders in attempting to address objective 2: To understand vulnerabilities and viabilities in the co-management system, significant to small-scale fishing practices. Factors were recorded from fishing and non-fishing stakeholders, compared and analyzed. The comparison and analysis between stakeholders allow us to understand how fishers' relationships and understanding of the co-management institutions differ from non-fishing stakeholders. This allows for a stronger understanding of stakeholder perceptions of the co-management institutions. Reach, transparency and empowerment were selected as measurements as they were revealed through bracketing phases, as outlined in chapter 3.

Reach was measured as it contextualizes the scale of a fisher's interaction with the co-management institutions. Reach of an institution is not commonly measured, however, it was chosen to be measured for this study as it provided insight towards how well-known the co-management institutions were among fishers. Transparency is a commonly used metric to measure good governance (Kooiman et al., 2003; Guggisberg et al., 2022; Mollick et al., 2022). Transparency can be understood as increased access to information, where secrets are minimal and an understanding of other stakeholders' practices is known to a greater degree (Pettersson

2022; Birkinshaw, 2006). This leads to more clear information systems, as well as accountability from governing actors (Skerritt, 2024). Transparency was a focus of this chapter as transparency is regularly seen as a vehicle to drive legitimacy and compliance in co-management (de Vos & van Tatenhove, 2011; Nunan, 2020; Reed, 2008). Institutional trust is a significant aspect when considering fisher compliance, as such there is a need for some degree of institutional transparency (Silva et al., 2021).

Much like transparency, empowerment is often looked at as a condition of co-management (Jentoft, 2005). While scholars argue the degree of empowerment that is most beneficial for an institution, empowerment of marginalized stakeholders remains a baseline need for a successful co-management institution (Carlsson & Berkes, 2005; Ayers et al., 2018). Fisher empowerment cannot be treated as equivalent to an institutional blunder, as an institutional problem may be addressed and changed overnight, while the development of fisher empowerment will take longer. Fisher empowerment is therefore not only significant for what it means to the co-management institutions, but also due to the complexity that occurs in its development, and difficulties that may arise in its absence (Sowman, 2003; Hara & Nielsen, 2003; Finkbeiner & Basurto, 2015).

Interviews were conducted in over 10 villages, but predominantly within four Union Parishads. As the project was focused in Satkhira, four unions were chosen in the district. Munshigonj, Gabura, Koikali, and Burigoalini were the four major unions where interviews were conducted, and their respective reports are made available below. These unions were chosen due to their previous establishment of co-management-based institutions, as well as their proximity to each other.

4.2 Reach of co-management institutions

Co-management has been growing in the Bangladesh side of the Sundarbans since its implementation in 2009, through the Integrated Protected Area Co-management Project (IPAC) which helped develop initial VCF groups (Baten, 2024; Begum et al., 2021). Various projects have supported co-management in the Sundarbans since. However, the Sustainable Forest and Livelihoods Project (SUFAL) has been supporting the project since 2022 (Siddique et al., 2024).

While formal regulations and structures for the institutions exist, this section attempts to understand how these formal structures account for fishers. Co-management can be understood as a power sharing governing institution in which governments engage with one or multiple stakeholder groups to manage a natural resource (Berkes et al., 2001). While the participation of stakeholders in co-management systems may vary from institution to institution, co-management institutions are around the idea of an increased input of local value in a decision-making process. As such, through determining the reach of the current co-management institutions, we can better understand the role of fishing stakeholders in the institutions.

This section looks to understand the level to which small-scale fishers are involved within the current co-management institutions. The reach of institutions is shown below, in figure 2. This section uses interview data to measure the awareness of small-scale fishers about the current institutions. Criteria was selected to best show fishers' relationships with the institutions. The following three criteria allowed for a stronger understanding of fisher-institutional relationships. Fisher data was placed into three sections:

- 1: Hasn't been consulted by or hasn't heard of the current co-management institutions.
- 2: Is aware, but has not attended any meetings
- 3: Is aware and attends/has attended a meeting.

Reach of Co-Management Institutions

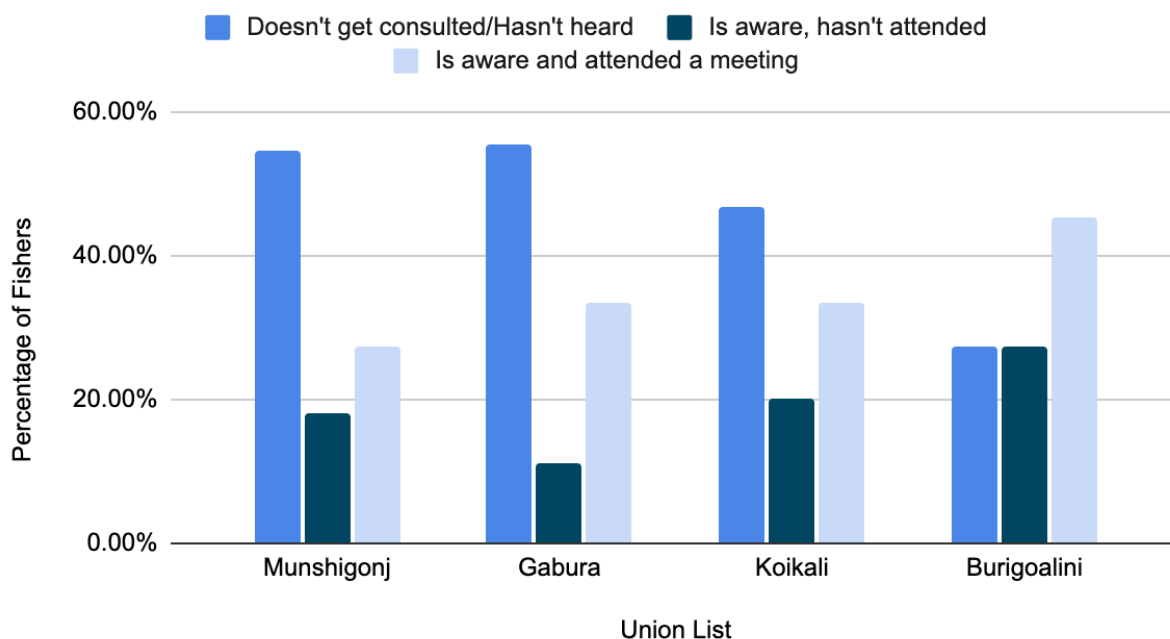


Figure 2. Reach of co-management institutions

The institutions are represented in three pillars, with the lowest pillar existing as the Village Conservation Forum (VCF) group, which consists of the poorest and resource-dependent users. VCFs have several responsibilities, including the patrolling of the forest alongside the Forest Department. The second pillar exists as the Peoples Forum, which consists of a group of VCF representatives from various near-by villages. Members of the Peoples Forum are able to participate as a member of the Executive Council, which with the General Council, consists as the top pillar of the co-management structure. When considering the reach of institutions, it considered fisher interactions with any pillars of the co-management structure.

4.2.1 Munshigonj

11 fisher interviews in Munshigonj were recorded and analyzed. 55% of all fishers interviewed in Munshigonj had not heard of the institutions at all. As mentioned earlier, Munshigonj does have the largest population out of all four unions. As such, there are larger fish markets in Munshigonj. Several NGO and administrative offices are also located in Munshigonj, some of

whom are involved in the co-management institutions. Munshigonj also has the highest literacy rate out of all four unions, hosting a 50.1% literacy rate (Bangladesh Bureau of Statistics, 2011). With this in mind, the assumption would be that communication systems are strongest in Munshigonj when compared to the other three unions. Regardless, over half of the population had not heard of the institutions at all.

4.2.2 Gabura

9 fisher interviews in Gabura were used in this section. Gabura was quite similar to Munshigonj when considering the answer breakdown of both unions. As mentioned above, Gabura had the highest percentage of fishers who were unaware of the current institutions. Gabura also hosts the lowest literacy rate among the four unions at 35.9% literacy rate. Gabura, an island, is rather secluded compared to the other unions, either needing to cross a bridge or take a boat to enter the union. This could be a contributing factor towards why communication surrounding co-management is the worst among all unions.

4.2.3 Koikali

15 fisher interviews were conducted and analyzed in Koikali. Koikali's graph is quite similar to both Munshigonj and Gabura. The largest difference being that they had a higher percentage of fishers who had heard of the institutions but had not gone to a meeting. Koikali had the highest number of fishers naming bribes as an aspect that is negatively impacting governing institutions, such as co-management. Although Koikali has the highest number of fishers who know of but choose not to attend co-management meetings, Koikali was also the only union where fish catch wasn't overwhelmingly answered as 'lowered'. This heightened fish catch is most likely due to various measures implemented by the Forest Department, such as seasonal fishing bans. Koikali and Gabura both have a total of $\frac{1}{3}$ of their fishers being aware and attending or having attended a co-management meeting before. However, 20% of fishers in Koikali were still aware of the institutions but chose not to attend meetings. This may signify a distrust in the institutions, on behalf of the fishers.

4.2.4 Burigoalini

11 fisher interviews were conducted in Burigoalini. Burigoalini differs the most out of all four unions. Not only does Burigoalini have the highest percentage of fishers who have attended a meeting, Burigoalini is the only union in which the highest percentage of fishers have attended a meeting. 56% of fishers interviewed reported that they were aware and had attended at least one meeting. Burigoalini has a relatively lower population compared to the other three unions, with just under 25,000 people. Only Koikali is smaller, with a difference of less than 400 people. The same number of fishers who reported not having heard of the institutions in the first place, had also reported that they had heard of the institutions, but have yet to attend a meeting (23% for each).

Throughout the four unions investigated, it was found that Burigoalini was the only union where more villagers had heard of or been to a CMC meetings, rather than having not heard of it at all. Both in Munshigonj and Gabura, the majority of villagers were unaware or unconsulted by the institutions. While in Koikali, 46% of villagers were also unaware or unconsulted with the institutions.

4.2.5 Cross union comparison

A total of 46 fisher responses were collected and analyzed. Outside of Burigoalini, all unions followed a similar curve. As mentioned, Burigoalini was the only union where the majority of interviewees responded that they had been to a meeting before. The rest of the unions were uniform in the biggest percentage of users responding that they hadn't heard of or been consulted about the institutions, while the second largest groups were those aware of the institutions, and the smallest group were those who were aware of the institutions but have yet to attend a meeting. When considering unaware fishers, all unions except for Burigoalini fell within a 6% difference of 50%, within a range of 47-56%. Burigoalini was an extreme outlier, measuring 27%. 46% of fishers' in Burigoalini had reported that they had been to a co-management meeting, 13% higher than the next highest union. The remaining unions answered between 27-33%. There seemingly was no link between literacy rates and fishers' interactions with the co-management system. Figure 3 below overviews the total fisher reach across all four unions.

Total Fisher Reach

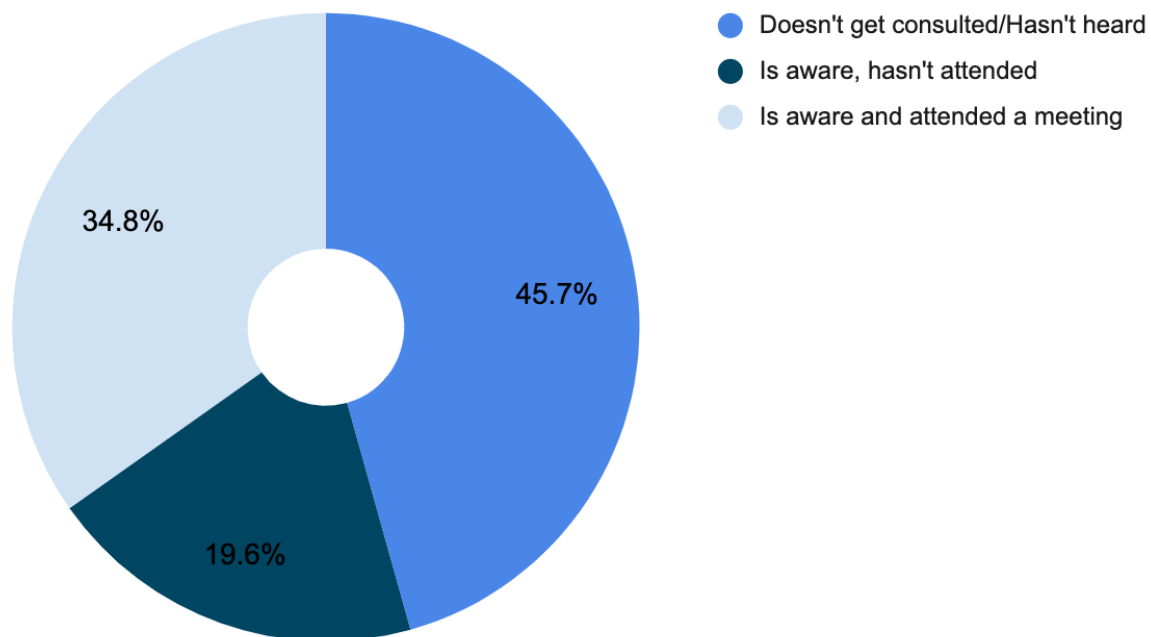


Figure 3. Total fisher reach

Across all four unions, 46 total interviews with fishers revealed that just over $\frac{1}{3}$ of fishers interviewed had attended at least one meeting, and 54% of the population were at minimum aware of the institutions. Over half the fishing population that had been interviewed had interacted with the co-management institutions on some level. In total, only 9 fishers out of 25 had heard of the institutions, but were yet to attend a meeting. 64% of fishers who had heard of the institutions, had attended at least one meeting. This indicates that if more fishers were aware of the institutions, fisher participation in meetings would likely increase. As the majority of fishers who know of the institutions have attended a meeting, it shows that fishers are generally interested in participating in an institutional governing-process. If the co-management institutions are able to reach more resource-dependent users, they will likely increase attendance and participation at their meetings.

4.2.6 Fisher's relationships with other stakeholders

Many fishers felt distance from the co-management institutions, as is evident by just over 45% who have never interacted with the institutions. While some fishers felt hostility from the institution itself, some fishers felt hostility towards other stakeholders. Fishers also described poor relationships with other stakeholder groups within the co-management institutions. Fishers specifically described negative relationships with NGOs as well as the Forest Department and other law enforcing agents particularly due to pre-existing relationships related to loans and issues surrounding corruption. In all unions, interactions with NGOs were consistently the most common among fishers. Of 46 fishers interviewed, 43 named NGO loans as being among the most significant elements related to any relationships they have with other stakeholders within the institutions. With over 45% of fishers reporting that they either have not heard of or not being consulted in regard to the in-place co-management institutions, and the vast majority of fishers reporting a relationship with an NGO, fishers may feel discouraged attending meetings, as they may feel that meetings are focused on loans, rather than knowledge-sharing.

4.3.0 Institutional transparency from fishers' perspective

Co-management is a power-sharing relationship between a governing institution and at least one other stakeholder group. In theory, co-management should drive participation, which would further provide legitimacy and accountability towards these governing processes (United Nations, 2009). This in turn should result in a more transparent institution (Bown et al., 2013). Transparency was chosen as a focus due to it widely being considered as a key principle of co-management, a key trait when measuring governance, and is further considered a solution towards solving complex environmental issues (Kooiman et al., 2005; Wilson, 2009; Petersson 2022). Often linked with awareness building and trust, transparency in a governing context can be defined as *“A policy of sharing information and acting in such a way so as to allow stakeholders to gather information that may be critical to uncovering abuses and defending their interests.”* (Saunier & Meganck, 2009). In the same work, Saunier and Meganck stated that a transparent system should include clear guidelines surrounding the rules and regulations of an institution, maintain accessible and informative communication channels between different stakeholders, and access to further information and context should stakeholders be interested. In fisheries conservation, a fisher's ability to communicate and exist beyond an observational role

can influence the degree of transparency of a decision-making process (Davis & Hanich, 2022; Skerritt, 2024; Trimble et al., 2014). This indicates that the degree of the fisher's role in co-management settings can speak to the transparency of the institution, in terms of both access to information, communication channels, as well as ability to participate.

Transparency is far from the end-all-be-all when considering good governance principles. There are several common means of measuring good governance, such as accountability, compliance, legitimacy, among several others. However, understanding the process of how communication travels as well as how and what information is available can speak to how inclusive the co-management institutions are for small-scale fishers. This would allow us to better understand the role of fishers, with respect to the functions of the institutions. As mentioned above, transparency is further linked with compliance and accountability, which may spread light in regards for stakeholders within the co-management systems to comply with institutional regulations.

For this study, transparency is defined on a scale ranging from 0-3. Attempts to define four stages of transparency were made using factors such as governing corruption, access to information, two-way communication channels, among other factors. Further description of each scale is written below. Interviewees who identified corruption, or other illegal activities were automatically received a ranking of 0, even if they had identified aspects of transparency existent in scores 1-3. This is because even with open communication channels and access to further information, corruption oftentimes can outweigh the progress of these other factors (Nunan et al., 2018; Tacconi & Williams, 2020). Scores of 2-3 represent access to 'good information', where Dervin (1994) states is required for 'good democracy'. In this study, good information represents regulatory information which will benefit the livelihoods of fishers. Adaptive co-management institutions assume that for its success communication networks need to be established and maintained, which furthers the emphasis of information and communication networks in scores 2-3 (Cundill & Fabricius, 2008; Olsson et al., 2006). Scores 2-3 further represents fishers existing beyond listening roles; this can indicate that fishers were either able to communicate their concerns, were receiving benefits related to their status as fishers, were contributing to ecological policy formulation or had their skill sets were utilized in other ways which fishers believed to benefit their livelihoods. Scores 2-3 are meant to highlight positive interactions

between fishers and the institutions. The score attempts to understand fisher involvement with the institutions on a scale, as increased involvement of fishers in community-based institutions is correlated with the trust and transparency fishers have associated with the respective systems (Holm & Soma, 2016; de Vos & van Tavenhove, 2011).

The scores are further described below:

1. A score of 0 representing identification of corruption, briberies, illegal activities, or a lack of reach or communication towards fishing stakeholders
2. A score of 1 represents knowledge-sharing or other information-based interactions, however fishers existing primarily in a listening role and do not have considerable knowledge about the rules of institutions
3. A score of 2 represents identification of either fisher interactions with good information, fishers existing beyond a listening role, or fishers having a basic understanding of the goals of the institutions
4. A score of 3 represents fisher interactions with good information, where fishers exist beyond a listening role, where fishers have the ability to access further institutional information, where stakeholders have a clear idea of the purpose, rules, and regulations of the institutions and are able to effectively communicate within the institutions

Identified instances of corruption, bribery, illegal activities, or a lack of reach or communication received an automatic score of zero because these traits undermine fundamental or key principles of transparency or co-management and present a threat to the viability of the institutions (Nunan et al., 2018; Yan & Graycar, 2020; Standing, 2008). A transparent system can allow for reallocation of the power relations and provide fishers a larger platform to engage in the institutions (Guggisberg et al., 2022). Beyond this, understanding that a top-down approach cannot avoid a tragedy of the commons reinforces the idea that an equitable distribution of roles within a co-management institution is required for long-term sustainability (Ostrom 1990, 2010). As such, the highest available score is meant to represent processes that would determine the long-term sustainability of a common-pool resource governed in a co-management setting. While the lowest available score is meant to represent a co-management institution process that would determine a failure to establish a sustainable governing institution. The scores in between, 1-2,

attempt to scale levels of communication and engagement, principles key to transparency in fisheries governance (Wilson, 2009). Although transparency has several key principals, and can be measured using various indicators, in the context of this study the main focus is on relation to communication, and fishers' access to information. Figure 4 below overviews the transparency of governing actors within the co-management institutions throughout each individual union. Figure 5 found in section 4.2.5 overviews combines all union responses.

Transparency of Governing Actors within Co-Management Institutions

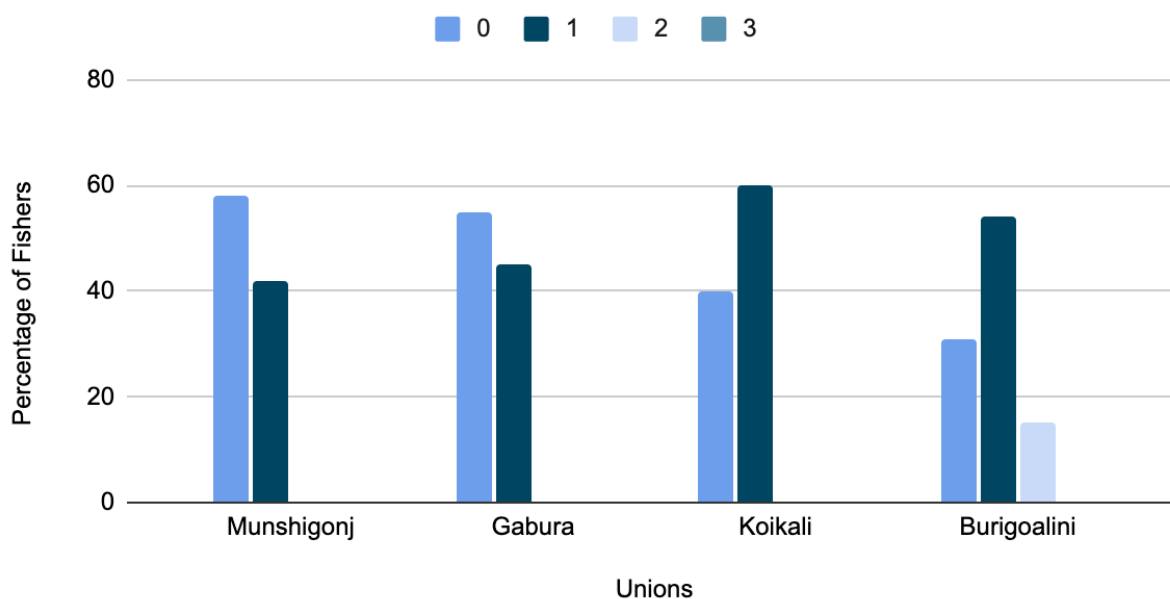


Figure 4. Transparency of governing actors within the co-management institutions

4.3.1 Munshigonj

12 fisher responses were collected and analyzed in Munshigonj. 58% of fishers in Munshigonj reported instances of corruption or absolutely zero reach and communication on behalf of the co-management institutions towards them. The remaining 42% answered as one, finding that there was communication. However, fishers in Munshigonj reported this communication to be entirely one-sided, with no space for fishers to voice their opinions or request for further information.

4.3.2 Gabura

10 responses were recorded in Gabura. Gabura was measured almost identically to Munshigonj. 55% of fisher responses in Gabura also suggested a score of 0. 45% of fisher responses resulted in a score of 1. Munshigonj and Gabura were two of four unions whose responses by fishers were majority recorded at zero, and the second highest response was 1. In both Unions, no fishers selected responses 2-3.

4.3.3 Koikali

13 responses were recorded in Koikali. Koikali was the first union where the majority of fisher responses did not rank as 0. 60% of fishers in Koikali reported a score of 1, while the remaining 40% reported a score of 0. Between all four unions, Koikali has the highest rate of fisher's scoring 1. Koikali joins Munshigonj and Gabura as not having any respondents select responses 2-3.

4.3.4 Burigoalini

10 responses were recorded in Burigoalini. As with the last section, Burigoalini is again the biggest outlier when measuring transparency. While 54% of fishers reported a score of 1, Burigoalini was also the only union where users reported a score higher than 1. 15% of fishers reported a score of 2, symbolizing open two-way communication. With that said, 31% of fishers in Burigoalini had reported that the institutions had not interacted with them, or that they reported instances of corruption. While 31% is the lowest among all four unions, it still represents almost $\frac{1}{3}$ of the fishing community in Burigoalini.

4.3.5 Cross union comparison

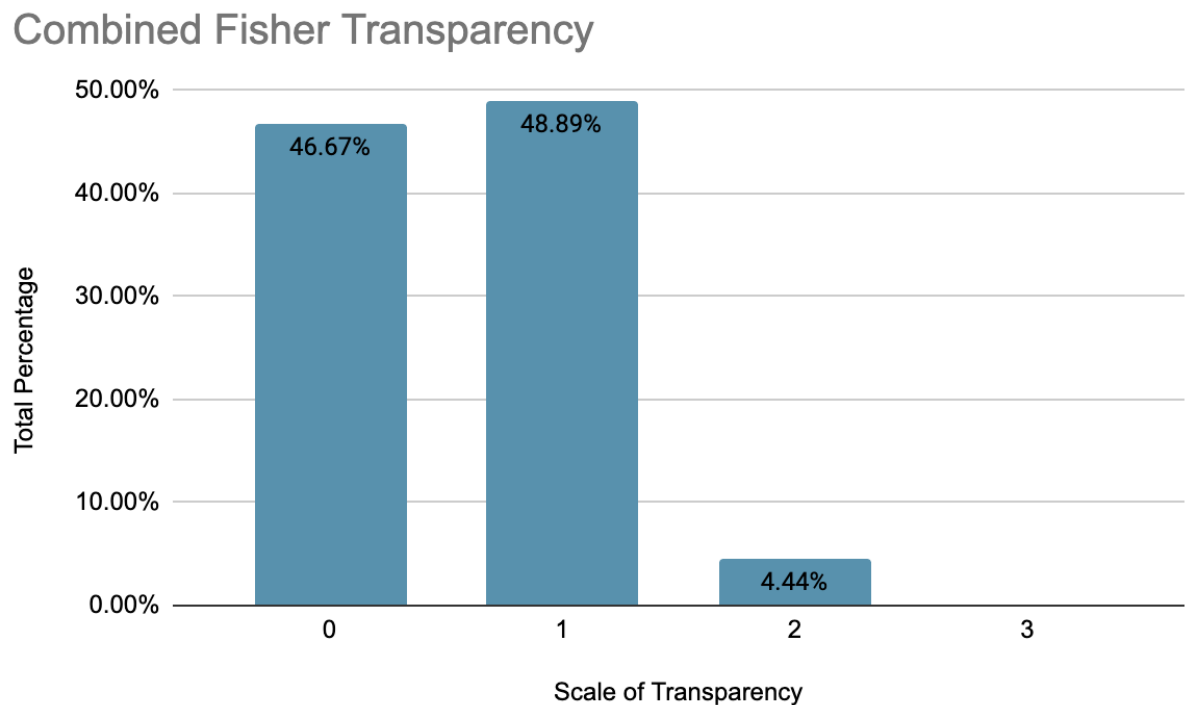


Figure 5. Combined fisher transparency

This section attempts to measure transparency of the co-management institutions as reported by fishing stakeholders within the Satkhira region. Results showed that most fishers are split within two groups, one slightly smaller group representing a complete lack of transparency (46.67%), and one slightly larger group (48.89%) representing early stages of institutional transparency. Out of all interviews, 4.44% of fishers felt favourably when considering how transparent co-management systems are. Generally, within the co-management institutions, small-scale fishers have little sway and influence. Through interviews, fishers showed frustration with their lack or ability to communicate within the co-management institutions. Related, some fishers felt that the co-management institutions are a waste of time. These scores represent that from the eyes of the small-scale fishers, they do not exist in a transparent system or are among the early stages in establishing transparency within the governing institutions.

When considering the initial guidelines surrounding transparent systems such as clear institutional guidelines, accessible communication channels, as well as the access to further information should it be requested, the co-management institutions in the Sundarbans fail to encapsulate many of these guidelines (Saunier & Meganck, 2009). As reported by fishing stakeholders, the co-management institutions failed to deliver when considering providing clear rules, regulations, and information about the institutions. Fishers throughout all four unions had confusion surrounding the purpose of the institutions. Further, fishers who had roles in the executive council had confusion surrounding some aspects of their role as well as wider regulations and rules of the institution. Should fishers who exist within the highest sector of the co-management hierarchy be unfamiliar with the institutions they are working to deliver, fishers in the VCF groups will lack respective institutional information, as they have no one providing them the information. The lack of both accessible communication and relevant information for fishing stakeholders indicates a lack of transparency.

When considering accessible communication channels among stakeholders, we should further relate the fact that 46.67% of fishers were unaware or had detected corruption or bribery. The communication channels available for fishers do not present adequate information surrounding the co-management institutions, to a point where many fishers don't feel trust towards and inclusivity within the institutions. Less than 5% of fishers indicated that they felt a high degree of participation when considering their role in the institution, while the remaining 95% of fishers scored between 0-1. When considering access to further information regarding governing institutions, several fishers reported difficulties obtaining their fishing registration. This registration is required to obtain several fishing rights, such as financial compensations during fishing ban periods and formal recognition as a fisher in the co-management institutions (Cons, 2020). One reason being due to some fishers lacking any formal identification, which proved to be a hurdle in the process of acquiring the fishing registration.

Consequently, fishers are often left with little money, time, and options, driving many to illegal fishing practices. Through increased access of information to fisher stakeholders, the institutions may further accomplish greater fisher compliance of governing regulations. Beyond this, if fishers have an inability to cooperate with governing regulations or feel that their role within the

institutions are meaningless, they have little-to-no reason to continue attending VCF meetings or otherwise interacting with the co-management institutions. If fishers feel that the interactions with the co-management institutions are insignificant, they will be less motivated by the institutions and less likely to comply. If the participation is meaningful, there is a greater chance it leads to institutional compliance on behalf of the fishers (Jentoft et al., 1998; Al-Qartoubi & Al-Masrooni, 2021). Fishers in Satkhira require financial support either through government compensation packages, or through the availability of other livelihood options in order to ensure the financial well-being of themselves and their dependents. Although both options exist, neither are accessible to the fishers (Mallick et al., 2021; Ela et al., 2021). Increased financial support would relieve pressure for fishers to engage in illegal fishing practices. Simultaneously, increased access to information, and two-way communication channels between fishing and non-fishing stakeholders, may relieve fisher pressure to engage with illegal practices due to increased understanding of institutional regulations. Beyond this, fishers need to find the interactions meaningful, to continuously engage with the co-management institutions.

Dissatisfaction is rampant at all levels of Bangladeshi governance in the Sundarbans, as well as the wider country (Roy & Gow, 2015). Specifically in the Sundarbans, as well as various protected areas in Bangladesh, dissatisfaction is typically high from the localized stakeholders as they often hold little to no power in the institutions and illegal fishing and forest practices remain significant issues (Roy, 2016; Islam, 2012; Jentoft et al., 2011). A relationship where fishers feel more trust represents a higher likelihood to comply with the respective regulations, than a fisher who does not feel trust (Silva et al, 2021). In Satkhira, fishers lack trust in the co-management institutions. If the institutions wish for the fishers to comply with their regulations, they must do more to build trust with resource-dependent populations. This section highlights the process of making co-management institutions in the Sundarbans transparent is still in its infancy. Throughout all four unions, only Burigoalini stood out as an outlier. Burigoalini was the only union where the majority of fishers had identified elements of transparency in the co-management institutions, and even in Burigoalini 31% of fishers had not interacted with the institutions to this point. Generally, this represents that fishers do not feel that they exist within a transparent institution.

4.4.0 Fisher's empowerment in current institutional arrangements

In small-scale fisheries management, empowerment of fishers refers to the attempt to better align fishers with governing institutions (Jacobsen et al., 2012). In fisheries literature, there isn't a uniform understanding of what fisher empowerment in community-based governance systems looks like (Drydyk, 2013). With that said, empowerment is often viewed as a means to strengthen governing institutions through an increase of community participation in decision-making. Debates concerning the size of the role of fishers in governing systems exist, primarily whether or not fishers should be an equal stakeholder, or if other distributions of power would be more appropriate (Sowman et al., 2003; Jentoft et al., 2003). Although the exact power dynamics are up for debate, it should be recognized that power dynamics across co-management institutions will differ depending on an institution's wider context. As such, empowerment in co-management institutions can be understood as the promotion of a larger role for fishers in terms of involvement and participation in decision-making processes (Berkes, 2001). Empowerment and co-management are closely linked topics, with empowerment existing as both a condition and a goal of fisheries co-management (Jentoft, 2005). Empowerment was chosen as a measurement because it speaks to a fishing community's ability to control, effect, or implement solutions coming out of the co-management institutions. Community empowerment has been increasingly addressed in Bangladesh in the past three decades with the implementation of various community-based governing institutions; this section attempts to understand fisher empowerment in the co-management settings within Satkhira.

There are various common means of understanding stakeholder empowerment. Education, increased access to clean food and water, and adequate sanitation facilities are not only common traits when measuring empowerment, but they exist among the first six goals within the United Nations Sustainable Development Goals (Dickin et al., 2021; Jepson et al., 2017; Caruso et al., 2022; UN, 2023). Beyond this, agency is often a concept intertwined with empowerment in community-based governance, as increased agency is associated with increased opportunity (Dickin et al., 2021). For this study, agency is understood as a trait of empowerment, where agency is referred to as a state of affairs, as opposed to empowerment which can be understood as a process of change (Drydyk, 2017). Agency in this sense can be understood as the ability for fishers to improve their own well-being within the co-management institutions. If a stakeholder

has significant empowerment, they will be more likely to be able to communicate their ideas and realize them into fruition (Kabir et al., 2011). As such, fisher communication channels are deemed significant for community empowerment and exist as a focal point for data analysis. An understanding of stakeholder empowerment would allow for a stronger understanding of the role of fishers within the co-management institutions. Specifically, it would let us better understand if fishers are able to present their own thoughts, if those thoughts are built to solutions, or if fishers feel that they are being presented with solutions or alternatives from an alternate party.

Similar to the last section, interview data was analyzed to rank fishers empowerment within the current institutions, on a scale of 0-3. Scores 0-1 are meant to measure factors that mitigate stakeholder empowerment, while scores 2-3 represent measure factors that promote stakeholder empowerment. In this scale, 0 represents that they were not contacted at all, there is a lack of adequate food and sanitation systems, *or* education is inaccessible for them or their family members. A score of 1 represents that stakeholders were contacted and given information about the co-management institutions, little access to education, *or* little access to adequate food and sanitation systems. A score of 2 represents two-way communication, moderate access to education, *or* moderate access to adequate food and sanitation systems. A score of 3 represents the implementation of fisher ideas, adequate access to food and water, or adequate sanitation systems. Scores of 2-3 represent fisher agency in decision-making processes, where fishers have a role in decision-making processes which improve their livelihoods and well-being. As there are multiple factors to each score, fishers were ranked to the lowest score had they indicated that they matched any of the given criteria. Figure 6 which can be found below, represents the data through each individual union, while figure 7 in section 4.3.5 provides a combined overview of the four unions.

The scoring system is defined more clearly below:

1. A score of 0 represents a complete lack in interactions, or a lack of adequate living conditions negatively impacting the fishers desire to engage in the institutions. This represents fishers who lack the empowerment to initially engage with the institutions.
2. A score of 1 represents that stakeholders have interacted with the institutions, or have adequate living conditions which empower them to engage with the institutions. This

represents fishers who lack empowerment to adequately engage in the institutions but still have had interactions.

3. A score of 2 represents that fishers have access to and are able to take advantage of institutional resources which benefit the viability of fishers and their families. A score of 2 is meant to represent increased fisher communication within the institutions leading to the increased decision-making ability for fishing stakeholders. A score of 2 is meant to represent a partial fisher agency, where fishers initiatives or decision-making are heavily influenced by other stakeholders in the institutions.
4. A score of 3 represents fishers that have taken advantage and benefited from institutional resources. A score of 3 is meant to represent a fully empowered fisher, whose interactions with the co-management institutions are mutually beneficial to both the fisher and other stakeholders, where fishers have full agency in decision-making. A score of 3 is meant to represent the self-organization of fisher initiatives or decision-making leading to improved livelihood conditions, supported by the co-management institutions.

Determining Fisherman Empowerment Within Current Institutions

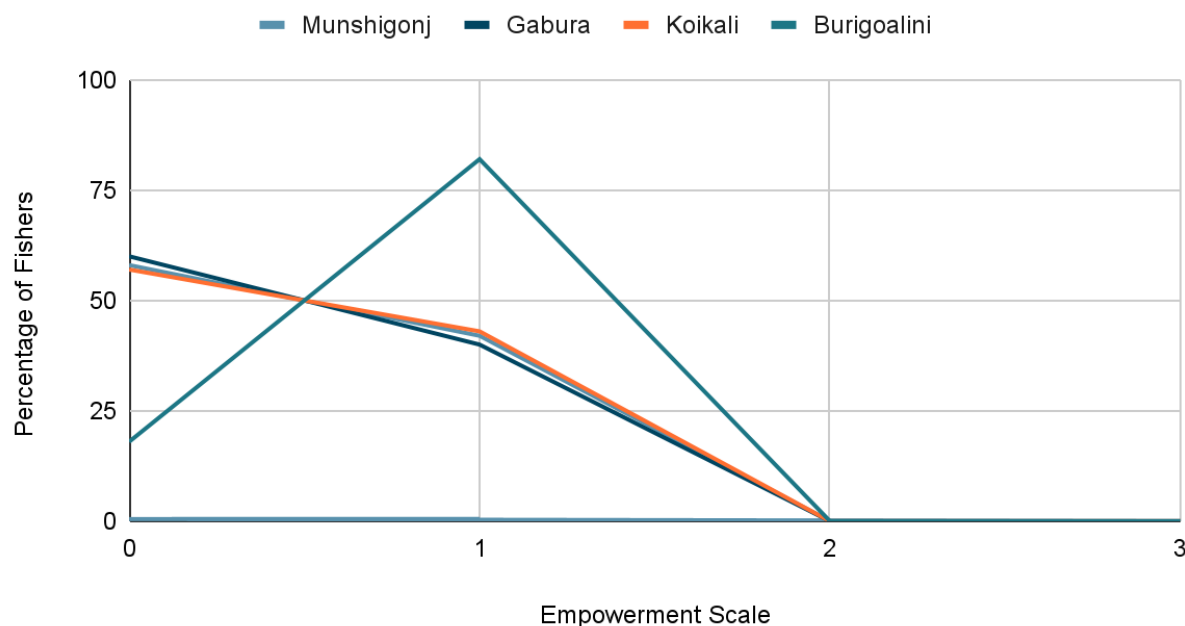


Figure 6. Determining fisher empowerment within current institutions

There were no fishers that reported a rating of 2-3. All interviews reported a score of either 0, or 1. From the perception of the fishers, they feel little-to-no agency in decision-making processes within the current co-management structures. Scoring between 0-1 indicates a lack of agency, and fishers feeling ignored or disregarded in the institutional processes. Scoring between 2-3 would have indicated positive communication channels between fishers and other institutional stakeholders, and implementation of solutions which improve the livelihoods of fishers.

4.4.1 Munshigonj

12 responses were recorded in Munshigonj. 58% of fishers in Munshigonj recorded a score of 0, signifying that they were not contacted at all. 42% of fishers reported that they were contacted, and had interactions with the co-management institutions, in a listening role. No fishers in Munshigonj recorded scores of 2 or 3, signifying that no fishers in Munshigonj felt that they had an opportunity to input opinion in their interactions with the institutions.

4.4.2 Gabura

10 responses were recorded in Gabura. Gabura ranked similarly to Munshiganj, with 60% of fishers recording a score of 0, and 40% of fishers recorded a score of 0. No fishers recorded a score of 3 or 4. The fishers in Gabura showed no significant difference from the fishers in Munshigonj, in terms of reach, transparency and empowerment.

4.4.3 Koikali

14 responses were recorded in Koikali. Koikali showed no significant differences from Munshigonj and Gabura. 57% of fishers in Koikali recorded a score of 0, while 43% recorded a score of 1. Again, no fishers recorded a score of 2 or 3. Koikali also showed no significant difference in the above-mentioned categories, in comparison with Munshigonj and Gabura.

4.4.4 Burigoalini

11 responses were recorded in Burigoalini. When measuring empowerment, Burigoalini continued to be an outlier, representing an inverse relationship with the other three unions. Only 18% of fishers recorded a score of 0. Meaning over $\frac{4}{5}$'s of fishers in Burigoalini have had an interaction with the co-management institutions. 82% of fishers recorded a score of 1, meaning that they have interacted with the institutions, but don't feel that they were listened to. Although Burigoalini's fishers have had a significantly higher rate of interacting with the co-management institutions, no fishers recorded a score of 2 or 3.

4.4.5 Cross union comparison

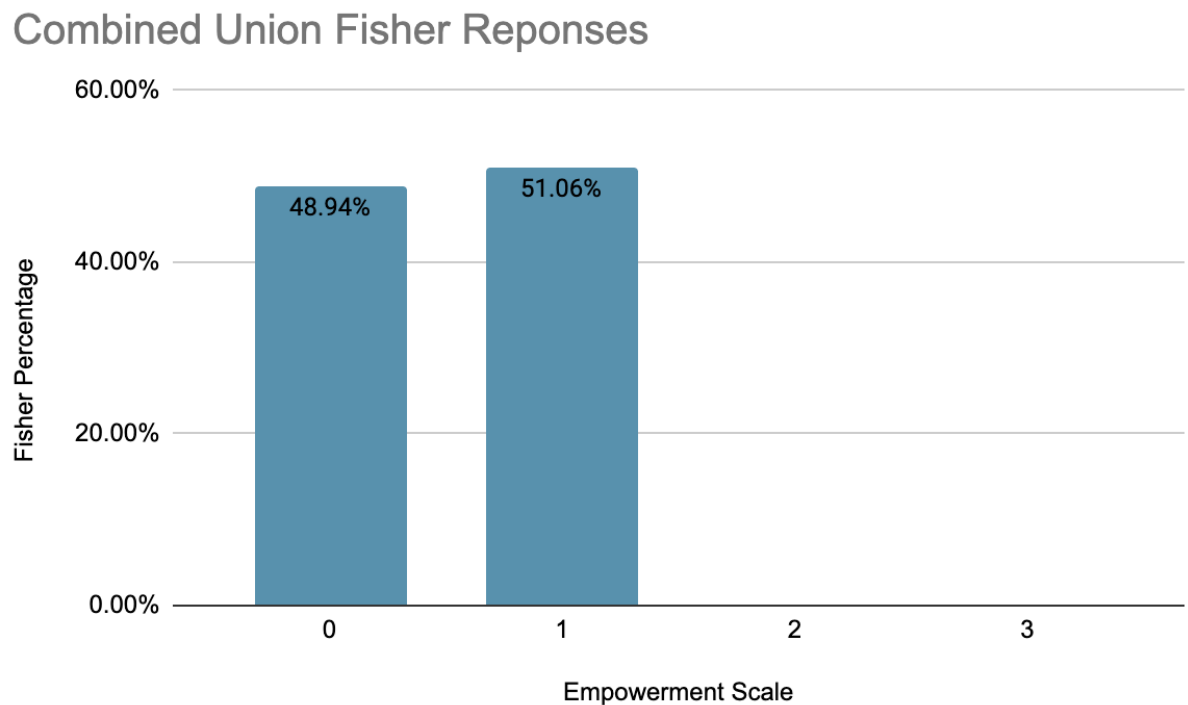


Figure 7. Combined union fisher responses

100% of fishers recorded a score of 0, or 1. Just under 49% of fishers recorded a score of 0, while just over 51% of fishers recorded a score of 1. When considering the first three unions without Burigoalini, 58.33% of fishers recorded a score of zero, and 41.67% of fishers recorded a score of 1. There were no fishers that recorded a score of 2 or 3. This not only indicates that no fishers feel that their input has been implemented, but no fishers felt that they are listened to in the co-management institutions at all. Beyond this, no fishers fell into the category of having clean water and food, access to education, and adequate sanitation systems. It should be noted that the disparity between these factors differs between fishers and unions, and some fishers do interact with higher levels of food, water, sanitation and education, no fishers qualified for this score as they better identified with a score between 0-1.

While Burigoalini continuously has produced more favourable results when compared with the other three unions, no fishers in Burigoalini reported that they felt listened to. Meaning that the empowerment of fishers in the union that has consistently been scoring the highest on all

measurements thus far, is in its early stage of empowerment building at best. As mentioned above, empowerment is closely tied to co-management, with literature promoting the need for empowerment to create a successful co-management institution. While community empowerment has been growing since community-based interventions arrived in Bangladesh, there is a need for greater community empowerment should these institutions wish to become functioning and sustainable.

It is often considered that without empowerment, there is no real co-management (Jentoft, 2005). Attempting to understand the empowerment of fishers within the co-management institutions provides clarity surrounding the role of fishers in the institutions. The institutions in Satkhira need to decide on the scale of participation they are interested in when considering resource-dependent stakeholders, such as fishers. No fishing stakeholder reported significant engagement when considering the co-management institutions, and they further reported that if they do interact with the institutions, it is typically within a listening role. At the current scale of participation, fishers may lose interest and become disengaged. Fishers have a desire to maintain sustainable practices within the Sundarbans, and do not wish to further degrade the environment. However, some fishers did admit that they often feel they have no option but to fish illegally. Should the increased empowerment of fishers through co-management be a goal of the institutions, increased access to services such as education or healthcare, and two-way communication channels can be an effective means of increasing engagement. The redistribution of the stakeholder power dynamics is necessary for fishers to hold meaningful power in the institutions and exist beyond a listening role.

4.5. Vulnerabilities and viabilities identified by stakeholders

To better understand the vulnerabilities and viabilities of small-scale fishers in relation to the co-management institutions, interview data using conversations with fishers where they spoke to pressures affecting their livelihoods was used. General social influences were identified through interviews with fishers, government officials, NGO representatives, and academics. The most predominant influences were attempted to be understood in relation to their effect on fisher livelihoods and the co-management institutions. It should be noted that forest bans were not

considered although they were named by stakeholders, this is because the following chapter is dedicated to the relationship between forest bans, co-management, and fishers.

This section is meant to identify how fisher and non-fisher stakeholders view and interact with the co-management institutions. Understanding stakeholder perceptions in terms of their relationships with the institutions can speak to how existing power dynamics may shape the institutions. This section includes a cross-stakeholder comparison which aims to understand if stakeholders within the co-management institutions have similar or differing goals from each other within the institutions. Tables 2-8 revealing the listed social impacts found throughout and between fishing stakeholders in the four unions and non-fishing stakeholders are found below. Figure 8 is further found in section 4.4.6, and contrasts fisher and non-fisher responses.

4.5.1 Munshigonj

Table 2. Munshigonj listed social influences

Munshigonj Fishers Factors Impacting Livelihoods	Total Percentage	Sample Value
Corruption	25.00%	7
Class issues with fishers	21.43%	6
Decreasing financial compensation for fishing	14.29%	4
Loan	14.29%	4
Forest health	10.71%	3
No consultation	7.14%	2
Knowledge Sharing	7.14%	2

Fishers in Munshigonj named several social factors impacting their livelihoods. Corruption was the largest listed factor. Corruption typically refers to instances of reported bribery, or other abuses of policy or regulations made by governing actors within the co-management institutions. These abuses often refer to issues surrounding land use, leading to confusion and sometimes punishments relating to the legality of various fishing waters. Class issues were the second most common factor as reported by fishers, with $\frac{1}{5}$ of the total responses citing class issues as a factor. Class issues refer to fishers stating their status as fishers prevents them from information or meaningful interactions with other stakeholders in the institutions. This can be better understood as a lack of social capital, where fishers have a limited amount of institutional power due to their status as fishers (Burt, 2000; Lin, 2000). Following class issues, the third largest factor was tied

between loans that fishers were involved in and decreasing financial compensation for fishers. Few fishers referred to knowledge-sharing, achieving 6.67% of the total responses. Knowledge-sharing was the process of information sharing as well as providing various forms of training at the VCF meetings.

4.5.2. Gabura

Table 3. Gabura listed social influences

Gabura Fishers Factors Impacting Livelihoods	Total Percentage	Total Sample Size
Corruption	22.73%	5
No consultation	18.18%	4
Loan	18.18%	4
Food/water	13.64%	3
Changing Weather	9.09%	2
Class issues with fishers	4.55%	1
Less fish	4.55%	1
No fishing records	4.55%	1
Knowledge Sharing	4.55%	1

Fishers in Gabura again named corruption as the largest social factor affecting fishers in relation to the co-management institutions. Following corruption, fishers named both the loan systems and a lack of consultation as the largest factors impacting their livelihoods, collectively accounting for just under 35% of the total responses. Issues with food and water systems were tied as the next largest factor. Beyond this, Gabura was the only union where fishers spoke to issues regarding fishing records. Fishers require fishing passes in order to receive available fishing benefits, such as financial compensations during fishing ban periods. Fishers often face trouble acquiring these fishing records as they lack any formal identification. Like Munshigonj, knowledge-sharing was the least recognized factor, garnering less than 5% of the responses.

4.5.3. Koikali

Table 4. Koikali listed social influences

Koikali Fishers Factors Impacting Livelihoods	Total Percentile	Total Sample Size
Loans	29.41%	5
Corruption	17.65%	3
Little income opportunity	17.65%	3
Not consulted	11.76%	2
Knowledge sharing	11.76%	2
Class issues with fishers	5.88%	1
Management not local	5.88%	1

Fishers in Koikali were rather in line with the fishers in both Munshigonj and Gabura, in terms of the listed factors. The largest factor listed was loans, getting 29.41% of the total responses.

Corruption and decreasing income opportunities were tied as the second largest factors. Lack of consultation as well as class issues were further listed. Similar to Munshigonj and Gabura, seldom fishers acknowledged knowledge-sharing. However, Kalikali had a higher percentage of fishers acknowledge knowledge-sharing than both Munshigonj and Gabura, gaining 11.76% of total responses.

4.5.4. Burigoalini

Table 5. Burigoalini listed social influence

Burigoalini Fishers Factors Impacting Livelihoods	Total Percentage	Total Sample Size
Class issues with fishers	35.00%	7
Knowledge sharing	35.00%	7
Corruption	15.00%	3
Loans	15.00%	3
Restrictions	5.00%	1

Burigoalini named the lowest number of total factors when compared with all four unions. Class issues and knowledge-sharing were listed as the largest factors. 35% of fisher responses named each factor, accounting for over $\frac{2}{3}$ of the total fisher input. Corruption and loans were tied as the next most listed. The rate of fishers acknowledging knowledge-sharing in Burigoalini was significantly higher than all other unions. Over $\frac{1}{3}$ of fishers acknowledged knowledge-sharing.

4.5.5. Cross union comparison

Table 6. Total listed social influences

Total Fisher Responses	Total Percentile	Total Sample Size
Corruption	20.69%	18
Loan	18.39%	16
Class issues with fishers	17.24%	15
Knowledge Sharing	13.79%	12
No consultation	9.20%	8
Decreasing financial compensation for fishing/little income opportunity	8.05%	7
Forest health	3.45%	3
Food/water	3.45%	3
Changing Weather	2.30%	2
Decreased Fish Catch	1.15%	1
No fishing records	1.15%	1
Management not local	1.15%	1

Few factors were identified across each of the four unions. Corruption, loans, class issues, and knowledge sharing were among the few identified in all four unions. They were also the four largest factors identified across all unions. Beyond being identified in each union, all were collectively identified within 3.54% of each other. Corruption was identified at the highest rate (20.69%), while class issues were third (18.39%). The fourth largest factor was listed as fishers receiving a lack of consultation from the co-management institutions, which received 8.79% of responses. Knowledge-sharing was identified at just over 13%. Burigoalini, similar to their ratings regarding reach, transparency, and empowerment, rated the institutions higher than their peer unions. One third of total fishers in Burigoalini identified knowledge-sharing, while the total fisher average was 13.19%. Burigoalini also listed the least number of factors impacting their livelihoods, listing only four factors.

4.5.6 Non-fisher stakeholders

Interviews with NGOs, governing and academic actors allowed for a more diverse range of identified factors concerning the co-management institutions. Interviews with non-fisher stakeholders were taken with the hope of gaining a stronger understanding of the institutional

practices within the co-management institutions and further building a more holistic understanding of the institutions. Similar to fishing stakeholders, some non-fishing stakeholders interviewees exist as a part of the Executive Council of the co-management institutions, but not all. All stakeholders have either professional, or academic experiences with the co-management institutions in question.

Table 7. Non-fisher responses

Non-Fishing Stakeholder Responses	Total Percentile	Total Sample Size
Disorganization of Institution	21.05%	8
Class/power	10.53%	4
Illegal Fishing	10.53%	4
High turnover of personelle	10.53%	4
Profit-sharing	10.53%	4
Knowledge-sharing	10.53%	4
Inability to enforce rules	7.89%	3
Lack of Fisher Institutional Awareness	7.89%	3
Corruption	2.63%	1
Loans	2.63%	1
More Frequent Meeting Occurance	2.63%	1
Promote Local Knowledge	2.63%	1

Non-fishing stakeholders identified several factors that were unidentified by the fishing stakeholders. Namely, the largest factor was listed as the disorganization of the institutions. Disorganization refers to significant gaps between committees that leads to a loss of momentum for the co-management institutions, lack of training for VCF and other stakeholder groups in the EC, lack of meeting minutes or recordings, lack of meeting places, lack of financial accountability and lack of direction after financing. Stakeholders spoke of how a lack of organization within the institutions prevents the growth of momentum in the institutions, ultimately preventing the accomplishment of institutional goals. Issues relating with class and power, high turnover of personnel related to co-management, and illegal fishing were all tied for the second largest factor named by non-fishers. There is regular turnover when considering stakeholders in the co-management institutions. Governing stakeholders existing as executive

members of the institutions regularly get promoted to new jobs, and their respective replacements take over their role in the institutions. The new stakeholder is often unaware of their responsibilities in the co-management institutions, and further disorganization ensues. Beyond this, council members are reelected every two years, creating more space for regularly occurring mass personnel change.

Non-fisher stakeholders also spoke to profit-sharing and knowledge-sharing. As mentioned above, knowledge-sharing refers to the training provided, and information shared during co-management meetings. Profit-sharing refers to the current co-management institutions financial set-up. The co-management institutions are to receive 50% of the Forest Offices tourism profits, as of the latest co-management committee. Increase in frequency of meetings, as well as the promotion of local knowledge were also spoken to.

4.5.7 Cross stakeholder comparison

Table 8. All stakeholder responses

All Stakeholder Responses	Total Percentile	Total Sample Size
Class	15.20%	19
Corruption	15.20%	19
Loan	13.60%	17
Knowledge-sharing	12.80%	16
Disorganization of Institution/No fishing records	7.20%	9
No consultation	6.40%	8
Decreasing financial compensation for fishing/little income opportunity	5.60%	7
Illegal Fishing	3.20%	4
High turnover of personelle	3.20%	4
Profit-sharing	3.20%	4
Inability to enforce rules	2.40%	3
Lack of Fisher Institutional Awareness	2.40%	3
Forest health	2.40%	3
Food/water	2.40%	3
Changing Weather	0.80%	1
Management not local	0.80%	1
Less Fish	0.80%	1
More Frequent Meeting Occurance	0.80%	1
Promote Local Knowledge	0.80%	1

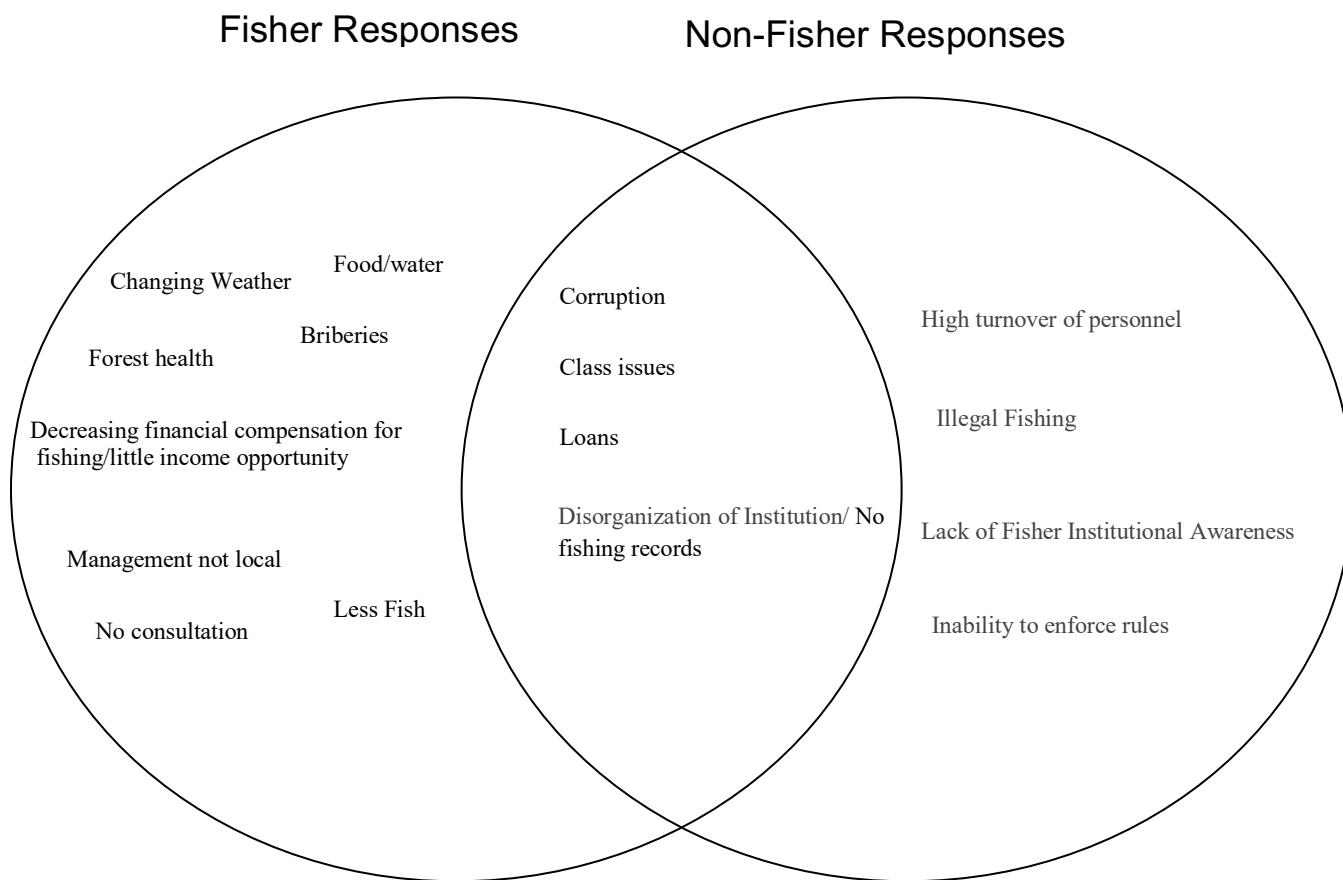


Figure 8. Stakeholder diagram

When comparing the factors listed by all stakeholders, there are several overlapping listings. Amongst all fishing and non-fishing stakeholders, class issues and corruption were the largest listed factor. Loans, knowledge-sharing and lack of financial options during ban periods were also named by both groups. One topic which was phrased differently between fishing and non-fishing stakeholders but meant the same thing was identified. Fishers described a lack of fishing records preventing a registration as fishers as a factor negatively impacting them, while the non-fishers spoke to the disorganization of the institutions and how it can negatively impact the growth of co-management.

Although the majority of fishers identified threats more closely associated with the functionality of the co-management systems, just under 9% of total responses were of fishers who identified threats more closely tied to their livelihoods, such as forest health, declining fish catch, and

issues with food and/or water, with the hope that the co-management institutions would help mitigate these threats. Non-fishing stakeholders only identified criteria that speak to the functionality of the co-management institutions. Seemingly through identifying vulnerabilities and viabilities in co-management, a small portion of fisher stakeholders are looking to improve their livelihoods, while the majority of fishing and non-fishing stakeholders are looking to improve the regulating powers of governing institutions.

Just over 65% of the total responses belonged to a category that was identified by both fishing and non-fishing stakeholders. Meaning, only about 35% of total responses were identified by only one of the two groups, rather than both. With this in mind, it should be acknowledged that while about 65% of responses were identified by stakeholders in both groups, some factors were identified at completely different rates. Corruption, which was listed by fishers tallying 19.78% of total fisher responses, was tied as the smallest factors listed by non-fishers at 2.70%. Loans, which was the second largest factor listed by fishers, was also among the smallest factors identified by non-fishers. Disorganization, which was the largest listed factor for non-fishers, was tied for the smallest among fishers. Class and knowledge-sharing were reported at similar rates by both groups. Evidently, stakeholder groups do differ significantly on issues that are important to the other. Bridging fishing and non-fishing stakeholders together, to determine common interests in the context of the co-management institutions would be key to ensure continuous fisher participation in the co-management institutions. Bridging organizations, or stakeholder groups for the process of knowledge-exchange is a key element to social learning (Berkes, 2009). A lack of bridging further marginalizes fishers, as fishers typically lack power to drive change in co-management institutions (Schusser et al., 2015). Beyond this, a lack of knowledge-exchange or other valuable interactions between stakeholders may prevent fishing stakeholders from wishing to engage with the institutions. Knowledge-sharing presents the opportunity for stakeholder groups to meaningfully engage with each other, should the knowledge be useful. With that said, much of the knowledge shared to fishers, is already known to fishers. This raises the question, how does this level of knowledge-sharing impact fishers? Generally, many fishers were displeased with the information they were receiving at the co-management institutions and felt attending the meetings to be a waste of time.

On the issues that are significant to one stakeholder group, should be recognized in the institutions by other groups. Stakeholders should feel that their concerns are being heard and addressed, in order to feel value in the institutions. A lack of bridging between groups may be detrimental to the participation of fishers within the institutions. An opportunity to bridge stakeholder groups together exists at the VCF meetings, as well as the larger co-management meetings. However, if these interactions continue to exist with fisher's acting in a listening role, there will not be an opportunity for fishers to share their own thoughts, and therefore unable to adequately bridge state or NGO stakeholders. In addition to this, it was already identified that fisher class, or a lack of social capital was determined by all stakeholders as being the largest factor impacting fishers within the institutions. If fisher participation, and more generally the participation of other resource-dependent stakeholders is desired within the institutions, the institutions must adapt to give resource-dependent stakeholders more power. The current delegation of power is not enough for fishers to feel value in the institutions.

This section records factors from both fishers and non-fishers alike and identifies how some of these factors impact the co-management institutions. It was found that while non-fishing stakeholders were more interested with the organization of the co-management institutions, fishing stakeholders were more likely to be interested in livelihood outcomes. Beyond this, fishers who note increased interactions with corruption are more likely to be interested in livelihood outcomes in relation to the co-management institution at the expense of interest in the organization of the institution. The findings in this chapter suggest that fishers who are more likely to interact with corruption, are more likely to expect livelihood benefits from governance institutions. This means that some fishers have a preexisting relationship with corrupt forces, which impact their interactions with the co-management institutions to expect more livelihood outcomes. It was also further strengthened that the existing power dynamics prevent fisher engagement in the institutions beyond a listening role. This chapter also found that the institutions have grown to further include the participation of resource-dependent stakeholders, by implementing a knowledge-sharing process. The information shared at this process is key to determine and maintain the participation of resource-dependent stakeholders in the institutions.

4.6. Chapter discussion and conclusions

To better understand the vulnerabilities and viabilities impacting small-scale fishers in relation to the co-management institutions, interview data using conversations with fishers where they spoke to pressures affecting their livelihoods was used. Different concerns brought up by both fishing and non-fishing stakeholders are looked at as both vulnerabilities and viabilities, specifically in relation to the small-scale fisher's role in the co-management institutions. The remainder of the discussion is split in five parts, highlighting various factors identified throughout the chapter and their impact on fisher livelihoods in relation to the co-management institutions. Reach, transparency, empowerment, corruption, social capital, loans, and knowledge-sharing are focused on due to the chapter's identification of the topics as key factors impacting the livelihoods of fishers.

4.6.1 Reach, transparency, and empowerment

The primary half of this chapter attempts to measure two means of common governance principles in both engagement and transparency in context to the co-management institution in Satkhira. It further attempts to measure the reach of the co-management institutions to better understand how many fishers are actually interacting with the institutions. Finally, this chapter attempts to present links between the concepts of institutional reach with transparency and engagement. Through this chapter, reach was measured to understand general inclusion or introductory inclusion, transparency to understand fisher trust in the institutions, and empowerment to better understand the role of fishers themselves. The measurements and analysis further allowed for an understanding of the first objective of the research project, which was to contextualize and conceptualize co-management in the Sundarbans to ultimately better understand how the in-place systems operate.

In all measurements, all unions followed a similar curve, outside of Burigoalini. Burigoalini was reporting heightened levels of reach, transparency, and empowerment. In all other unions, low levels of reach, transparency, and empowerment were relatively uniform. In $\frac{3}{4}$ unions investigated, this describes a lack of reach, transparency, and empowerment for fishers in the institutions, which should be addressed in order to harbour a sustainable co-management institution. Burigoalini, as mentioned above, was the only union who did not fall into line with

these standards. This can bring to question the interconnectedness of reach, transparency, and empowerment, and the relationship between these factors in the context of a sustainable co-management institution.

Unions which saw lower levels of the institutions reaching them, simultaneously reported lower levels of transparency, as well as engagement in the institutions. Burigoalini, the only union with a heightened level of institutional reach, reported higher levels of transparency and engagement. It is important to note that a key governing offices responsible for the co-management institutions are located in Burigoalini, which likely influenced the increased reach of the institutions. This contextualized the relationship between factors of reach, transparency, and empowerment in context to co-management institutions. This further contextualized the value of reach of co-management institutions for their success. For a fisher to adequately engage with an institution, the fisher at minimum requires the knowledge of the institution's existence. Through increased reach, fishers would have more knowledge about the institutions, which would then increase the transparency of the institutions. Increased institutional transparency will lead to increased empowerment as transparency will allow fishers to more accurately engage with aspects of the institutions which they feel are most beneficial to their lives and livelihoods. Increased empowerment will lead to an increase of communication regarding the effectiveness of an institutions, leading to increased communication reflecting in a higher institutional reach. This promotes a circular relationship between the three factors, which is reflected below in figure 9.

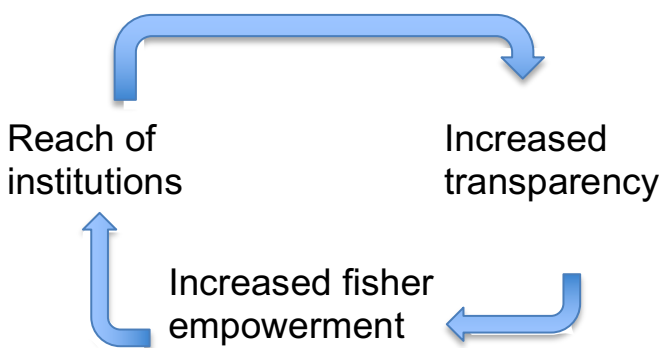


Figure 9. Relationship between reach, transparency, and empowerment in a co-management institution

It should be emphasized that without some form of institutional reach which is engaging and introducing fishers to the co-management system, they will remain uninformed about the institutions and further be less likely to comply with the institutions. Based on the four unions, a lack of communication or access to information from the institution leads to a lack of empowerment, while increased communication eventually leads to increased empowerment. A lack of information leads to a lack of ability to use the information. A lack of access to regulatory information is a sign of low transparency. Following this logic, a lack of understanding or awareness of the institutions, prevents fishers from participating in the institutions. Increasing the reach that communication and information related to co-management travels would likely increase fisher empowerment, as more fishers would be aware of the institutions and their powers within the institutions.

While singularly, transparency or empowerment can't describe the entirety of a co-management institution, together they can provide a more holistic understanding of the processes within the institutions. For transparency to be empowering, literature points that transparency may need to be paired with a tool, initiative, or something otherwise that would promote the needs of fishers (Orofino et al., 2023). Transparency paired with, or delivered through a co-management institution, has the potential to prioritize fisher needs when considering all stakeholder needs in a co-management institution beyond an extent in which it is currently being considered. Literature finds that with increased transparency and/or empowerment, fishers are more likely to be willing to comply with institutional regulations in a co-management setting (Bown et al., 2013; Battista et al., 2018). This is backed up by the data revealed through this section, which identifies that unions with lower levels of institutional reach, are shown to have lower levels of institutional transparency, which further allows for lower levels of fisher empowerment. This chapter further identifies that Burigoalini, the union with the strongest institutional reach, also showed higher levels of transparency and empowerment.

4.6.2 Corruption

Corruption can present a major challenge towards the success of fisheries co-management and is perhaps one of the greatest challenges co-management institutions face internationally (Nunan et al., 2018; Nunan 2020; Rahman & Islam, 2018). Literature is still divided surrounding what

motivates engagement in corruption (Sundstrom, 2019). Older branches of study spoke to anticipated personal gains being the driver for engaging in corruption (Becket & Stigler, 1974; Ades & Di Tella, 1999). While a more modern branch assumes that engagement in corruption is tied to expectations surrounding the roles of other actors participating in the institutions (Dong et al., 2012; Persson et al., 2013). This study hopes to identify how fishers engage with corruption, in order to better understand if this affects fishers' interactions with the co-management institutions.

As identified earlier through transparency and empowerment measurements, most fishers in the Sundarbans already feel a significant distance between themselves and the governing institutions. This was further made evident as fishers identified corruption as the largest factor within the co-management institutions. As mentioned earlier, corruption refers to instances of reported bribery, extortion, or other instances where governing stakeholders' broke rules, or regulations to favour their personal interests. Fishers spoke to forest officers arresting fishers for fishing in legal fishing zones, among other disputes. As small-scale fishers are already some of the poorest and most marginalized populations in the world, trade-offs between bribes and time spent punished where you are unable to fish or otherwise make earnings can prove to be significant. As such, there is short-term gain for fishers to participate in corruption, and pay bribes (Foellmi, R., & Oechslin, 2007). Even with the short-term gain available, the opportunity for fishers to engage in corruption still requires governing actors to first be willing to corruptly behave (Rose-Ackerman, 1997).

Koikali, and Burigoalini, the two of four unions where corruption was listed as smaller than 20%, were identifying factor related to the organization of the co-management institutions at a higher rate than Munshigonj, and Gabura, who were identifying factor related to fisher livelihoods at a higher rate than the former two unions. Unions where corruption was rated more than 20%, were more likely to identify factors more related to fisher livelihoods, such as forest health, declining fish catch, and issues with food and/or water. Unions where corruption was rated below 20%, were less likely to identify these factors and more likely to identify factors relating to the organization or integrity of the institutions, such as corruption, lack of consultation, or class issues. This identifies that fishers in Munshigonj and Gabura, who interact

with higher levels of corruption, more-so view the co-management institutions as a means of personal or livelihood gain than fishers in Koikali and Burigoalini, who interacted with lower levels of corruption. This suggests that the increased exposure to and interactions with corruption shifted fishers' perceptions to associate governing institutions with livelihood gains. These fishers who were interacting with corruption at a higher level, were also expecting livelihood gains from institutional support at a higher level. These fishers have experience paying bribes or otherwise exploiting the governing system or small-term benefits, and are more likely to expect direct livelihood benefits from institutional tools, such as co-management.

As such, fisher engagement with corruption can be understood as a trade-off between short-term benefits and long-term governing transparency. Should fisher goals and practices be more-so aligned with short-term gain, or anticipated personal gains, the long-term goal of a sustainable co-management institution may prove to be difficult to realize. As instances of corruption are high in the Sundarbans, as are instances of fisher non-compliance (Rahman, 2020). Both attitudes in engaging from the standpoint of a governing actor and complying from the standpoint of fishers need to be addressed should the institutions aim to truly be free of corruption.

4.6.3 Loans

Throughout all fishers, the second largest factor was recognized as loans. Just under $\frac{1}{3}$ of all fishers named loans as a factor towards their own livelihoods and ability to organize co-management institutions. With that said, almost all fishers identified that they currently are engaged with at least one loan. Microcredit schemes have left the vast majority of fishers in debt trap. Loans typically come from NGOs, but further loans can come from informal lending systems. However, some NGOs are key members of co-management institutions, unlike the informal lenders. The loan systems, specifically micro-financing, isn't investigated in this research due to the research available regarding how micro-financing and other common NGO practices affect community-based management settings, and fisher livelihoods throughout Bangladesh (Baser & Hasnath, 2022; Khan et al., 2021; Mahmud et al., 2022). Rather, the focus was on how the respective loans and respective relationships with the NGO's affect the practices of small-scale fishers in the co-management institutions. As many fishers have pre-existing

relationships with NGOs due to loans, fishers may feel a lack of power while interacting within the institutions due to their standing debts. As reported by fishers, NGOs often provide various opportunities for fishers to engage in loans within and outside of the formal co-management institutions. These interactions often exist as reaching various villages and speaking with villagers, similar to field interviews. Beyond this, NGOs often do provide training for fishers, and some of this training does occur through the co-management institutions. However, many fishers did state that they felt the training to be a waste of time, citing that they were not learning anything new.

Non-fisher stakeholders spoke to fishers being uncomfortable with non-fisher stakeholders in the co-management institutions, due to pre-existing relationships between fishers and non-fishers, as well as existing social structures. Fishers lack the power in the co-management institutions to adequately voice their concerns with the other stakeholders. Conversations, and concerns made by fishers are often shot down without significant surrounding conversation or follow-up. To address this, the existing power-dynamics within the co-management institutions need to be addressed. This is expanded upon in the below section.

4.6.4 Lack of social capital

Class issues, referring to a fisher's social status as a fisher preventing them from engaging adequately with the co-management institutions were identified as the second largest factor affecting fishers. As mentioned earlier, this can be related back to the concept of social capital, which can speak to the amount of power a fisher stakeholder has within the institutions based on their social status as fishers. In resource governance, social capital refers to social ties relating to, between, and within stakeholder groups and how these ties move forward to impact governing institutions, particularly in reference to traits such as reciprocity and trust (Nenadovic and Epstein, 2016). Social capital can be understood in co-management as the social norms, networks, and relationships that harbour a cohesive working environment between all respective stakeholders (Armitage et al., 2008). Co-management institutions may attempt to address social capital and trust and build relationships between stakeholders, however, it is evident the differences amongst stakeholders within the institutions are regularly not addressed to a standard that makes meaningful change to marginalized populations (Fratsea & Papadopoulos, 2022;

Chuenpagdee et al., 2013). Although all co-management institutions are independent with their own respective issues to tackle, a lack of social capital for fishing stakeholders often exists as a hurdle in institutional participation (Plummer & FitzGibbon, 2006). With that understanding, both fishers and non-fishers alike agreed that the social status of fishers prevents other stakeholder groups from respecting fisher stakeholders in the co-management institution.

In the context of the co-management institutions in Satkhira, fishing and non-fishing stakeholders feel that fisher voices are often ignored in favour of other stakeholders. As mentioned above, pre-existing loans and debts fishers may impact power dynamics between them and the NGO stakeholders providing the loans in the institutions. Beyond this, fisher relationships with governing stakeholders also weigh in favour of the governing stakeholders. This is inherently true when considering that the governing stakeholders are creating and enforcing rules, while the resource-dependent stakeholders choose to follow the rules and is further emphasized when considering bribery. Fishers do not enjoy the social benefits that come with working for an NGO, or the government, and are regularly treated poorly due to their low social status. This reflects into the co-management institutions, in which fishers' concerns are often dismissed in favour of the emphasis of governing regulations, or training-sessions provided by local NGOs. The lack of social cohesion within co-management institutions can prove to be a significant detriment to fisher participation in co-management institutions and is further reflected in Satkhira by a lack of confidence from the resource-dependent people towards the institutions (Trimble et al., 2014; Pinkerton et al., 2014).

In the management of power dynamics, co-management institutions have an opportunity to either increase or decrease fisher engagement. To determine an ideal relationship between stakeholders is respective to an institution and the various social factors it is dealing with. The ideal power relation for the Satkhira co-management institutions is to be determined by those who design and participate in the institutions. Whether the existing power dynamics are addressed, is up to how the institutions wish to grow and if the institutions feel that current levels of fisher and other resource-dependent stakeholders' engagement are appropriate for what the institutions wish to achieve. However, it should be acknowledged that increasing fishers' social capital within the co-

management institutions is likely to increase institutional compliance (Sessin-Dilascio et al., 2015).

4.6.5 Knowledge-sharing

Knowledge-sharing was identified in just over 13% of fisher responses, and over 10% of non-fisher stakeholders. As mentioned above, knowledge-sharing refers to the sharing of information in VCF meetings. Specifically, interactions between VCF members, NGO and government stakeholders, and fishers where fishers are informed about forest regulations, NGO initiatives, as well as other information which may be relevant to forest maintenance, or fishing and other livelihood well-being. Many fishers described these interactions as a one-way communication channel where their voices weren't heard, and they primarily exist in a listening role. Further, many fishers described the information shared in the meetings as information that they already knew.

With that said, previous councils did not share information when considering forest regulations, making knowledge-sharing a new trait that's being made available through the newer institutions. Knowledge-sharing and knowledge generation exists as a focal element in co-management (Berkes, 2009). As such, the increase of communication between stakeholder groups should be recognized as a positive development. Although this is not new information for many fishers, the fact that knowledge-sharing is now occurring in the co-management institutions strengthens a communication channel for news related to fisher and other forest related livelihoods. Should VCF meetings look to further engage fishers in order to integrate local knowledge within regulatory institutions, they must first work to extract this knowledge for the fishers. Maintaining communication channels with fishers to an extent where they feel they are being heard and are understanding the process of what is going on at an institutional level is a necessary step for a successful co-management institution (Freeman et al., 2018).

With that said, many fishers did acknowledge that they felt the knowledge-sharing to be a waste of time, stating that they were not learning anything new or helpful in regard to their own livelihood practices. Generally, many fishers shared a consensus feeling that the institutions served no benefit to them, as what the institutions spent time on was not related to their concerns,

rather than the concerns of the governing authorities. Most fishers felt that neither the knowledge-sharing, or training provided by NGOs significantly benefited them. There is a need for the co-management institutions to engage with the fishers before their desire to interact with the institutions diminished to a point of no return.

Chapter 5: Understanding Forest Restrictions in relation to Customary and Statutory Orders

5.1 Introduction

In fisheries literature, co-management is often presented as a potential solution used to address conflicts between various stakeholders in order to come to a mutually beneficial solution, while providing an opportunity to sustainably manage a common-pool resource (Armitage et al., 2008; Cundill & Fabricius, 2008; Parlee & Wiber, 2014). While this is true, co-management often does fail as a solution to develop sustainable livelihoods or otherwise fail to meet their institutional goals (Swerdfager & Armitage, 2023; Young et al., 2020; Obiero et al., 2015). A significant difference is often realized when considering the potential of a co-management institution during development versus its physical reality during implementation (Olsson et al., 2004; Nadasdy, 2006). De facto rights often reach their limitations of legitimacy once they begin interacting with statutory orders, which then ultimately reshape the original de facto rights (Schlager & Ostrom, 1992). As such, interactions between orders can prove to be painful for fishers. Regardless of on-ground realities, co-management has potential to benefit marginalized stakeholders. However, it is up to an institution's arrangement and attitude of actors to decide if a genuine pursuit of demarginalization is realized.

Although fishers and governing actors have historically existed in different social realms in the Sundarbans, the independence of Bangladesh as well as the degradation of the forest have increasingly inspired interactions between customary and statutory orders (Siddique et al., 2023). As such, this chapter attempts to develop an understanding of the relationship between customary and statutory orders. Specifically, this chapter wishes to develop an understanding of any institutional biases towards either customary or statutory orders, particularly considering the relationship between the co-management institutions and newly imposed conservation measures in the Sundarbans. This chapter attempts to understand the relationship between customary and statutory institutions in the lens of legal pluralism, a concept which has been used in fisheries literature for well over a decade to better understand dynamics between formal and informal

legal systems (Bavinick, 2003; Jentoft et al., 2009; Wiber & Recchia, 2010; Bavinick & Gupta, 2014).

The chapter attempts to address the thesis's third and final research objective, which asks '*to define the relationship between statutory and customary institutions within the co-management institutions, and determine next steps which could promote stakeholder viability*'. In attempting to do so, this chapter focuses on the newly implemented forest restrictions as an example of how the co-management institutions influence customary and statutory powers. Using data collected throughout field visits, the following chapter attempts to describe how the co-management institutions in Satkhira influence the relationship between customary and statutory orders.

5.2 Defining legal pluralism, ban context, and influence of statutory order

The concept of legal pluralism refers to the coexistence of governing or statutory order with localized or customary order, while descriptions of strong and weak refers to the quality of relationships and recognition between orders (Griffiths, 1986; von Benda-Beckmann & von Benda-Beckmann, 2006; Bavinck et al, 2013; Karnad, 2017; Bavinck, 2020). Strong legal pluralism refers to a customary order that can coexist with a statutory order without the domination of one and other, meaning that customary practices are often recognized through a formal legal system. Under strong legal pluralism, customary law is recognized by the appropriate governing powers (Jentoft et al., 2009; Ruddle & Satria, 2010; Khumsri et al., 2009). In a weak legal pluralism setting there is a lack of mutual recognition between orders and a dominant order prevails (Bavinick & Gupta, 2014; Woodman 1998). In settings which provide weak legal pluralism, resource-dependent people are more likely to engage in illegal fishing practices, or otherwise not comply with statutory orders as the orders do not provide adequate benefits to them (Jentoft et al., 2010). In this text, strong and weak legal pluralism refers to the quality of recognition and interactions between governing orders.

Legal pluralism can further be understood as various legal systems being applied in a single scenario (von Benda-Beckmann & von Benda-Beckmann, 2013). Non-state community-based institutions, such as village councils, have historically shown tremendous influence in the social and economic developments among marginalized communities dependent on natural resources,

reinforcing the influence of community-based structures on statutory orders (Jentoft & Chuenpagdee, 2009). Actors from various sectors are often responsible for shaping both informal and formal institutions in natural resource based settings (Berkes, 2015). Specifically in the context of fisheries governance research, legal pluralism literature attempts to understand the relationship between orders and the respective impacts it has on an environment and community members. Co-management is often regarded as a means of addressing legal pluralism, due to its ability to bridge actors who respond to different legal orders (Parlee & Wiber, 2014; Bavinck & Gupta, 2014).

The concept of legal pluralism is hand-in-hand with the issue of fishing and forest rights in the Sundarbans, as both governing and fishing stakeholders feel they have a respective right to interact with the forest through means of the order they identify with. As such, this chapter uses legal pluralism to frame a discussion surrounding the validity of both fisher rights and customary order, as well as governing laws and statutory orders, specifically in reference to the newly established co-management institutions. Although forest extraction practices in the Sundarbans had been existent for centuries prior to the British colonization of modern-day India and Bangladesh, forest users officially lost legal rights to the Sundarbans shortly following the installation of the British Raj (Siddique et al., 2023). Although this did not halt fishing practices in the area, this marked the beginning of extraction practices in the Sundarbans being influenced by a legal or statutory order. Since then, many fishers have operated within a de facto basis, adjusting their practices whenever a new conservation effort is implemented within the forest (Islam & Chuenpagdee, 2013; Guha 1990). For example, increased conservation efforts have led to fishers paying bribes to forest staff allowing fishers to disregard conservation efforts and continue their livelihood practices, this practice exists as a continuation and modern development of customary orders (Roy et al., 2013). Marginalized actors concerned with the effects to their livelihoods will often develop responses respective to the implemented statutory order, such as paying bribes to access a restricted area, effectively establishing a new customary order. Governing actors in the Sundarbans have had issues with their ability to enforce forest or statutory law and inability to achieve compliance with respective resource-dependent users. Simultaneously, resource-dependent users have historically been unfavoured by statutory orders.

Soon after the independence of Bangladesh, conservation methods implemented throughout the late 1970s began to severely restrict fishing practices, further emphasizing the loss of de facto fishing practices in the forest (Siddique et al., 2023). The prior lack of regulation within the forest has allowed for both past and newly implemented conservation efforts to hold a significant influence. By 1999, the designation of three separate wildlife sanctuaries had covered just under $\frac{1}{4}$ of the forest, which deemed the lands as non-fishing zones (Mahmood et al, 2021; Hoq, 2007). Since then, growing international and anthropogenic pressures to preserve forest lands and make biodiversity targets further influenced the loss of fishing lands (Choudhury & Hossain, 2011; Chowdhury & Hafsa, 2022). Forest lands have increasingly been designated as sanctuary areas, and as of 2022 over 50% of the forest land, accounting for almost 320,000 hectares, is considered as no-fishing zones (Siddique et al, 2023). Further, the implementation of defined industrial spaces has often been designated near fishing zones, heavily affecting small-scale fishing practices due to industrial pollution (Rahman et al, 2009; Rahman & Asaduzzaman, 2010). The aforementioned lack of regulations when considering forest conservation is also true when considering regulations monitoring large-scale industry practices in the Sundarbans. The lack of regulations has allowed for various industries such as commercial fishing or tourism industries to operate as they please without significant concern for industrial effects to the local environment. This has further influenced the decay of the forest, contributing to significant deforestation of the Sundarbans while further mitigating small-scale fishing practices (Siddique et al., 2023).

Seasonal fishing bans arrived in the Sundarbans soon after the turn of the 21st century, in attempts to address diminishing fish and other aquatic species populations (Ahkter, 2012). In 2000, ban periods from May 1st to June 30th were implemented. However, for fishers, the long-term benefits such as increased fish catch were considered marginal in context to the short-term benefits, such as income earned through illegal fishing (Siddique et al., 2023; Clarke et al, 2015; Napata et al, 2020; Brillo et al., 2019). This was primarily due to the lack of increased fish catch overtime, as well as the lack of viable alternative livelihood options or financial compensation during ban periods. Fisher compensation for respective conservation initiatives has been available through a licensing programme which has been in power since colonial times (Cons, 2020). However, due to the decreased number of permits overtime, as well as bribes associated

with claiming a permit, fishers have found it increasingly more difficult to register for and acquire compensations during ban periods.

Overtime, conservation implementations in the forest have influenced an extreme loss of land, combined with the decline in fish stock, marginal financial returns on fish as well as the increased demand for fish helped spark intense competition among fishers (Siddique, 2023). This in turn has helped influence illegal fishing and overfishing in the forest. Increasing statutory orders have led to the increased persecution of resource-dependent users (Razzak et al., 2020; Shah et al, 2010; Sen & Pattanaik, 2018). Historically, the resource-dependent community members of the forest have been the ones who have had to bear the biggest cost when dealing with the repercussions of respective conservation efforts and have had seldom benefits to show from conservation efforts (Cons, 2020; Paprocki, 2018; Roe and Elliott, 2004). Fishers are often left by themselves to deal with the structural and socio-ecological repercussions of a respective conservation implementation. In an economic environment where the most localized and marginalized stakeholders bear the brunt of conservation efforts, stakeholders will address these new issues through informal means, such as bribery (Laurance, 2007; Robbins, 2000; Klooser, 1999). In the context of the Sundarbans, conservation efforts installed through statutory order have had a negative effect on the well-being and livelihood practices of fishers. In their 2023 work, Siddique et al. referred to the style of conservation in the Sundarbans as ‘neoliberal conservation’, where a predominant focus exists on the commodification of nature while simultaneously further increasing marginalization among some stakeholder groups, with some regulations and institutions negatively impacting a fisher’s ability to survive today, as well as survive in the future.

Prominent legal scholars argue that strong legal pluralism is not possible in a neoliberal or liberal market state (Michaels, 2014). Michaels argues that statutory order will ignore a customary order that is too weak to be recognized by the appropriate statutory orders, and too strong that it will pose threat to the position of the statutory order. McKerracher (2023) speaks to neoliberalism existing as ‘a paradigm of domination’, where transnational market needs outweigh the needs within the state, thus enabling the overpower of statutory law of customary law. In contrast, Jentoft and Bavinick (2019) expressed that for co-management structures to incorporate legal

pluralism, institutions must be able to ensure the legitimate participation of all relevant stakeholder groups. Jentoft and Bavinick further argued that co-management should act as a neutral platform, not favouring statutory, customary, state, or transnational objectives, and rather should attempt to bridge a solution based on a human-rights centered approach defined in the SSF Guidelines. As of 2022, the annual three-month forest ban has been shifted to June-August, effectively banning resource collectors from entering the forest and collecting their respective goods throughout the three-month time period (Martinez Fabiani, 2024). This prevents fishers from entering the forest to fish. The new restrictions have been emphasized through the newly implemented co-management institutions, and this study attempts to understand if the new institutions in Satkhira fall in line with the findings of Michaels, McKerracher, Jentoft, and Bavinick when considering what contexts strong legal pluralism will be possible.

5.3 Overview of protected area management rules 2017

The previous chapter stated that within the co-management institutions fisher populations were being informed about decision-making, rather than being a part of the decision-making processes. Fishers for the most part identified that they exist in a listening role, without space for their concerns to be heard. Fishers described the co-management institutions as something that emphasizes forest law, livelihood training, and opportunities to engage in loans with NGOs. Fishers described forest restrictions as a central regulatory function administered by the Forest Office, which were further emphasized through the co-management institutions. Specifically at Village Conservation Forum (VCF) meetings, which are meant to be a platform for marginalized resource-users, were described as platforms to share regulations about forest restrictions while simultaneously providing forest-training and loan opportunities that many forest-users felt to be counterproductive.

The fishers' initial descriptions describe co-management in Satkhira as an institution which promotes statutory order, which is in-line with the growing statutory order in the forest. In issues of legal pluralism, should the stark contrast between orders fail to be addressed, co-management risks becoming something of an echo-chamber, potentially losing any value that it may have (Gondo, 2011; Bellanger et al., 2019). This is evident when considering the history of forest bans in the Sundarbans, as illegal fishing has remained rampant, and people continued to lack faith in

governing institutions. Co-management provides the opportunity for bridging between stakeholder groups, potentially providing a solution for disagreements between stakeholders. In the context of managing forest restrictions, local knowledge could prove to be significant when considering the generational ecological context that local stakeholders have. If a purpose of co-management is the promotion of local ecological knowledge, restoration efforts such as forest restrictions exist as key areas for input.

With that said, co-management in itself cannot be expected to address socio-ecological issues affecting an environment but rather exist as a tool for potential socio-ecological prosperity. The success of co-management institutions is often up to those who shape and use the tool, when considering the funding and development of institutional regulations. It can be helpful to acknowledge that stakeholders typically have goals respective to their own needs and different stakeholders do not share a unison view and interactions with the institutions, ultimately shaping the institutions (Welch-Devine, 2012; Armitage et al., 2009). If the goals of the co-management institution are centered around the increased engagement of marginalized populations, then the success could be understood through increased local participation in decision-making, as well as through the identification of programs promoting alternative or sustainable livelihood opportunities. In the case of many institutions internationally, as well as the institutions in the Sundarbans, the goals exist as a variety promoting both customary and statutory order.

The Protected Area (PA) Management Rules 2017 outline the desired functions for co-management institutions throughout Bangladesh and specifically refers to goals for both the Village Conservation Forum (VCF), and the Peoples Forum (PF) (Mollick et al., 2022). Although the functions were defined in 2017 and were applied to the previous co-management institutions, they remain the defined functions as of today. The functions, originally written in Bengali, were translated by Mollick in his 2022 work, and found below in table 9. At first glance, the majority of the functions established for the VCF as well as the PF are being met. The occurrence of the VCF meetings and respective knowledge sharing processes implies that VCF goals 2, 3, 6, 8, and PF goals 1, 4, 5, 7 are being met. VCF goal 5, and PF goals 6, 8, and 9 are accomplished through the formulation of Community Patrol Groups, (CGP) who monitor the forest to ensure rules and regulations are being followed. PF goal 3 is technically met through the

availability of fishing compensation during ban periods. However, PF function 3 is not met to a high enough scale to significantly impact fishers' compliance with the institutions. PF function 3 fails to successfully provide adequate compensation programs or generate adequate alternative income opportunities, and fishers face increasing struggle during restricted periods as a result.

Table 9. PA management rules 2017

People's Forum (PF)	Village Conservation Forum (VCF)
1. Raising mass awareness among local people on the conservation of natural resources and biodiversity in PA and its adjacent areas.	1. Providing assistance in planning and implementation of the annual work plan of respective PA.
2. Ensuring participation of forest-dependent people in planning and implementation of annual work plan for management of natural resources in PA.	2. Raising mass awareness among the local people on the conservation of natural resources and wildlife.
3. Providing assistance to village conservation forum (VCF) in implementing alternate income generating activities and uplift livelihood of forest-dependent people in PA.	3. Encouraging local people to abide by the forest and environment related existing laws and rules
4. Providing assistance to the activities of co-management executive committees.	4. Providing assistance in implementing social forestry programs in the buffer zones of PA.
5. Encouraging local people to abide by the rules of forest, wildlife and environment and assist forest department (FD) in its appropriate implementation.	5. Cooperating with CMEC in formation and operation of community petrol groups (CPG) in PA.
6. Cooperating and assisting with FD and VCF in selecting participants along with	6. Cooperating with FD and CMEC in curbing tree cutting, wood pilferage, encroachment,

implementation of social forestry programs in the buffer zone areas of PA.	over exploitation of resources and other forest related offenses.
7. Assisting FD and VCF in raising tree plantation programs and agroforestry in fallow landscape adjacent to PA.	7. Assisting FD and CMEC in their endeavors' to planning and implementing an annual work plan.
8. Cooperating with CMEC in formation and operation of community petrol groups (CPG) in PA.	8. Providing assistance in raising awareness of the climate change impacts and necessary measures to adapt among the local people.
9. Monitoring and supervision of implemented PA management activities.	

Arguably, the accomplished functions most relating to the protection of customary orders have very little requirements for their completion. Many of the aforementioned functions listed above are able to be recognized with the basic organization of the co-management structures, such as the development of knowledge-sharing in a VCF meeting. This also should not be considered as legitimate participation for stakeholders, as the institution still fails to provide fishers space to share their thoughts. There are various functions that are practiced that attempt to empower forest-dependent community-members with heightened engagement, such as PF functions 6, 8, and 9. However, these functions are rooted to serve and ultimately benefit the interests of statutory order. The development of CPG exists as an example of increased statutory rule at the loss of customary orders. While CPG members are made up of forest-dependent community-members, their function as a group exists to enforce forest bans implemented by statutory order. As such, by completing these functions, it does not inherently mean that localized stakeholders have a greater say in the decision-making functions, rather than often existing as an additional means of labour to enforce the existing statutory order. Beyond this, goals such as VCF 3, 4, and 8 further imply the use of localized labour or change in local practices in cooperating with or developing statutory solutions.

Many key goals oriented towards the empowerment of marginalized stakeholders are not being met. Goals focusing on customary orders, such VCF goals 1 or PF goal 2, which look at local involvement throughout the management of respective protected areas in the Sundarbans, are not met. No fisher or non-fishing stakeholder acknowledged the coordination of any work plan, with stakeholders contrastingly speaking to the lack of space that exists for fisher input and customary order within the institutions. PF function 6 and VCF function 4 further speak to social forestry programs that were not identified throughout any interviews conducted. Many fishers had quarrels with the effectiveness of the bans when considering a lack of diversity of species being protected, as well as with the timing of the bans. However, due to the lack of space fishers had within the institutions, the decision for many fishers becomes whether or not they choose to comply with the co-management institutions and forest restrictions.

5.4 Results: fisher relationship with bans

This section attempts to understand fisher relationships with the new implemented forest restrictions. This section uses interview data obtained through field work. This section attempts to loosely understand how fishers feel about the new institutions and understand the respective effects it has had on their livelihood practices. Table 10, which is found directly below this section overviews fishers' relationships with the fishing restrictions.

Table 10. Fisher relations with bans

Union	Munishigonj (n=11)	Gabura (n=10)	Koikali (n=14)	Burigoalini (n=12)	Total Overall
Interviewee Identified Restrictions	72.73%	70%	64.29%	75.00%	70.21%
Interviewee Has identified Issues or Displeasure with Restrictions	63.64%	40%	28.57%	50.00%	44.68%
Interviewee Who Identified Bans as a Positive Change	9.09%	30%	35.71%	16.67%	23.40%
Identify bribery, or illegal fishing as a result of the ban	36.36%	0%	7.14%	33.33%	19.15%
Percentage of Fishers Who Believe Their Fish Catch Has Lowered	100%	80%	61.50%	100%	87.23%

Throughout the interviews within all four unions, fishers identified the restrictions at a similar rate, falling between 64.29% - 75.00%. Beyond this, there was a lack of consistency in the three other measurements. All percentages were created through the number of times a characteristic identified divided by the total number of interviewed fishers in a union.

5.4.1 Munshigonj

72.73% of fishers in Munshigonj identified restrictions throughout the interview sessions. As mentioned above, this is relatively in-line with the rest of the unions. Munshigonj, however, did have the highest number of fishers who identified issues or displeasure with the institutions, with 63.64%, almost 15% higher than the next highest union. Munshigonj was also one of two unions where fishers directly identified illegal fishing, or bribery as a direct result of the fishing bans, with 36.36% of fishers identifying a connection. Less than 10% of fishers in Munshigonj regarded the fishing bans as a positive change, the lowest among all unions.

5.4.2 Gabura

Exactly 70% of fishers in Gabura identified fishing restrictions. 40% of fishers expressed displeasure with the restrictions, while 30% viewed the bans as a positive change. Gabura was the sole union where zero fishers identified bribery, or illegal fishing directly as a result of the fishing bans.

5.4.3 Koikali

Koikali had just over 64% of fishers identifying fishing restrictions throughout their interviews, the lowest among all unions. Koikali further has the lowest percentage of fishers identifying displeasures with the restrictions, and the only union where a higher percentage of fishers voiced support of the restrictions, rather than displeasure. 7.14% of fishers in Koikali identified bribery, or illegal fishing due to the bans.

5.4.4 Burigoalini

Burigoalini had the highest percentage of fishers who identified the fishing restrictions in interviews and had the second highest percentage of fishers identifying displeasure with the restrictions, with 75% and 50% respectively. Only 16.67% of fishers in Burigoalini viewed the restrictions as a positive change. A third of fishers in Burigoalini had identifying bribes, or illegal fishing because of the fishing bans. This marked the second highest among all unions.

5.4.5 Cross-union comparison

Munshigonj and Burigoalini, the two unions where 100% of the fishers stated that the fish catch has lowered, were the two unions with the highest rate of fishing restrictions being identified in interviews, the highest percentage of fishers identifying issues or displeasure with the bans, and the lowest percentage of fishers who identify the bans as a positive change. It should be further noted that on all metrics measured in the previous chapter, Burigoalini was an outlier in all measurements. Fishers in Koikali had the highest percentage of approval towards the restrictions, with the lowest hesitancy. Throughout all four unions, Koikali was one of two unions where some fishers were reporting a heightened fish catch when compared to years past. Just over 38% of fishers in Koikali acknowledged that fish catch was slowly rising when compared to past years, and many fishers attribute this rise to the various restrictions implemented. A small minority of fishers in Gabura also reported a heightened fish catch. As Gabura had the second lowest disapproval ratings, and the second highest approval ratings, there seemingly is a relation between the rise or decline of fish catch, and approval of the fishing restrictions, or statutory institutions.

For fishers to view the restrictions positively, there is a need for the restrictions to make sense or provide benefit to them. As fishers in Koikali and Gabura were later on benefitting from a heightened fish catch, they saw value and potential benefits of the ban period. An increase in or accessible financial compensation for fishers during ban periods would likely further build support and compliance of the bans. Koikali and Gabura further may have seen increased fish catch due to their unique environments. Koikali is directly on the border, facing the Indian Sundarbans, likely reaping benefits from the conservation efforts from the Indian side, while Gabura exists as its own island, likely to interact with less interference of fishers outside of the union. Ultimately, the full reasons these two unions were seeing heightened fish catch in comparison to the other two requires further research.

Over $\frac{1}{4}$ of fishers who recognized the bans in the interviews acknowledged the direct link between the bans and increased illegal practices such as bribery or illegal fishing practices. This number may be higher, as some fishers may have chosen to keep their illegal fishing practices private during interviews. Of the fishers who named fishing bans in the interview process, 61.8%

recognized the restrictions as something that they had issues or displeasure with, vs 32.18% who found the restrictions favorable. The remaining fishers did not display strong feelings either way. Some fishers had issues with the timings and other specific considerations of the bans and expressed frustration in that the institutions for not giving them space to share their thoughts. Many fishers spoke to the fact that the three-month ban cannot encompass the various life cycles of all fish species in the forest's waters and pointed to the decreasing fish catch as evidence. For example, Hilsa fish which exist as the most popular fish in Bangladesh, typically breed between October to November. Beyond this, due to the forest's brackish waters, many fish species avoid spending all 12 months of the year in the forest (Habib et al., 2020).

A minority fishers are able to access financial compensation distributed during ban periods to fishers by the Forest Office. However, as mentioned earlier, fishers increasingly facing issues regarding the registration of fishing permits prevents them from receiving compensations during ban periods. It is incorrect to state that the bans provide no benefits, but the effectiveness of the bans should be further considered as the statutory order ultimately leads to increased crime. Although fishing bans were not intended to further marginalize stakeholders, the lack of financial compensation or alternative livelihood options during these ban periods attributes to just that.

5.5 Discussion

The validity of customary law in contrast to statutory law has long been perceived as a legal value which has equal or greater legitimacy for marginalized stakeholders (Griffiths, 1986). In the intersection between orders, where customary practices meet statutory orders, there is nothing defining an inherent right and wrong (Vanderlinden, 1972). Contextualized to Satkhira, fishers prefer to follow customary order but tend to participate in whatever order they perceive will provide them maximized benefits. In unions where some fishers reported increased fish catches, fishers were more willing to comply with statutory order, likely as they were seeing perceived benefits of the restrictions. In contrast, most fishers admitting to illegal fishing practices came from unions where no fishers reported heightened fish catches. With that said, over $\frac{2}{3}$ of fishers who acknowledged the forest bans in the institutions, felt that the bans negatively affected them and expressed overall displeasure with the bans.

When speaking about the current restrictions, fishers expressed similar concerns when compared to previous restrictions and were at contrasts between long and short-term benefits. Within the co-management institutions, fishers spoke to the lack of space they had to share their input, specifically in regard to ecological or conservation-based solutions. Some fishers spoke to the lack of diversity and homogeneous selection when considering the protection of tree-species, as well as an overarching fishing ban which fails to encompass all the various birth cycles of respective fish species within the Sundarbans boundaries. Although co-management was implemented with the intention of integrating local knowledge into statutory order, fishers lack space within the institutions to share respective insights. In contexts that deal with the ecological boundaries of the Sundarbans, such as forest bans, local input may have significant value due to generational knowledgebases that exist and are passed through livelihood practitioners. However, the institutional emphasis on statutory order over customary order creates space for these knowledge-bases to be lost. While the co-management institutions recognize customary orders through their enforcement of forest bans, they remain unable to accommodate customary order. In function the structures fail to provide means for legitimate participation for all stakeholders, failing Jentoft and Bavinicks criteria for what a co-management institution must incorporate to ensure legal pluralism. In the same 2019 work, Jentoft and Bavinick expressed how legal pluralism was identified and addressed through the SSF Guidelines set forward by the Food and Agriculture Organization of the United Nations (2015), and offered article 10.2 as part of their evidence, which is referenced below.

“States should facilitate, train and support small-scale fishing communities to participate in and take responsibility for, taking into consideration their legitimate tenure rights and systems, the management of the resources on which they depend for their well-being and that are traditionally used for their livelihoods. Accordingly, States should involve small-scale fishing communities – with special attention to participation of women, vulnerable and marginalized groups – in the design, planning and, as appropriate, implementation of management measures, including protected areas, affecting their livelihood options. Participatory management systems, such as co-management, should be promoted in accordance with national law”

- Section 10.2, SSF Guidelines

This article further represents the institutional failures in producing strong legal pluralism under the PA Management Rules 2017 or national law. The article promotes addressing conflicts over the management of resources through participatory management. This is done with the expectation that the participatory approach may resolve conflicts between statutory and customary order. However, in Satkhira the promotion is halted by the reality that the co-management institutions fail to provide marginalized stakeholders the adequate tools required to meaningfully participate. As defined earlier, without legitimate participation within the institutions, the institutions cannot be expected to produce strong legal pluralism. Therefore, as the institutions in Satkhira fail to provide legitimate participation, they are failing to adequately address issues of resource management as the article suggests.

When considering the written functions of the co-management institution defined in the PA Management Rules 2017, functions often are centred around statutory order, and various functions targeting customary order are ignored or are functionally weak. On an on-ground level, the institutions fail to provide strong legal pluralism, and it is evident as over $\frac{1}{4}$ of fishers who recognized the forest bans stating they do not comply with the institutions. Ongoing conservation projects isolate resource-dependent fishers from their income source without providing them adequate support. The lack of mutual recognition between orders and the respective institutional preference of statutory orders over customary has led to poor tenure rights, high crime rates, low institutional compliance, the degradation of fish stock and forest areas, and minimal avenues for legitimate communication between fishing and non-fishing stakeholders. These conditions would define the institutions in Satkhira as producing weak legal pluralism as per the designed framework available in section 2.4. This chapter's findings are in-line with Michaels and McKerracher's stance that strong legal pluralism isn't possible in a neoliberal market. Further the findings are in line with Jentoft and Bavinicks work stating that without meaningful participation, legal pluralism is not possible. Without a middle between customary and statutory orders, fishers are forced to choose what order they believe to provide the most benefits. Should the co-management institutions in Satkhira favour statutory order to the point where customary practices are ignored, long-term fisher compliance within the institutions should not be expected unless fishers see respective livelihood benefits from the institutions.

This chapter attempts to understand how co-management institutions in Satkhira impact the relationship of customary or statutory orders. Conservation efforts in the Sundarbans have significantly limited fishing lands overtime, which has helped influence an intense increase in competition among fishers. Increased competition influenced fishers to engage in bribery, which established new norms or customary measures related to their role in conservation within the area. This has historically been true in the Sundarbans and continues through modern restrictions. Ongoing conservation practices negatively impact fishers current and future livelihoods by limiting their access to fishing resources without providing adequate compensation. This further pressures fishers into a poverty-cycle. I argue that customary order will continue to evolve to adjust to the negative livelihood impacts fishers and other resource-dependent stakeholders face when considering's new conservation measures. To prevent this, fishers must receive benefits compensating for their livelihood losses during the implementation of a respective conservation initiative (Menon et al., 2018). This should initially be emphasized through financial compensations which will increase fisher compliance with the restrictions, which would allow conservation measures to better realize the fruits of their labour. Should the conservation measures be accurate to the needs of the forest, the increased compliance among fishers will lead to a heightened fish catch.

5.6 Conclusions

Co-management institutions favouring statutory law over customary is not only evident through the accomplished functions of the PA Management Rules 2017, but when considering specific examples where statutory and customary order meet and clash, co-management favours and benefits statutory law, overpowering customary. This is evident through the history of conservation implementations in the forest and has continued to be true when considering the newly implemented forest bans. Over ¼ of fishers who recognized the bans in the interviews acknowledged the direct link between the bans and increased illegal practices such as bribery or illegal fishing. This number could be higher, as some fishers may have chosen to keep their illegal fishing practices to themselves during interviews.

This chapter attempts to understand the co-management institutions in the lens of legal pluralism and attempts to define the relationships between the two in the context of Satkhira. As the

institutions are unable to accommodate customary order and fisher stakeholders to the same degree as statutory order is accommodated, the institutions should be defined as weak. The findings in Satkhira fall in line with Michaels and McKerrachers stance that strong legal pluralism isn't possible in a neoliberal market. This study supports that strong legal pluralism is not possible through neoliberal conservation. Although it wasn't specifically determined that strong legal pluralism is impossible in a neoliberal economy, the institutions in Satkhira act as further evidence that strong legal pluralism is not occurring within a neoliberal economy. Further, the findings are in line with Jentoft and Bavinicks work stating that without meaningful participation, legal pluralism is not possible. Although this project's findings don't directly determine that strong legal pluralism can only exist where legitimate participation is occurring, the institutions act as an example of strong legal pluralism failing to occur in a co-management setting that fails to provide legitimate participation to marginalized stakeholders. Historically, weak legal pluralism has been the norm in the Sundarbans, and it still is when considering the newly implemented institutions.

Chapter 6: Summary and Conclusions

6.1 Thesis summary

The goal of this thesis research was to better understand how stakeholder interactions influence co-management institutions. Using the co-management institutions in Satkhira as a case study, this thesis utilized several metrics commonly used in fisheries studies. As the Sundarbans goes through further environmental transformation, resource-dependent people are often left to deal with major environmental repercussions. Bangladesh's extreme climate vulnerability, lack of political stability, among other living conditions makes fishers in the Sundarbans amongst the most marginalized populations in the world. Co-management serves as a tool to potentially mitigate this through the increased consideration of the perspectives of resource-dependent people.

As the increasing marginalization of resource-dependent stakeholders and further degradation of the Sundarbans Mangrove Forest continuously ravages the livelihoods of many living in Satkhira, this work hopes to shed light towards the role of fishers in modern-day co-management institutions. Co-management presents the opportunity for increased equity of resource-dependent stakeholders through their increased participation in decision-making processes. As the Sundarbans continues to deal with rapid deforestation and loss of biodiversity, increased participation of local stakeholders and the value of local ecological knowledge may prove to be integral. This thesis attempts to better understand the co-management structures in Satkhira, predominantly in two contexts. The first chapter has a focus on various indicators of good governance, as well as identification of social influences on the relationship between co-management and fishers. The second chapter uses the concept of legal pluralism to better understand the dynamics between customary and statutory governing orders. This lens is particularly used to understand the relationship between forest bans and co-management.

6.2 Key Findings

This study concluded with four significant findings. Primarily, this thesis found that 1. There is a circular relationship between reach, transparency, and empowerment in the institution with

considering community participation in a co-management institution, 2. Reach of a co-management institution can be utilized as a metric to better understand important context, 3. Fishers were more oriented to speak about their livelihood concerns while non-fisher stakeholders were more oriented to speak about the organization of the institutions, however, the consensus between all stakeholder groups is that a lack of social capital, corruption, loans, and knowledge-sharing were the largest factors impacting fisher relationships with co-management institutions, and 4. The institutions in Satkhira promote weak legal pluralism, and that strong legal pluralism is not parallel with a neoliberal economy.

6.3. Relation between findings and objectives

The most in-depth understanding of the relationship between findings and objectives will be available through reading the thesis. However, brief summaries are provided below. This section attempts to cover the thesis's respective findings for each objective.

6.3.1 Objective 1

Objective 1: To contextualize and conceptualize co-management in the Sundarbans to ultimately better understand how the in-place systems operate.

Co-management in the Sundarbans reaches about 50% of the total fisher population but maintains significant issues when considering the lack of institutional transparency, as well in its ability to empower and engage fishers. Munshigonj, Gabura, and Koikali, the three unions who indicated the lowest levels of institutional reach, also had lower levels of transparency, empowerment as well as engagement in the institutions. Burigoalini, the sole union that had a heightened level of institutional reach, reported higher levels of transparency, empowerment and engagement. The findings indicate that if fishers are engaged initially, they are more likely to believe in and then later engage again with the co-management institutions. Fishers were also more likely to comply with forest restrictions if they noticed a subsequent increase in fish catch. However, the increased fish catch is typically marginal compared to the short-term needs of fishers (Siddique et al., 2023).

6.3.2. Objective 2

Objective 2: To understand vulnerabilities and viabilities in the co-management system, significant to small-scale fishing practices.

This section identified several factors, including corruption, loans, social capital, and knowledge-sharing as key factors influencing the co-management institutions, particularly in reference to the positionality of fishers. These factors not only affect the fisher's position to meaningfully engage with the co-management institutions but have wider effects when considering their day-to-day lives. Factors were dually identified by fishing and non-fishing stakeholders alike.

Corruption is a significant threat to the viability of the co-management institutions and remains a significant threat to the realization of conservation measures (Rahman, 2018). Corruption is often attempted to be combated with institutional transparency; however, fishers did not feel the institutions to be transparent (Freitas, 2021). A decrease in corruption will increase fisher trust in governing actors, ultimately readjusting the power dynamics between stakeholders and furthering potential for a successful co-management institution (Nunan et al., 2018). Fishers and NGO stakeholders have pre-existing relationships centred around loans, and their previous relationship with each other may influence their interactions in the co-management institutions.

6.3.3. Objective 3

Objective 3: To define the relationship between statutory and customary institutions within the co-management institutions and determine next steps which could promote stakeholder viability.

To address the third and final objective, the chapter utilized the legal pluralism perspective to understand the stakeholder dynamics between governing and non-governing actors within the co-management institutions. Legal pluralism attempts to distinguish the relationship between customary and statutory orders, while this specific work attempts to make light at the newly implemented forest restrictions in the Sundarbans. The institutions were found to generally be unable to accommodate fishers and generally were centred around statutory functions. As such, the institutions were found to be in delivery of weak legal pluralism. Recommendations have been developed and are written below in attempts to inspire strong legal pluralism. However, many academics argue that strong legal pluralism is not possible in a neoliberal economy (Michaels, 2014; McKerracher, 2023).

6.4. Future recommendations

As the world increasingly moves towards an oligarchy where political change is motivated by the wealthiest, Bangladesh must choose for whom they wish to develop. In the name of building credit, small-scale fishers are increasingly falling into debt, with both credit and debt existing as concepts relatively, if not completely foreign to fishers of generations past. The value of ‘good debt’ is often questioned by the reality of hungry fishers. Governing tools which are meant to empower fishers, typically echo statutory order, which often works to reinforce the political will of the wealthy landowners. With decreased access to fishing resources, as well as decreased fish stock in general, small-scale fishers are increasingly being marginalized to the point where most fishers cannot support themselves on fishing alone. Without increased and effective regulation, fisher competition will continue to rise and access to fishing resources will continue to decline. Without government aid or intervention, the development of social structures such as adequate education, healthcare, and road infrastructure remain unlikely, which further limits livelihood options for fishers.

Bangladesh's new government has the opportunity to promote increased socio-ecological sustainability through upcoming conservation efforts. It should be noted that as the co-management project is ending in 2024, the opportunity to install new institutions that further promotes the participation of resource-dependent people is eminent. Currently, fishers lack power in the institutions to have a meaningful relationship with co-management. To change this, the institutions need to empower fishers. Increased fisher empowerment through community-based institutions can be achieved through several means, generally by addressing power imbalances particularly impacting fisher needs and livelihoods (De la Cruz-González et al., 2018; Wiber et al., 2009). Contextualized to community needs in Satkhira, fishers require financial compensation to safely abide by the forest restrictions. In abiding the statutory order without compensation, fishers’ further risk financial vulnerability. Issues with the fishing registration system need to be addressed before institutional compliance can be expected. Beyond this, fishers in Sundarbans are already financially vulnerable due to a diminishing resource-pool and lack of alternative income sources. This is emphasized to an extreme when considering loans schemes, diminishing earnings, as well as a rising cost of living that fishers deal with. This further outlines the need for an adequate compensation system for fishers, or

larger industrial reform. Several recommendations are listed when considering needs for potential next steps for the co-management institutions, as determined through this thesis. The recommendations were developed in-line with the findings of this thesis, with the goal of increasing legitimate participation among resource-dependent stakeholders.

1. Within the co-management institutions, fishers are treated poorly due to their social status as fishers, further impacting their ability to engage meaningfully with the institutions (Plummer & Fitzgibbon, 2006). This should be acknowledged as discrimination and highlights a need to protect fishers within the institutions. Although there is an undoubted need for conservation measures restricting resource collection, conservation measures in the Sundarbans have been of little impact to fish catch while further marginalizing fishers (Cotterrell, 2006; Siddique et al., 2023). A legal basis protecting fishers in co-management institutions would likely increase their participation in the institutions (Pomeroy et al., 2001; Puley & Charles, 2022). Fishers can be accosted on this basis through various means, primarily through increased jurisdictions over land or resource rights (Ebel, 2020; Allison et al., 2020; Treves et al., 2018).
2. There is a significant need for an easily accessible fisher registration. Increased access to fishing compensation should dramatically increase fisher compliance with the institutions. Although issues with non-fishers registering as fishers in order to receive fisher compensations may arise, a verification process can likely be installed. The current in-place registration comes from a colonial-era registration system that is increasingly more difficult to get for modern-day fishers, which further puts to question the system's potential for alleviating fisher poverty (Cons, 2020). This may potentially be best addressed through shifts in responsibility from national to regional administrations to handle registration processes, as locals will have a better idea of who the real fishers in a village are (Pomeroy, 1995). Similarly, the institutions are poorly organized and this needs to be addressed for an efficient co-management institution. The institutions should begin recording minutes, designate official meeting places, and promote financial accountability through means such as an introduction of community-based audit systems.
3. The institutions need to do a better job in reaching fishing stakeholders. This may prove to be difficult as word of mouth and door-to-door pitches are often the most effective

means of reaching fishers, particularly for NGO and governing stakeholders. Should there be a wish for heightened inclusion of resource-dependent stakeholders within the institutions, institutions must incentivize the meetings and institutions for fishers.

Financial incentives would not only inspire fishers to go to meetings, but it would allow for the co-management institutions to attempt to alleviate fisher poverty (Austin et al., 2014).

4. The findings of this thesis support that neoliberal conservation is unparallel with strong legal pluralism, and that neoliberalism is unlikely to support co-management. Without better defined tenure rights, sufficient fishing incomes, and functioning governmental services such as hospitals and educational institutions, fishers have less reason to comply with statutory order. Without these factors being realized, Bangladeshi small-scale fishers will continue to deal with increasing marginalization through diminishing purchasing powers and resource-dependent people will continue to have little-to-no means of building skills that may be desirable to out-of-forest employers. To address this, and generally to aid in the aforementioned recommendations, I recommend that Bangladesh works to move away from neoliberal models of fisheries management and conservation and nationalize their fisheries industry. State ownership of fishing lands as well as employment and education programs may work to provide both short-term and long-term economic stimulus while working towards both supporting the livelihoods of resource-dependent people and wider ecological goals.

Works Cited

1. Ades, A., & Di Tella, R. (1999). Rents, competition, and corruption. *American economic review*, 89(4), 982-993.
2. Abdullah, A. N. M., Stacey, N., Garnett, S. T., & Myers, B. (2016). Economic dependence on mangrove forest resources for livelihoods in the Sundarbans, Bangladesh. *Forest Policy and Economics*, 64, 15-24.
3. Akber, M. A., Patwary, M. M., Islam, M. A., & Rahman, M. R. (2018). Storm protection service of the Sundarbans mangrove forest, Bangladesh. *Natural Hazards*, 94, 405-418.
4. Akhter, M. (2012). Present status, harvesting, management and legislations pertinent to the Sundarbans fisheries. *Sundarbans fisheries of Bangladesh: current status and potentialities*, 1-13.
5. Alam, M. Z., Carpenter-Boggs, L., Mitra, S., Haque, M. M., Halsey, J., Rokonzaman, M., ... & Moniruzzaman, M. (2017). Effect of salinity intrusion on food crops, livestock, and fish species at Kalapara Coastal Belt in Bangladesh. *Journal of Food Quality*, 2017(1), 2045157.
6. Ali, L., & Thompson, P. (2006). *Wetland Protection and Enhancement through Sanctuaries in Bangladesh* (No. 4). MACH Technical Report.
7. Alizadeh Ashrafi, T., Hermansen, Ø., & Kvamsdal, S. F. (2023). The effect of quota portfolio composition on optimal harvest strategy and profitability in a multi-species fishery. *ICES Journal of Marine Science*, 80(8), 2099-2113.
8. Allison, E. H., Arnaud-Haond, S., Bebbington, J., Bennett, N., Blasiak, R., Boonstra, W., ... & Selim, S. A. (2020). Towards Ocean Equity. *World Resources Institute*.
9. Alvesson, M., & Skoldberg, K. (2009). *Reflexive Methodology: New Vistas for Qualitative Research* (2nd ed.). London: Sage.
10. Amin, R., & Shammin, M. R. (2022). A resilience framework for climate adaptation: The Shyamnagar experience. *Climate Change and Community Resilience*, 12, 69-84.
11. Armitage, D. (2008). Governance and the commons in a multi-level world. *International Journal of the commons*, 2(1), 7-32.

12. Armitage, D., Berkes, F., & Doubleday, N. (2007). Introduction: moving beyond co-management. *Adaptive co-management: Collaboration, learning, and multi-level governance*, 1-15.
13. Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global environmental change*, 18(1), 86-98.
14. Armitage, D. R., Plummer, R., Berkes, F., Arthur, R. I., Charles, A. T., Davidson-Hunt, I. J., ... & Wollenberg, E. K. (2009). Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment*, 7(2), 95-102.
15. Arthur, R. I., Skerrett, D. J., Schuhbauer, A., Ebrahim, N., Friend, R. M., & Sumaila, U. R. (2022). Small-scale fisheries and local food systems: Transformations, threats and opportunities. *Fish and Fisheries*, 23(1), 109-124.
16. Ashrafuzzaman, M., Artemi, C., Santos, F. D., & Schmidt, L. (2022). Current and future salinity intrusion in the south-western coastal region of Bangladesh. *Spanish Journal of Soil Science*, 12, 10017.
17. Austin, Z., Smart, J. C., Yearley, S., Irvine, R. J., & White, P. C. (2014). Incentivising the collaborative management of mobile ecological resources. *Land Use Policy*, 36, 485-491.
18. Ayers, A. L., Kittinger, J. N., & Vaughan, M. B. (2018). Whose right to manage? Distribution of property rights affects equity and power dynamics in comanagement. *Ecology and Society*, 23(2).
19. Aziz, A., & Paul, A. R. (2015). Bangladesh Sundarbans: present status of the environment and biota. *Diversity*, 7(3), 242-269.
20. Badola, R., & Hussain, S. A. (2005). Valuing ecosystem functions: an empirical study on the storm protection function of Bhitarkanika mangrove ecosystem, India. *Environmental Conservation*, 32(1), 85-92.
21. Baksh, B. (2018). To bracket or not to bracket: Reflections of a novice qualitative researcher. *Reflections: Narratives of professional helping*, 24(3), 45-55.
22. Balabanova, D., McKee, M., Pomerleau, J., Rose, R., & Haerpfer, C. (2004). Health service utilization in the former Soviet Union: evidence from eight countries. *Health services research*, 39(6p2), 1927-1950.
23. Barbier, E. B. (2016). The protective service of mangrove ecosystems: A review of valuation methods. *Marine pollution bulletin*, 109(2), 676-681.

24. Barclay, K., Voyer, M., Mazur, N., Payne, A. M., Mauli, S., Kinch, J., ... & Smith, G. (2017). The importance of qualitative social research for effective fisheries management. *Fisheries research*, 186, 426-438.
25. Baser, S., & Hasnath, S. A. (2022). The Rise and Fall of the NGOs in Bangladesh: What Does the Future Hold?. In *Global Perspectives on Non-Governmental Organizations*. IntechOpen.
26. Baten, M. A. Revisiting the success of co-management in forest protected areas of Bangladesh: Untangling the interplay of power, participation, and community empowerment. *Environmental Policy and Governance*.
27. Battista, W., Romero-Canyas, R., Smith, S. L., Fraire, J., Effron, M., Larson-Konar, D., & Fujita, R. (2018). Behavior change interventions to reduce illegal fishing. *Frontiers in Marine Science*, 5, 403.
28. Bavinck, M. (2003). The spatially splintered state: myths and realities in the regulation of marine fisheries in Tamil Nadu, India. *Development and Change*, 34(4), 633-657.
29. Bavinck, M. (2020). Implications of legal pluralism for socio-technical transition studies—scrutinizing the ascendancy of the ring seine fishery in India. *The Journal of Legal Pluralism and Unofficial Law*, 52(2), 134-153.
30. Bavinck, M., & Gupta, J. (2014). Legal pluralism in aquatic regimes: a challenge for governance. *Current Opinion in Environmental Sustainability*, 11, 78-85.
31. Bavinck, M., Johnson, D., Amarasinghe, O., Rubinoff, J., Southwold, S., & Thomson, K. T. (2013). From indifference to mutual support—a comparative analysis of legal pluralism in the governing of South Asian fisheries. *The European Journal of Development Research*, 25, 621-640.
32. BBS (2011) Population and Housing Census 2011 Bangladesh Bureau of Statistics (BBS). Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka.
33. Becker, G. S., & Stigler, G. J. (1974). Law enforcement, malfeasance, and compensation of enforcers. *The Journal of Legal Studies*, 3(1), 1-18.
34. Beem, B. (2007). Co-management from the top? The roles of policy entrepreneurs and distributive conflict in developing co-management arrangements. *Marine Policy*, 31(4), 540-549.

35. Begum, F., de Bruyn, L. L., Kristiansen, P., & Islam, M. A. (2021). Institutionalising co-management activities for conservation of forest resources: Evidence from the Sundarban mangrove forest management of Bangladesh. *Journal of Environmental Management*, 298, 113504.
36. Bellanger, M., Holland, D. S., Anderson, C. M., & Guyader, O. (2019). Incentive effect of joint and several liability in fishery cooperatives on regulatory compliance. *Fish and Fisheries*, 20(4), 715-728.
37. Benton, L. (2002). *Law and colonial cultures: Legal regimes in world history, 1400-1900*. Cambridge University Press.
38. Berkes, F. (2001). *Managing small-scale fisheries: alternative directions and methods*. IDRC.
39. Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of environmental management*, 90(5), 1692-1702.
40. Berkes, F. (2015). *Coasts for people: Interdisciplinary approaches to coastal and marine resource management*. Routledge.
41. Berkes, F., Colding, J., & Folke, C. (Eds.). (2008). *Navigating social-ecological systems: building resilience for complexity and change*. Cambridge university press.
42. Berkes, F., Mahon, R., McConney, P., Pollnac, R., & Pomeroy, R. (2001). Managing small-scale fisheries. *Alternative directions and methods*. Ottawa: IDRC.
43. Bhowmik, J., Selim, S. A., Irfanullah, H. M., Shuchi, J. S., Sultana, R., & Ahmed, S. G. (2021). Resilience of small-scale marine fishers of Bangladesh against the COVID-19 pandemic and the 65-day fishing ban. *Marine Policy*, 134, 104794.
44. Birkinshaw, P. (2006). Transparency as a Human Right. *Transparency: The Key to Better Governance*.
45. Bodin, Ö., & Crona, B. I. (2008). Management of natural resources at the community level: exploring the role of social capital and leadership in a rural fishing community. *World development*, 36(12), 2763-2779.
46. Bogert, J. M., Ellers, J., Lewandowsky, S., Balgopal, M. M., & Harvey, J. A. (2022). Reviewing the relationship between neoliberal societies and nature: implications of the

- industrialized dominant social paradigm for a sustainable future. *Ecology and society: a journal of integrative science for resilience and sustainability*, 27(2).
47. Bown, N. K., Gray, T. S., & Stead, S. M. (2013). Co-management and adaptive co-management: Two modes of governance in a Honduran marine protected area. *Marine Policy*, 39(1), 128–134. <https://doi.org/10.1016/j.marpol.2012.09.005>
 48. Brillo, B. B. C., Jalotjot, H. C., Cervantes, C. C., & Rola, A. C. (2019). Impact on income and livelihood of fisheries workers: Closed fishing season policy for sardines in Zamboanga Peninsula, Philippines. *Journal of Coastal Conservation*, 23, 1057-1067.
 49. Burt, R. S. (2000). The network structure of social capital. *Research in organizational behavior*, 22.
 50. Carlsson, L., & Berkes, F. (2005). Co-management: concepts and methodological implications. *Journal of environmental management*, 75(1), 65-76.
 51. Carothers, C., & Chambers, C. (2012). Fisheries privatization and the remaking of fishery systems. *Environment and Society*, 3(1), 39-59.
 52. Caruso, B. A., Conrad, A., Patrick, M., Owens, A., Kviten, K., Zarella, O., ... & Sinharoy, S. S. (2022). Water, sanitation, and women's empowerment: A systematic review and qualitative metasynthesis. *PLoS Water*, 1(6), e0000026.
 53. Castro, A. P., & Nielsen, E. (2001). Indigenous people and co-management: implications for conflict management. *Environmental Science & Policy*, 4(4-5), 229-239.
 54. CIA. *Health Protection in the Soviet Union*. CIA, 11 Feb. 2008, <https://www.cia.gov/cia-rdp80t00246a001600750002-0>.
 55. CIA. *The Soviet Fishing Industry: Prospect and Problems*. CIA, Feb. 1975, https://www.cia.gov/docs/DOC_0000309575.
 56. Choudhury, J. K., & Hossain, M. A. A. (2011). Bangladesh forestry outlook study. *Asia-Pacific Forestry Sector Outlook Study II. Bangkok, Thailand: Food and Agriculture Organization*.
 57. Chowdhury, M. S., & Hafsa, B. (2022). Multi-decadal land cover change analysis over Sundarbans Mangrove Forest of Bangladesh: A GIS and remote sensing based approach. *Global Ecology and Conservation*, 37, e02151.

58. Chuenpagdee, R., Pascual-Fernández, J. J., Szeliánszky, E., Alegret, J. L., Fraga, J., & Jentoft, S. (2013). Marine protected areas: Re-thinking their inception. *Marine Policy*, 39, 234-240.
59. Cilesiz, S. (2011). A phenomenological approach to experiences with technology: Current state, promise, and future directions for research. *Educational Technology Research and Development*, 59, 487-510.
60. Cinner, J., & Huchery, C. (2014). A comparison of social outcomes associated with different fisheries co-management institutions. *Conservation Letters*, 7(3), 224-232.
61. Clarke, J., Bailey, D. M., & Wright, P. J. (2015). Evaluating the effectiveness of a seasonal spawning area closure. *ICES Journal of Marine Science*, 72(9), 2627-2637.
62. Cons, J. (2020). Delta Temporalities: Choked and Tangled Futures in the Sundarbans. *Ethnos*, 88(2), 308–329. <https://doi.org/10.1080/00141844.2019.1697334>
63. Cotterrell, R. (2006). *Law, Culture and Society: legal ideas in the mirror of social theory*/by Roger Cotterrell.
64. Coulibaly-Lingani, P., Savadogo, P., Tigabu, M., & Oden, P. C. (2011). Factors influencing people's participation in the forest management program in Burkina Faso, West Africa. *Forest Policy and Economics*, 13(4), 292-302.
65. Creswell, J. W. (2007). *Qualitative inquiry and research design: Choosing among five approaches* (2nd ed.). Sage Publications, Inc.
66. Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*.
67. Crona, B., & Bodin, Ö. (2010). Power asymmetries in small-scale fisheries: a barrier to governance transformability?. *Ecology and society*, 15(4).
68. Cundill, G., & Fabricius, C. (2008). Adaptive co-management under resource-poor conditions. *Exploring sustainability science: A Southern African perspective*, 537-568.
69. Cutler, C. (2013). Legal pluralism as the “common sense” of transnational capitalism.
70. Damiano, M., Wager, B., Rocco, A., Shertzer, K. W., Murray, G. D., & Cao, J. (2022). Integrating information from semi-structured interviews into management strategy evaluation: A case study for Southeast United States marine fisheries. *Frontiers in Marine Science*, 9, 1063260.

71. Dasgupta, S., Huq, M., Mustafa, M. G., Sobhan, M. I., & Wheeler, D. (2016). Impact of climate change and aquatic salinization on fish habitats and poor communities in southwest coastal Bangladesh and Bangladesh Sundarbans. *World Bank Policy Research Working Paper*, (7593).
72. Davis, R. A., & Hanich, Q. (2022). Transparency in fisheries conservation and management measures. *Marine Policy*, 136, 104088.
73. De la Cruz-González, F. J., Patiño-Valencia, J. L., Luna-Raya, M. C., & Cisneros-Montemayor, A. M. (2018). Self-empowerment and successful co-management in an artisanal fishing community: Santa Cruz de Miramar, Mexico. *Ocean & Coastal Management*, 154, 96-102.
74. De Pourcq, K., Thomas, E., Arts, B., Vranckx, A., León-Sicard, T., & Van Damme, P. (2015). Conflict in protected areas: who says co-management does not work?. *PloS one*, 10(12), e0144943.
75. Dervin, B. (1994). Information↔ democracy: An examination of underlying assumptions. *Journal of the American Society for Information Science*, 45(6), 369-385.
76. De Vos, B. I., & Van Tatenhove, J. P. (2011). Trust relationships between fishers and government: new challenges for the co-management arrangements in the Dutch flatfish industry. *Marine Policy*, 35(2), 218-225.
77. Diba, S. A., Irfanullah, H. M., Selim, S. A., & Raihan, S. T. (2022). *A Situational Analysis of Small-Scale Fisheries in Bangladesh: From Vulnerability to Viability*. V2V Working Paper 2022-1. V2V Global Partnership, University of Waterloo, Canada.
78. Dickin, S., Bisung, E., Nansi, J., & Charles, K. (2021). Empowerment in water, sanitation and hygiene index. *World development*, 137, 105158.
79. Didar-UI Islam, S. M., Bhuiyan, M. A., & Ramanathan, A. L. (2015). Climate change impacts and vulnerability assessment in coastal region of Bangladesh: a case study on Shyamnagar Upazila of Satkhira District. *Journal of Climate Change*, 1(1-2), 37-45.
80. Dong, B., Dulleck, U., & Torgler, B. (2012). Conditional corruption. *Journal of Economic Psychology*, 33(3), 609-627.
81. Drydyk, J. (2013). Development ethics and the ‘climate migrants’. *Ethics, Policy & Environment*, 16(1), 43-55.

82. Drydyk, J. (2017). Empowerment, agency, and power. In *Gender Justice and Development: Vulnerability and Empowerment* (pp. 17-30). Routledge.
83. Ebel, S. A. (2020). Moving beyond co-management. *International Journal of the Commons*, 14(1), 278-295.
84. Egan, B., & Place, J. (2013). Minding the gaps: Property, geography, and Indigenous peoples in Canada. *Geoforum*, 44, 129-138.
85. Ela, M. Z., Rabya, T., Khan, L., Rahman, M. H., Shovo, T. E. A., Jahan, N., ... & Islam, M. N. (2021). Climate Change and Livelihood Vulnerabilities: The Forest Resource-Dependent Communities of the Sundarbans of Bangladesh. *Climate Vulnerability and Resilience in the Global South: Human Adaptations for Sustainable Futures*, 341-352.
86. Martinez Fabiani, M. (2024). *Beyond Boundaries: Women and the Sundarbans Mangrove Forest. A study of the non-migration livelihood pathways of women in Coastal Bangladesh* (Master's thesis).
87. FAO. 2015. *Voluntary Guidelines for Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. Rome: United Nation's Food and Agriculture Organization. <http://www.fao.org/3/i4356en/I4356EN.pdf>.
88. FAO. "Year of Artisanal Fisheries and Aquaculture in Russia: FAO's View on Challenges of Small-Scale Fisheries." *FAO*, FAO, 26 Sept. 2022, <https://www.fao.org/russian-federation/news/news-detail/Year-of-Artisanal-Fisheries-and-Aquaculture-in-Russia-FAO-s-view-on-challenges-of-small-scale-fisheries/en>.
89. Farran, S. (2006). Is legal pluralism an obstacle to human rights? Considerations from the South Pacific. *The Journal of Legal Pluralism and Unofficial Law*, 38(52), 77-105.
90. Fedreheim, G. E., & Blanco, E. (2017). Co-management of protected areas to alleviate conservation conflicts: Experiences in Norway. *International Journal of the Commons*, 11(2), 754-773.
91. Ferdiousi, J., & Khan, M. M. H. (2021). Human-wildlife conflict along the edge of the Sundarbans mangrove forest in Satkhira, Bangladesh. *Jahangirnagar University Journal of Biological Sciences*, 10(1-2), 59-70.
92. Ferdous, R. (2023). *The Influence of Patron-client Relations on Fisheries Co-management in Bangladesh* (Doctoral dissertation, University of Birmingham).

93. Finkbeiner, E. M., & Basurto, X. (2015). Re-defining co-management to facilitate small-scale fisheries reform: An illustration from northwest Mexico. *Marine Policy*, 51, 433-441.
94. Foellmi, R., & Oechslin, M. (2007). Who gains from non-collusive corruption?. *Journal of development Economics*, 82(1), 95-119.
95. Fratsea, L. M., & Papadopoulos, A. G. (2022). Fisheries co-management in the “Age of the commons”: social capital, conflict, and social challenges in the aegean sea. *Sustainability*, 14(21), 14578.
96. Freeman, E. R., Civera, C., Cortese, D., & Fiandrino, S. (2018). Strategising stakeholder empowerment for effective co-management within fishery-based commons. *British Food Journal*, 120(11), 2631-2644.
97. Freitas, B. (2021). Corruption in the Fisheries Sector: Import Controls, Transparency, and WWF Practice. *TNRC Practice Note*. <https://www.worldwildlife.org/pages/tnrc-practice-note-corruption-in-the-fisheries-sectorimport-controls-transparency-and-wwf-practice>.
98. Fry, J., Scammell, J., & Barker, S. (2017). Drowning in muddied waters or swimming downstream? A critical analysis of literature reviewing in a phenomenological study through an exploration of the lifeworld, reflexivity and role of the researcher. *Indo-Pacific Journal of Phenomenology*, 17(1).
99. Fukuyama, F. (2011). The Origins of Political Order: From Prehuman Times to the French Revolution. *Farrar, Straus and Giroux*.
100. Gerrard, S., & Kleiber, D. (2019). Women fishers in Norway: few, but significant. *Maritime Studies*, 18(3), 259-274.
101. Getzner, M., & Islam, M. S. (2013). Natural resources, livelihoods, and reserve management: a case study from Sundarbans mangrove forests, Bangladesh. *International Journal of Sustainable Development and Planning*, 8(1), 75-87.
102. Giri, S., Mukhopadhyay, A., Hazra, S., Mukherjee, S., Roy, D., Ghosh, S., ... & Mitra, D. (2014). A study on abundance and distribution of mangrove species in Indian Sundarban using remote sensing technique. *Journal of coastal conservation*, 18, 359-367.
103. Gondo, T. (2011). Adaptive co-management of natural resources: a solution or problem?. *Journal of Human Ecology*, 33(2), 119-131.

104. Granek, E. F., & Ruttenberg, B. I. (2007). Protective capacity of mangroves during tropical storms: a case study from ‘Wilma’ and ‘Gamma’ in Belize. *Marine Ecology Progress Series*, 343, 101-105.
105. Greening, N. (2019). Phenomenological research methodology. *Scientific Research Journal*, 7(5), 88-92.
106. Griffiths, J. (1986). What is legal pluralism?. *The journal of legal pluralism and unofficial law*, 18(24), 1-55.
107. Guggisberg, S., Jaeckel, A., & Stephens, T. (2022). Transparency in fisheries governance: Achievements to date and challenges ahead. *Marine Policy*, 136, 104639.
108. Guha, R. (1990). An early environmental debate: The making of the 1878 forest act. *The Indian Economic & Social History Review*, 27(1), 65-84.
109. Gunjal G.K., (2021). A Study of Climate Change-Induced Migration in the Sundarbans Mangrove Region in the Last Ten Years. <https://cjids.in/volume-v-2021/a-study-of-climate-change-induced-migration-in-the-sundarbans-mangrove-region-in-the-last-ten-years/a-study-of-climate-change-induced-migration-in-the-sundarbans-mangrove-region-in-the-last-ten-years/>
110. Habib, K. A., Neogi, A. K., Nahar, N., Oh, J., Lee, Y. H., & Kim, C. G. (2020). An overview of fishes of the Sundarbans, Bangladesh and their present conservation status. *Journal of Threatened Taxa*, 12(1), 15154-15172.
111. Hamilton, S. E., & Casey, D. (2016). Creation of a high spatio-temporal resolution global database of continuous mangrove forest cover for the 21st century (CGMFC-21). *Global Ecology and Biogeography*, 25(6), 729-738.
112. Han, B. C. (2015). *The transparency society*. Stanford University Press.
113. Hara, M., & Nielsen, J. R. (2003). Experiences with fisheries co-management in Africa. In *The fisheries co-management experience: Accomplishments, challenges and prospects* (pp. 81-97). Dordrecht: Springer Netherlands.
114. Harper, E. (2011). Engaging with customary justice systems. *Customary justice: Perspectives on legal empowerment*, 29-42.
115. Hermansen, Ø., & Dreyer, B. (2010). Challenging spatial and seasonal distribution of fish landings—the experiences from rural community quotas in Norway. *Marine Policy*, 34(3), 567-574.

116. Heylings, P., & Bravo, M. (2007). Evaluating governance: a process for understanding how co-management is functioning, and why, in the Galapagos Marine Reserve. *Ocean & Coastal Management*, 50(3-4), 174-208.
117. Holm, P., & Soma, K. (2016). Fishers' information in governance—a matter of trust. *Current Opinion in Environmental Sustainability*, 18, 115-121.
118. Hoq, M. E. (2007). An analysis of fisheries exploitation and management practices in Sundarbans mangrove ecosystem, Bangladesh. *Ocean & Coastal Management*, 50(5-6), 411-427.
119. Hoque, M. A. A., Saika, U., Sarder, B. C., & Biswas, K. K. (2013). Environmental and socio-economic impacts of salinity intrusion in the coastal area: A case study on Munshigong Union, Shymnagar, Satkhira. *Jahangirnagar University Environmental Bulletin*, 2, 41-49.
120. Hossain, E. *Physical and Socio-economic Profile on Gabura Union, Shyamnagar Upazilla, Satkhira* (Doctoral dissertation, Jagannath University).
121. Huq, N. A. (2022). *A Report on Shrimp Cultivation of Shyamnagar Upazilla in Satkhira District* (Doctoral dissertation, University of Dhaka).
122. Hussain, M., & Hoq, M. E. (2010). Marine and coastal resources of Bangladesh: BOBLME project implication. *Sustainable Management of Fisheries Resources of the Bay of Bengal*, 107.
123. Islam, K. K., Rahman, G. M., Fujiwara, T., & Sato, N. (2013). People's participation in forest conservation and livelihoods improvement: experience from a forestry project in Bangladesh. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 9(1), 30-43.
124. Islam, M. M. (2012). *Poverty in small-scale fishing communities in Bangladesh: Contexts and responses* (Doctoral dissertation, Universität Bremen).
125. Islam, M. M., & Chuenpagdee, R. (2013). Negotiating risk and poverty in mangrove fishing communities of the Bangladesh Sundarbans. *Maritime Studies*, 12, 1-20.
126. Islam, M. M., & Herbeck, J. (2013). Migration and translocal livelihoods of coastal small-scale fishers in Bangladesh. *The Journal of Development Studies*, 49(6), 832-845.

127. Islam, M. M., & Shamsuddoha, M. D. (2018). Coastal and marine conservation strategy for Bangladesh in the context of achieving blue growth and sustainable development goals (SDGs). *Environmental science & policy*, 87, 45-54.
128. Islam, M. M., Shamsuzzaman, M. M., Mozumder, M. M. H., Xiangmin, X., Ming, Y., & Jewel, M. A. S. (2017). Exploitation and conservation of coastal and marine fisheries in Bangladesh: Do the fishery laws matter?. *Marine Policy*, 76, 143-151.
129. Islam, M. R. (2012). *Key factors and readiness perception indicators appraisal: Public-Private partnership in infrastructure development project in Bangladesh* (Doctoral dissertation, BRAC University).
130. Islam, M. W., Ruhanen, L., & Ritchie, B. W. (2018). Tourism governance in protected areas: investigating the application of the adaptive co-management approach. *Journal of Sustainable Tourism*, 26(11), 1890-1908.
131. Islam, S. D. U., & Bhuiyan, M. A. H. (2018). Sundarbans mangrove forest of Bangladesh: causes of degradation and sustainable management options. *Environmental Sustainability*, 1(2), 113-131.
132. Islam, S. D. U., Bhuiyan, M. A. H., Rume, T., & Azam, G. (2017). Hydrogeochemical investigation of groundwater in shallow coastal aquifer of Khulna District, Bangladesh. *Applied Water Science*, 7, 4219-4236.
133. Ivashchenko, Y. V. (2013). *Soviet whaling: past history and present impacts* (Doctoral dissertation, Southern Cross University.).
134. Jacobsen, R. B., Wilson, D. C., & Ramirez-Monsalve, P. (2012). Empowerment and regulation–dilemmas in participatory fisheries science. *Fish and Fisheries*, 13(3), 291-302.
135. Jakobsen, S. E. (1996). Political regulation and market allocation. Development trends in the Norwegian fish farming industry. *Norsk Geografisk Tidsskrift-Norwegian Journal of Geography*, 50(3-4), 187-198.
136. Jacobson, D., & Weidner, D. (1989). Argentino-Soviet fishery relations reviewed, 1966-1988. *Marine fisheries review*, 51(2), 55-68.
137. Jentoft, S. (2000). Legitimacy and disappointment in fisheries management. *Marine policy*, 24(2), 141-148.

138. Jentoft, S. (2005). Fisheries co-management as empowerment. *Marine policy*, 29(1), 1-7.
139. Jentoft, S., & Bavinck, M. (2019). Reconciling human rights and customary law: Legal pluralism in the governance of small-scale fisheries. *The Journal of Legal Pluralism and Unofficial Law*, 51(3), 271-291.
140. Jentoft, S., Bavinck, M., Johnson, D., & Thomson, K. (2009). Fisheries co-management and legal pluralism: how an analytical problem becomes an institutional one. *Human Organization*, 68(1), 27-38.
141. Jentoft, S., & Chuenpagdee, R. (2009). Fisheries and coastal governance as a wicked problem. *Marine policy*, 33(4), 553-560.
142. Jentoft, S., Chuenpagdee, R., & Pascual-Fernandez, J. J. (2011). What are MPAs for: On goal formation and displacement. *Ocean & Coastal Management*, 54(1), 75-83.
143. Jentoft, S., & McCay, B. (1995). User participation in fisheries management: lessons drawn from international experiences. *Marine policy*, 19(3), 227-246.
144. Jentoft, S., Minde, H., & Nilsen, R. (Eds.). (2003). *Indigenous peoples: resource management and global rights*. Eburon Uitgeverij BV.
145. Jentoft, S., McCay, B. J., & Wilson, D. C. (1998). Social theory and fisheries co-management. *Marine policy*, 22(4-5), 423-436.
146. Jentoft, S., Onyango, P., & Islam, M. M. (2010). Freedom and poverty in the fishery commons. *International Journal of the Commons*, 4(1), 345-366.
147. Jentoft, S., Stacey, N., Sunde, J., & González, M. (2019). The small-scale fisheries of indigenous peoples: a struggle for secure tenure rights. *Transdisciplinarity for small-scale fisheries governance: analysis and practice*, 263-282.
148. Jepson, W., Budds, J., Eichelberger, L., Harris, L., Norman, E., O'Reilly, K., ... & Young, S. (2017). Advancing human capabilities for water security: A relational approach. *Water Security*, 1, 46-52.
149. Johansen, U., Bull-Berg, H., Vik, L. H., Stokka, A. M., Richardsen, R., & Winther, U. (2019). The Norwegian seafood industry—importance for the national economy. *Marine Policy*, 110, 103561.

150. Johnsen, J. P., & Jentoft, S. (2018). Transferable quotas in Norwegian fisheries. *Fisheries, quota management and quota transfer: Rationalization through bio-economics*, 121-139.
151. Johnson, N. N. (2019). Writing HERstory: Examining the intersectional identities of black women in educational leadership.
152. Kabir, D. M. H., & Hossain, J. (2008). *Resuscitating the Sundarbans: customary use of biodiversity and traditional cultural practices in Bangladesh*. Forest Peoples Programme (FPP).
153. Kabir, G. S., Yew, T. S., Noh, K. M., & Hook, L. S. (2011). Assessing fishers' empowerment in inland openwater fisheries in Bangladesh. *Ecological Economics*, 70(11), 2114-2123.
154. Karnad, D. (2017). Navigating customary law and state fishing legislation to create effective fisheries governance in India. *Marine Policy*, 86, 241-246.
155. Khalil, M. B., Jacobs, B. C., McKenna, K., & Kuruppu, N. (2020). Female contribution to grassroots innovation for climate change adaptation in Bangladesh. *Climate and Development*, 12(7), 664-676.
156. Khan, M. F. A., Uddin, M. S., & Giessen, L. (2021). Microcredit expansion and informal donor interests: Experiences from local NGOs in the Sundarbans Mangrove Forest, Bangladesh. *World Development Perspectives*, 21, 100295.
157. Khan, N. I., & Ahmed, K. (2017). Wetland Sanctuary Co-management and Conflict: An Exploratory Study of the Impacts of the Baikka Beel Project in Bangladesh. *International Quarterly for Asian Studies (IQAS)*, 48(3-4), 223-248.
158. Khumsri, M., Ruddle, K., & Shivakoti, G. P. (2009). Rights and conflicts in the management of fisheries in the Lower Songkhram River Basin, Northeast Thailand. *Environmental management*, 43, 557-570.
159. Kimengsi, J. N., Bhusal, P., Aryal, A., Fernandez, M. V. B. C., Owusu, R., Chaudhary, A., & Nielsen, W. (2019). What (de) motivates forest users' participation in co-management? Evidence from Nepal. *Forests*, 10(6), 512.
160. Klooster, D. (1999). Community-based forestry in Mexico: can it reverse processes of degradation?. *Land Degradation & Development*, 10(4), 365-381.

161. Kofinas, G. P. (2005). Caribou hunters and researchers at the co-management interface: emergent dilemmas and the dynamics of legitimacy in power sharing. *Anthropologica*, 179-196.
162. Kofinas, G. P. (2009). Adaptive co-management in social-ecological governance. *Principles of ecosystem stewardship: Resilience-based natural resource management in a changing world*, 77-101.
163. Kolding, J., Béné, C., & Bavinck, M. (2014). Small-scale fisheries: Importance, vulnerability and deficient knowledge. *Governance of marine fisheries and biodiversity conservation: Interaction and coevolution*, 317-331.
164. Kooiman, J. (2002). Governing as governance.
165. Kooiman, J. (2003). *Societal governance* (pp. 229-250). vs Verlag für Sozialwissenschaften.
166. Kooiman, J., Jentoft, S., Bavinck, M., & Pullin, R. (2005). *Fish for life: interactive governance for fisheries* (p. 432). Amsterdam university press.
167. Krishna, A. (2001). Moving from the stock of social capital to the flow of benefits: the role of agency. *World development*, 29(6), 925-943.
168. Lahiri, I. (2024, September 26). *How climate change is battering one of Norway's key commodity markets* | euronews. Euronews.
<https://www.euronews.com/business/2024/09/26/how-climate-change-is-battering-one-of-norways-key-commodity-markets>
169. Laurance, W. F. (2007). Forest destruction in tropical Asia. *Current Science*, 1544-1550.
170. Lim, W. M. (2024). What is qualitative research? An overview and guidelines. *Australasian Marketing Journal*, 14413582241264619.
171. Lin, N. (2000). Inequality in social capital. *Contemporary sociology*, 29(6), 785-795.
172. Lobe, K., & Berkes, F. (2004). The padu system of community-based fisheries management: change and local institutional innovation in south India. *Marine Policy*, 28(3), 271-281.
173. MacNeil, M. A., & Cinner, J. E. (2013). Hierarchical livelihood outcomes among co-managed fisheries. *Global environmental change*, 23(6), 1393-1401

174. Mahmood, H., Ahmed, M., Islam, T., Uddin, M. Z., Ahmed, Z. U., & Saha, C. (2021). Paradigm shift in the management of the Sundarbans mangrove forest of Bangladesh: Issues and challenges. *Trees, Forests and People*, 5, 100094.
175. Mahmud, K. T., Parvez, A., Ahmed, S. S., & Rafiq, F. (2022). Microcredit and the household food security of the fish farmers: evidence from rural Bangladesh. *Development in Practice*, 32(8), 1091-1100.
176. Mallick, B., Priodarshini, R., Kimengsi, J. N., Biswas, B., Hausmann, A. E., Islam, S., ... & Vogt, J. (2021). Livelihoods dependence on mangrove ecosystems: Empirical evidence from the Sundarbans. *Current Research in Environmental Sustainability*, 3, 100077.
177. Matera, J. (2016). Livelihood diversification and institutional (dis-) trust: Artisanal fishing communities under resource management programs in Providencia and Santa Catalina, Colombia. *Marine Policy*, 67, 22-29.
178. McKerracher, K. (2023). Relational legal pluralism and Indigenous legal orders in Canada. *Global Constitutionalism*, 12(1), 133-153.
179. Melnychuk, M. C., Peterson, E., Elliott, M., & Hilborn, R. (2017). Fisheries management impacts on target species status. *Proceedings of the National Academy of Sciences*, 114(1), 178-183.
180. Menon, A., Sowman, M., & Bavinck, M. (2018). Rethinking capitalist transformation of fisheries in South Africa and India. *Ecology and Society*, 23(4).
181. Merry, S. E. (1991). Law and colonialism.
182. Michaels, R. (2014). On liberalism and legal pluralism. In *Transnational Law—Rethinking European Law and Legal Thinking* (pp. 122-142). Cambridge University Press.
183. Moller, H., Berkes, F., Lyver, P. O. B., & Kislalioglu, M. (2004). Combining science and traditional ecological knowledge: monitoring populations for co-management. *Ecology and society*, 9(3).
184. Mollick, A. S., Roy, M., Khan, N. I., Islam, W., Sadath, N., & Nath, T. K. (2022). Assessing good governance in protected areas (PA) Co-management: a case study of the Sundarbans Mangrove Forests of Bangladesh. *Journal of Sustainable Forestry*, 41(3-5), 277-301.

185. Mollick, T. (2024). Impact of Climate Change: A Case Study on Gabura Union of Satkhira District, Bangladesh - SESDO.
186. Mondal, S. H., & Debnath, P. (2017). Spatial and temporal changes of Sundarbans reserve forest in Bangladesh. *Environment and Natural Resources Journal*, 15(1), 51-61.
187. Moniruzzaman, M., Cottrell, A., King, D., & Islam, M. N. (2018). Environmental migrants in Bangladesh: A case study on climatic change hazards in the southwestern coastal area. *Bangladesh I: Climate change impacts, mitigation and adaptation in developing countries*, 99-117.
188. Moustakas, C. (1994). Phenomenological research methods. *Thousand Oaks*.
189. Mozumder, M. M. H., Shamsuzzaman, M. M., Rashed-Un-Nabi, M., & Karim, E. (2018). Social-ecological dynamics of the small scale fisheries in Sundarban Mangrove Forest, Bangladesh. *Aquaculture and Fisheries*, 3(1), 38-49.
190. Murty, T. S., & Neralla, V. R. (1992). On the recurvature of tropical cyclones and the storm surge problem in Bangladesh. *Natural Hazards*, 6, 275-279.
191. Nadasdy, P. (2006). Time, Space, and the Politics of 'Trust' in Co-management Practice. *Traditional ecological knowledge and natural resource management*, 127.
192. Naderifar, M., Goli, H., & Ghaljaie, F. (2017). Snowball sampling: A purposeful method of sampling in qualitative research. *Strides in development of medical education*, 14(3).
193. Nakamura, J., Chuenpagdee, R., & El Halimi, M. (2021). Unpacking legal and policy frameworks: a step ahead for implementing the small-scale fisheries guidelines. *Marine Policy*, 129, 104568.
194. Nakhshina, M. (2016). Constraints on community participation in salmon fisheries management in Northwest Russia. *Marine Policy*, 74, 309-315.
195. Napata, R. P., Espectato, L. N., & Serofia, G. D. (2020). Closed season policy in Visayan Sea, Philippines: A second look. *Ocean & Coastal Management*, 187, 105115.
196. Natcher, D. C., Davis, S., & Hickey, C. G. (2005). Co-management: managing relationships, not resources. *Human organization*, 64(3), 240-250.

197. Nenadovic, M., & Epstein, G. (2016). The relationship of social capital and fishers' participation in multi-level governance arrangements. *Environmental science & policy*, 61, 77-86.
198. Newaz, M. W., & Rahman, S. (2019). Wetland resource governance in Bangladesh: An analysis of community-based co-management approach. *Environmental Development*, 32, 100446.
199. Ng, Q. X. (2025). Bridging abstraction and action: Phenomenology and public health research and practice. *Public Health in Practice*, 100610.
200. Nielsen, M., Asche, F., Bergesen, O., Blomquist, J., Henriksen, E., Hoff, A., ... & Waldo, S. (2018). The myth of the poor fisher: evidence from the Nordic countries. *Marine Policy*, 93, 186-194.
201. Nilssen, F. (2022). Chapter 5: Russia's Role in International Fish and Seafood Trade. *Russia's Role in the Contemporary International Agri-Food Trade System*, 139-164.
202. Nishorgo. (2024) *Nishorgo Network*. <https://nishorgo.org/nishorgo-network/>
203. Nunan, F. (2020). The political economy of fisheries co-management: Challenging the potential for success on Lake Victoria. *Global Environmental Change*, 63, 102101.
204. Nunan, F., Cepić, D., Mbilingi, B., Odongkara, K., Yongo, E., Owili, M., ... & Onyango, P. (2018). Community cohesion: Social and economic ties in the personal networks of fisherfolk. *Society & natural resources*, 31(3), 306-319.
205. Nunan, F., Cepić, D., Yongo, E., Salehe, M., Mbilingi, B., Odongkara, K., ... & Owili, M. (2018). Compliance, corruption and co-management: how corruption fuels illegalities and undermines the legitimacy of fisheries co-management. *International Journal of the Commons*, 12(2), 58-79.
206. Obiero, K. O., Abila, R. O., Njiru, M. J., Raburu, P. O., Achieng, A. O., Kundu, R., ... & Lawrence, T. (2015). The challenges of management: Recent experiences in implementing fisheries co-management in Lake Victoria, Kenya. *Lakes & Reservoirs: Research & Management*, 20(3), 139-154.

207. Olsson, P., Folke, C., & Hahn, T. (2004). Social-ecological transformation for ecosystem management: the development of adaptive co-management of a wetland landscape in southern Sweden. *Ecology and society*, 9(4).
208. Olsson, P., Gunderson, L. H., Carpenter, S. R., Ryan, P., Lebel, L., Folke, C., & Holling, C. S. (2006). Shooting the rapids: navigating transitions to adaptive governance of social-ecological systems. *Ecology and society*, 11(1).
209. Orofino, S., McDonald, G., Mayorga, J., Costello, C., & Bradley, D. (2023). Opportunities and challenges for improving fisheries management through greater transparency in vessel tracking. *ICES Journal of Marine Science*, 80(4), 675-689.
210. Österblom, H., & Folke, C. (2015). Globalization, marine regime shifts and the Soviet Union. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 370(1659), 20130278.
211. Ostrom, E. (1990). *Governing the commons: The evolution of institutions for collective action*. Cambridge university press.
212. Ostrom, E. (2009). *Understanding institutional diversity*. Princeton university press.
213. Ostrom, E. (2010). Beyond markets and states: polycentric governance of complex economic systems. *American economic review*, 100(3), 641-672.
214. Paprocki, K. (2018). Threatening dystopias: Development and adaptation regimes in Bangladesh. *Annals of the American Association of Geographers*, 108(4), 955-973.
215. Parlee, C. E., & Wiber, M. G. (2014). Institutional innovation in fisheries governance: adaptive co-management in situations of legal pluralism. *Current Opinion in Environmental Sustainability*, 11, 48-54
216. Persson, A., Rothstein, B., & Teorell, J. (2013). Why anticorruption reforms fail—systemic corruption as a collective action problem. *Governance*, 26(3), 449-471.
217. Petersson, M. T. (2022). Transparency in global fisheries governance: The role of non-governmental organizations. *Marine Policy*, 136, 104128.
218. Pfadenhauer, M., & Grenz, T. (2015). Uncovering the essence: the why and how of supplementing observation with participation in phenomenology-based ethnography. *Journal of Contemporary Ethnography*, 44(5), 598-616.

219. Plummer, R., & Baird, J. (2013). Adaptive co-management for climate change adaptation: Considerations for the Barents Region. *Sustainability*, 5(2), 629-642.
220. Plummer, R., & Fitzgibbon, J. (2004). Co-management of natural resources: a proposed framework. *Environmental management*, 33, 876-885.
221. Plummer, R., & FitzGibbon, J. (2006, February). People matter: The importance of social capital in the co-management of natural resources. In *Natural Resources Forum* (Vol. 30, No. 1, pp. 51-62). Oxford, UK: Blackwell Publishing Ltd.
222. Polkinghorne, D. E. (1989). Phenomenological research methods. In *Existential-phenomenological perspectives in psychology: Exploring the breadth of human experience* (pp. 41-60). Boston, MA: Springer US.
223. Pomeroy, R. S. (1995). Community-based and co-management institutions for sustainable coastal fisheries management in Southeast Asia. *Ocean & Coastal Management*, 27(3), 143-162.
224. Pomeroy, R. S., Katon, B. M., & Harkes, I. (1998, June). Fisheries co-management: Key conditions and principles drawn from Asian experiences. In *Seventh Biannual Conference of the International Association for the Study of Common Property, "Crossing Boundaries"*. Vancouver, June10-14.
225. Pomeroy, R. S., Katon, B. M., & Harkes, I. (2001). Conditions affecting the success of fisheries co-management: lessons from Asia. *Marine policy*, 25(3), 197-208.
226. Puley, M., & Charles, A. (2022). Dissecting co-management: Fisher participation across management components and implications for governance. *Fish and Fisheries*, 23(3), 719-732.
227. Pretty, J., & Ward, H. (2001). Social capital and the environment. *World development*, 29(2), 209-227.
228. Rahman, M. M. (2020). Impact of increased salinity on the plant community of the Sundarbans Mangrove of Bangladesh. *Community Ecology*, 21(3), 273-284.
229. Rahman, M. M. (2022). Is co-management a double-edged sword in the protected areas of Sundarbans mangrove?. *Biology & Philosophy*, 37(1), 4.
230. Rahman, M. M., Chongling, Y., Islam, K. S., & Haoliang, L. (2009). A brief review on pollution and ecotoxicologic effects on Sundarbans mangrove ecosystem in Bangladesh. *International Journal of Environmental Engineering*, 1(4), 369-383.

231. Rahman, M. M., & Islam, N. (2018). Effectiveness of Co-management Approach in the Protected Areas of Sundarbans: A Double-Edged Sword Tools for Biodiversity Conservation. *The Jahangirnagar Review, Part II: Social Sciences*, 42, 53-70.
232. Rahman, M. R., & Asaduzzaman, M. (2010). Ecology of sundarban, bangladesh. *Journal of Science Foundation*, 8(1-2), 35-47.
233. Rahman, M. S. (2009). Ecology and management of Sundarban: A rich biodiversity of the world's largest mangrove ecosystem. URL: <http://docs.google.com/viewer>.
234. Ranjit, Y. (2014). Determinants of people's participation in forest protection and management: a study in Kaski, Nepal. *Economic Journal of Development Issues*, 175-186.
235. Raufirad, V., Hunter, R., Khalili, R., & Bagheri, S. (2017). Drivers of local people's participation in sustainable natural resource management: A case study in central Iran. *Local environment*, 22(7), 880-893
236. Ray, B., & Bhattacharya, R. N. (2011). Transaction costs, collective action and survival of heterogeneous co-management institutions: case study of forest management organisations in West Bengal, India. *The Journal of Development Studies*, 47(2), 253-273.
237. Ray, S., Mondal, A., & Ramachandran, K. (2018). How does family involvement affect a firm's internationalization? An investigation of Indian family firms. *Global Strategy Journal*, 8(1), 73-105.
238. Razzak, M. A., Ahsan, M. E., & Nahar, N. (2020). The impact of co-management on the Sundarbans fisheries: evidence from Sharankhola, Bagerhat, Bangladesh. *resource*, 10(2), 41-50.
239. Reed, M. S. (2008). Stakeholder participation for environmental management: a literature review. *Biological conservation*, 141(10), 2417-2431.
240. Rezoyana, U., Tusar, M. K., & Islam, M. A. (2023). Impact of salinity: A case study in saline affected Satkhira District. *Open Journal of Social Sciences*, 11(5), 288-305.

241. Ringeling, A. (2005). Instruments in four: the elements of policy design. In *Designing Government; from Instruments Choice to Governance* (pp. 185-202). McGill-Queen's University Press.
242. Robbins, P. (2000). The rotten institution: corruption in natural resource management. *Political Geography*, 19(4), 423-443.
243. Roe, D., & Elliott, J. (2004). Poverty reduction and biodiversity conservation: rebuilding the bridges. *Oryx*, 38(2), 137-139.
244. Rose-Ackerman, S. (1997). The political economy of corruption. *Corruption and the global economy*, 31(60), 54.
245. Roy, A. K. D., Alam, K., & Gow, J. (2013). Community perceptions of state forest ownership and management: A case study of the Sundarbans Mangrove Forest in Bangladesh. *Journal of environmental management*, 117, 141-149.
246. Roy, A. K. D. (2016). Local community attitudes towards mangrove forest conservation: Lessons from Bangladesh. *Marine Policy*, 74, 186-194.
247. Roy, A. K. D., & Alam, K. (2012). Participatory forest management for the sustainable management of the Sundarbans mangrove forest. *American Journal of Environmental Sciences*, 8(5), 549-555.
248. Roy, A. K. D., & Gow, J. (2015). Attitudes towards current and alternative management of the Sundarbans Mangrove Forest, Bangladesh to achieve sustainability. *Journal of Environmental Planning and Management*, 58(2), 213-228.
249. Roy, S. (2022). Integrating Resilience Through Adaptability and Transformability: Ecologically Responsive Design Approach in Case of Southwestern Coastal Region of Bangladesh. In *Resilient and Responsible Smart Cities: Volume 2* (pp. 31-41). Cham: Springer International Publishing.
250. Ruddle, K., & Satria, A. (2010). An introduction to pre-existing local management systems in Southeast Asia. *Managing coastal and inland waters: Pre-existing aquatic management systems in Southeast Asia*, 1-30.
251. Saha, C. K. (2015). Dynamics of disaster-induced risk in southwestern coastal Bangladesh: an analysis on tropical Cyclone Aila 2009. *Natural Hazards*, 75(1), 727-754.
252. Saunier, R. E., & Meganck, R. A. (2009). *Dictionary and introduction to global environmental governance* (2nd ed. [fully revised and updated]). Earthscan

253. Schlager, E., & Ostrom, E. (1992). Property-rights regimes and natural resources: a conceptual analysis. *Land economics*, 249-262.
254. Schmid, U. (2001). Legal pluralism as a source of conflict in multi-ethnic societies: The case of Ghana. *The Journal of Legal Pluralism and Unofficial Law*, 33(46), 1-47.
255. Schusser, C., Krott, M., Movuh, M. C. Y., Logmani, J., Devkota, R. R., Maryudi, A., ... & Bach, N. D. (2015). Powerful stakeholders as drivers of community forestry—Results of an international study. *Forest Policy and Economics*, 58, 92-101.
256. Seminario, C. B. (2024). Decolonising Legal Theory: The Rule of Law and the Legalisation of Legal Pluralism. *Revista Via Iuris*, (36), 38-67.
257. Sen, A., & Pattanaik, S. (2019). The political agenda of implementing Forest Rights Act 2006: evidences from Indian Sundarban. *Environment, Development and Sustainability*, 21(5), 2355-2376.
258. Sessin-Dilascio, K., Prager, K., Irvine, K. N., & de Almeida Sinisgalli, P. A. (2015). The dynamics of co-management and social capital in protected area management—The Cardoso Island State Park in Brazil. *World Development*, 67, 475-489.
259. Shamsuzzaman, M. M., Mozumder, M. M. H., Mitu, S. J., Ahamad, A. F., & Bhyuian, M. S. (2020). The economic contribution of fish and fish trade in Bangladesh. *Aquaculture and Fisheries*, 5(4), 174-181.
260. Shackleton, S., Campbell, B., Wollenberg, E., & Edmunds, D. (2002). Devolution and community-based natural resource management: creating space for local people to participate and benefit. *Natural resource perspectives*, 76(1), 1-6.
261. Shah, S., Huq, K. A. and Rahaman, S.M. B. (2010). Draft report on Study on the conservation and management of fisheries resources of the sundarbans. IPAC, Bangladesh
262. Shaw, M. (2020). History, Status and Governance of Small-Scale Fisheries in Arkhangelsk Oblast, Northwest Russia. *Small-Scale Fisheries in Europe: Status, Resilience and Governance*, 463-481.
263. Siddique, M. R., Hossain, M., Rashid, A. M., Khan, N. A., Shuvo, S. N., & Hassan, M. Z. (2024). Evaluating co-management in the Sundarbans mangrove forest of

- Bangladesh: success and limitations from local forest users' perspectives. *Ecology and Society*, 29(2).
264. Siddique, M. R. H., Hossain, M., & Rashid, A. M. (2023). The dilemma of prioritizing conservation over livelihoods: Assessing the impact of fishing restriction to the fishermen of the Sundarbans. *Trees, Forests and People*, 11, 100366.
 265. Silva, M. R., Pennino, M. G., & Lopes, P. F. M. (2021). Predicting potential compliance of small-scale fishers in Brazil: The need to increase trust to achieve fisheries management goals. *Journal of Environmental Management*, 288, 112372.
 266. Singleton, S. (2000). Co-operation or capture? The paradox of co-management and community participation in natural resource management and environmental policy-making. *Environmental Politics*, 9(2), 1-21.
 267. Skerritt, D. J. (2024). Seeking clarity on transparency in fisheries governance and management. *Marine Policy*, 165, 106221.
 268. Smith, D. W. (2003). Phenomenology.
 269. Smith, S. L. (2012). Toward inclusive co-management: factors influencing stakeholder participation. *Coastal Management*, 40(3), 327-337.
 270. Solecki, J. J. (1979). A review of the USSR fishing industry. *Ocean Management*, 5(2), 97-123.
 271. Solstad, K. J., & Andrews, T. (2020). From rural to urban to rural to global: 300 years of compulsory schooling in rural Norway. *Journal of rural studies*, 74, 294-303.
 272. Sowman, M. (2003). Co-management of the Olifants River hardier fishery. *Waves of changes: Coastal fisheries co-management in South Africa*, University of Cape Town Press, Cape Town, 358
 273. Standal, D., & Hersoug, B. (2023). Illegal fishing: A challenge to fisheries management in Norway. *Marine Policy*, 155, 105750.
 274. Standal, D., & Grimaldo, E., & Svorken, M. (2022). Fisher's Perceptions of Illegal Overfishing and New Catch Control Technologies – a Case Study from Norway. SSRN Electronic Journal. 10.2139/ssrn.4044372.
 275. Standing, A. (2008). Corruption and industrial fishing in Africa. *U4 Issue*.

276. Straumea, K., & Shawb, D. M. (2010). Effective physician retention strategies in Norway's northernmost county. *Bulletin of the World Health Organization*, 88(5), 390-394.
277. Bhowmik, J., Selim, S. A., Irfanullah, H. M., Shuchi, J. S., Sultana, R., & Ahmed, S. G. (2021). Resilience of small-scale marine fishers of Bangladesh against the COVID-19 pandemic and the 65-day fishing ban. *Marine Policy*, 134, 104794.
278. Sultana, P., & Abeyasekera, S. (2008). Effectiveness of participatory planning for community management of fisheries in Bangladesh. *Journal of Environmental Management*, 86(1), 201–213. <https://doi.org/10.1016/j.jenvman.2006.12.027>
279. Sundström, A. (2019). Why do people pay bribes? A survey experiment with resource users. *Social Science Quarterly*, 100(3), 725-735.
280. Swenson, G. (2018). Legal pluralism in theory and practice. *International Studies Review*, 20(3), 438-462.
281. Swerdfager, T., & Armitage, D. (2023). Co-management at a crossroads in Canada: issues, opportunities, and emerging challenges in fisheries and marine contexts. *Facets*, 8, 1-10.
282. Tabassum, T. (2017). *A gender perspective of climate change and disaster management practices of a cyclone affected coastal community* (Doctoral dissertation).
283. Tacconi, L., & Williams, D. A. (2020). Corruption and anti-corruption in environmental and resource management. *Annual Review of Environment and Resources*, 45(1), 305-329.
284. Tajrin, S., & Hossain, B. (2017). The socio-economic impact due to cyclone Aila in the coastal zone of Bangladesh. *Int. J. Law Hum. Soc. Sci*, 1(6), 60-7.
285. Thomas, S. P., & Sohn, B. K. (2023). From uncomfortable squirm to self-discovery: a phenomenological analysis of the bracketing experience. *International Journal of Qualitative Methods*, 22, 16094069231191635.
286. Thompson, P. M., Sultana, P., & Islam, N. (2000, May). Cooperation, conflicts and sustainability in community managed fisheries in Bangladesh. In *Constituting the Commons, the 8th Annual Conference of the International Association for the Study of Common Property*. Bloomington, Indiana, US.

287. Thompson, P. M., Sultana, P., & Islam, N. (2003). Lessons from community based management of floodplain fisheries in Bangladesh. *Journal of environmental management*, 69(3), 307-321.
288. Thorvaldsen, T., Sønvisen, S. A., & Holmen, I. M. (2022). The impact of fisheries management on fishers' health and safety: A case study from Norway. *Marine Policy*, 140, 105066.
289. Tikadar, K. K., Islam, M. J., Saha, S. M., Alam, M. M., Barman, S. K., & Rahman, M. A. (2022). Livelihood status of small-scale fishermen and determinants of their income: Insights from north-eastern floodplains of Bangladesh. *Geography and Sustainability*, 3(3), 204-213.
290. Titumir, R. A. M., Afrin, T., & Islam, M. S. (2020). Traditional knowledge, institutions and human sociality in sustainable use and conservation of biodiversity of the Sundarbans of Bangladesh. *Managing socio-ecological production landscapes and seascapes for sustainable communities in Asia: Mapping and navigating stakeholders, policy and action*, 67-92.
291. Treves, A., Artelle, K. A., Darimont, C. T., Lynn, W. S., Paquet, P., Santiago-Ávila, F. J., ... & Wood, M. C. (2018). Intergenerational equity can help to prevent climate change and extinction. *Nature Ecology & Evolution*, 2(2), 204-207.
292. Trimble, M., de Araujo, L. G., & Seixas, C. S. (2014). One party does not tango! Fishers' non-participation as a barrier to co-management in Paraty, Brazil. *Ocean & Coastal Management*, 92, 9-18.
293. UNDP, UNICEF, & Women, U. N. (2012). Informal Justice Systems: Charting a Course for Human Rights-Based Engagement.
294. United Nations Economic and Social Commission for Asia and the Pacific. (2009). What is good governance?. *Bangkok: United Nations Economic and Social Commission for Asia and the Pacific*.
295. United Nations Economic and Social Commission for Asia and the Pacific. (2024). *THE 17 GOALS*. (<https://sdgs.un.org/goals>)
296. Vanderlinden, J. (1972). Le Pluralisme juridique: essai de synthèse. In J. Gilissen & J. Vanderlinden (Eds.), *Le Pluralisme juridique* (pp. 19-56). Bruxelles: Ed. de l'Université Libre de Bruxelles.(Etudes d'histoire et d'ethnologie juridiques, 11).

297. Van Schie, D., Ranon, R. J. K., Mirza, A. B., & Anderson, S. (2022). Local responses to climate-related non-economic losses and damages: A case study in Burigoalini and Gabura Union, Southwest Bangladesh. *International Institute for Environment and Development*. <https://www.iied.org/21161iied>.
298. von Benda-Beckmann, F., & von Benda-Beckmann, K. (2006). The dynamics of change and continuity in plural legal orders. *The Journal of Legal Pluralism and Unofficial Law*, 38(53-54), 1-44.
299. von Benda-Beckmann, F., & von Benda-Beckmann, K. (2013). *Political and legal transformations of an Indonesian polity: the Nagari from colonisation to decentralisation*. Cambridge University Press.
300. Welch-Devine, M. (2012). Searching for success: defining success in co-management. *Human organization*, 71(4), 358-370.
301. Wertz, F. J. (2005). Phenomenological research methods for counseling psychology. *Journal of counseling psychology*, 52(2), 167.
302. Wiber, M., Berkes, F., Charles, A., & Kearney, J. (2004). Participatory research supporting community-based fishery management. *Marine Policy*, 28(6), 459-468.
303. Wiber, M., Charles, A., Kearney, J., & Berkes, F. (2009). Enhancing community empowerment through participatory fisheries research. *Marine policy*, 33(1), 172-179.
304. Wiber, M., & Recchia, M. (2010). Legal pluralism and integrated management in Saint John Harbour, Canada. *MAST*, 9(1), 81-101.
305. Wilson, D. C., Ahmed, M., Siar, S. V., & Kanagaratnam, U. (2006). Cross-scale linkages and adaptive management: fisheries co-management in Asia. *Marine Policy*, 30(5), 523-533.
306. Wilson, D. C. (2009). *The paradoxes of transparency: science and the ecosystem approach to fisheries management in Europe* (p. 304). Amsterdam University Press.
307. Wolff, S. (2020). Intersections: Pluralism and Conflict Prevention. *Global Center for Pluralism*.
308. Woodman, G. R. (1998). Ideological combat and social observation: recent debate about legal pluralism. *The Journal of Legal Pluralism and Unofficial Law*, 30(42), 21-59.
309. Worldbank. (2024). *Average precipitation in depth (mm per year)*. https://data.worldbank.org/indicator/AG.LND.PRCP.MM?most_recent_value_desc=true

310. Worldbank. (2024). *Total fisheries production (metric tons)*. World Bank Open Data.
https://data.worldbank.org/indicator/ER.FSH.PROD.MT?most_recent_value_desc=true
311. Yan, Y., & Graycar, A. (2020, May). Exploring corruption in fisheries. In *Natural Resources Forum* (Vol. 44, No. 2, pp. 176-190). Oxford, UK: Blackwell Publishing Ltd.
312. Young, N., Cooke, S. J., Hinch, S. G., DiGiovanni, C., Corriveau, M., Fortin, S., ... & Solås, A. M. (2020). "Consulted to death": Personal stress as a major barrier to environmental co-management. *Journal of environmental management*, 254, 109820.
313. Young, J. C., Rose, D. C., Mumby, H. S., Benitez-Capistros, F., Derrick, C. J., Finch, T., ... & Mukherjee, N. (2018). A methodological guide to using and reporting on interviews in conservation science research. *Methods in Ecology and Evolution*, 9(1), 10-19.

Appendices

Appendix 1:

Research Objectives:

1. To contextualize and conceptualize co-management in the Sundarbans to ultimately better understand how the in-place systems operate.
2. To understand vulnerabilities and viabilities in the co-management system, significant to small-scale fishing practices.
3. To define the relationship between statutory and customary institutions within the co-management institutions and determine next steps which could promote stakeholder viability.

Preamble:

The degradation of the Sundarbans is an on-going process that is impacted by climate change, as well as the human practices affecting the area. Co-management, or community-based management, is a form of management implemented in some villages within the Sundarbans, to regular small-scale fishing practices. The purpose of this study, therefore, is to ***better understand how stakeholder interactions within the current co-management institutions may influence the transition towards vulnerability, or viability. It is important to note that all information you provide through this interview will be confidential.*** I will name the following stakeholder groups involved in this study, and then if you have any questions prior to the interview in regards to privacy, please do state them.

For the success of this study, the following groups will be requested for interviews: Peoples Forums representatives (PF), Village Conservation Forum (VCF), Government Agencies/Forest Department (GOA/FD), Law Enforcement Agencies and Local Government Representatives (LEA/LGR), and Community Patrol Groups (CPG). Further, relevant NGO groups working within the Sundarbans will be requested for interviews. Groups have been decided based on the co-management structure in-place in the Sundarbans represented by Mollick et al. (2023), as well as the acknowledgement of NGO's for their work in SSF communities (Thompson et al., 2003).

VCF:

1. How would you describe the current co-management institutions in place? What other stakeholders do you interact with, and what are the interactions about? How much of a say do you have in decision making?
2. Can you describe major changes you have seen through the co-management or community-based fisheries management that are currently in-place, and the significant actors behind these changes?
3. Would you describe decision-making processes as hierarchical, or more democratic? What regularity and depth are you and your fellow community members consulted prior to any decision-making process?
4. When considering SSF practices in the Sundarbans, can you describe how your fish catch has changed overtime?
5. When considering SSF practices in the Sundarbans, can you describe how much fish is exported vs kept internally within villages?
6. When considering mangrove dependent communities, specifically those dependent on SSF practices, is this population/dependance increasing or decreasing?
7. Can you give context regarding the property rights of the fisheries commonly used by members of villages you represent?
8. Can you describe your relationships with government agencies, Forest Department, law enforcing agencies, as well as NGO groups who you work with?
9. When considering SSF management in the Sundarbans, can you describe how both your responsibilities and the structures of co-management have changed overtime? Can you describe how long ago each change occurred, and what you think triggered this change?
10. Can you describe the relationship between statutory and customary institutions? What responsibilities are shared between the two institutions, and how are these responsibilities managed?
11. If any, can you describe any conflicts between statutory and customary institutions?
12. Can you describe the process that happens following an event that may affect SSF practices, ex. What interventions exist towards something such as flooding?
13. Can you describe supports that SSFs get from governments and NGOs, ex. Subsidies?

14. Can you describe key interactions that determine a transition towards either viability or vulnerability?
15. Can you describe potential interactions could that determine a transition towards either viability or vulnerability?
16. Can you speak to how the physical environment, resources within the Sundarbans, specifically the fish, have changed overtime? Can you further speak to the institutional forces that you feel significantly have contributed to these changes, as well as forces that you feel could mitigate any change that has been seen?
17. What would you describe as the key issues plaguing SSFs and their communities today? Could you further speak to potential interventions towards these key issues that you feel would be appropriate or necessary?
18. What changes would you like to see in your own community, be it institutional changes or changes internal to your communities SSF practices?

GOA/FD:

1. How would you describe the current co-management institutions in place? What stakeholders do you interact with through the co-management institutions? How often do you interact with groups such as the CPG/VCF?
2. Would you describe decision-making as a hierarchical process?
3. Can you speak to your duties and responsibilities in regards to the in-place co-management/community-based fisheries management institutions?
4. What have been the major changes you have seen throughout your duration of working in this area? Can you speak towards the forces behind these changes?
5. What have the interactions between stakeholders within the current co-management institutions led to? Can you name specific actions or interactions made by or between stakeholders that have produced a significant outcome through the co-management institution?
6. Can you describe your relationships with local villages organizations and fishers, Forest Department, law enforcing agencies, as well as NGO groups who you work with?

7. When considering SSF management in the Sundarbans, can you describe how both your responsibilities and the structures of co-management have changed overtime? Can you describe how long ago each change occurred, and what you think triggered this change?
8. Can you describe the relationship between statutory and customary institutions? What responsibilities are shared between the two institutions, and how are these responsibilities managed?
9. If any, can you describe any conflicts between statutory and customary institutions?
10. Can you describe the process that happens following an event that may affect SSF practices, ex. What interventions exist towards something such as flooding?
11. In the in-place co-management institutions, can you describe key interactions that have suggested a transition towards either viability or vulnerability?
12. Can you describe potential interactions could that determine a transition towards either viability or vulnerability?
13. Can you speak to how the physical environment, resources within the Sundarbans, specifically the fish, have changed overtime? Can you further speak to the statutory or customary institutional forces that you feel significantly have contributed to these changes, as well as forces that you feel could mitigate any change that has been seen?
14. What would you describe as the key issues plaguing SSFs and their communities today? Could you further speak to potential interventions towards these key issues that you feel would be appropriate or necessary?

NGO Group(s):

1. How would you describe the current co-management institutions in place? What stakeholders do you most commonly interact with through the co-management institutions?
2. Would you describe decision making as a hierarchical process?
3. What would you describe your organizational position in any decision-making process as well as general responsibilities when considering any current co-management or community-based fisheries management institutions?
4. What have been the major changes you have seen throughout your duration of working in this area? Can you speak towards the forces behind these changes?

5. Can you describe your organization's major contributions within the current co-management/community-based fisheries management institutions?
6. Can you describe your organization's major challenges within the current co-management/community-based fisheries management institutions?
7. Can you describe your relationships with government agencies, Forest Department, law enforcing agencies, as well as local village organizations or fisher groups who you work with?
8. When considering SSF management in the Sundarbans, can you describe how both your responsibilities and the structures of co-management have changed overtime? Can you describe how long ago each change occurred, and what you think triggered this change?
9. What have the interactions between stakeholders within the current co-management institution led to?
10. How would you describe the relationship between customary and statutory institutions? Do the institutions clash? What happens if there's a problem or disagreement between institutions?
11. Can you further elaborate on your organizational relationship and interactions with both institutions?
12. As an NGO group, would you describe yourself as a customary or statutory institution? If neither, where do you view your organizational positioning when considering any institutional change you are striving for?
13. In the in-place co-management institution, can you describe key interactions that have suggested a transition towards either viability or vulnerability?
14. Can you describe potential interactions could that determine a transition towards either viability or vulnerability?
15. Can you speak to how the physical environment, resources within the Sundarbans, specifically the fish, have changed overtime? Can you further speak to the statutory or customary institutional forces that you feel significantly have contributed to these changes, as well as forces that you feel could mitigate any change that has been seen?
16. What would you describe as the key issues plaguing SSFs and their communities today? Could you further speak to potential interventions towards these key issues that you feel would be appropriate or necessary?

LEA/LGR:

1. How would you describe the current co-management institutions in place? What stakeholders do you interact with through the co-management institutions? How often do you interact with groups such as the VCF?
2. Would you describe decision making as a hierarchical process?
3. Can you speak to your duties in regards to the in-place co-management/community-based fisheries management institutions?
4. Can you describe your relationships with government agencies, Forest Department, local village organizations or fisher groups, as well as NGO groups who you work with?
5. When considering SSF management in the Sundarbans, can you describe how both your responsibilities and the structures of co-management have changed overtime? Can you describe how long ago each change occurred, and what you think triggered this change?
6. What have the interactions between stakeholders within the current co-management institution led to?
7. Can you describe your interactions with customary regulations? How would you describe the relationship between customary and statutory institutions?
8. Can you further elaborate on your organizational relationship and interactions with and within both institutions?
9. Do the institutions clash? What happens if there's a problem or disagreement between institutions?
10. In the in-place co-management institution, can you describe key interactions that have suggested a transition towards either viability or vulnerability?
11. Can you describe potential interactions could that determine a transition towards either viability or vulnerability?
12. Can you speak to how the physical environment, resources within the Sundarbans, specifically the fish, have changed overtime? Can you further speak to the statutory or customary institutional forces that you feel significantly have contributed to these changes, as well as forces that you feel could mitigate any change that has been seen?

13. What would you describe as the key issues plaguing SSFs and their communities today?
Could you further speak to potential interventions towards these key issues that you feel
would be appropriate or necessary?