



VULNERABILITY TO VIABILITY
GLOBAL PARTNERSHIP

Pathways from Vulnerability to Viability: A Multi-Case Analysis of Small-Scale Fisheries in Africa and Asia using I-ADApT

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Abstract

Small-scale fisheries are confronted with several complex, wicked challenges that threaten their existence and community well-being. This comparative study explored pathways from vulnerability to viability using knowledge gathered from analysing 11 case studies in Africa (Ghana, Malawi, Nigeria, Senegal, South Africa) and Asia (Bangladesh, India, Indonesia, Japan, Malaysia, Thailand) using the I-ADApT (Assessment based on Description and Responses, and Appraisal for a Typology) framework, a decision-support tool based on a systems-thinking approach. The study identified several cross-cutting challenges within the small-scale fisheries sector, including declining fish stocks, coastal erosion, regulatory reforms, loss of traditional knowledge, and conflicts. Each case study examined stressors in the natural, social, and governance systems (the social-ecological system), depicting country-specific contexts and root causes.

These challenges were further heightened by systemic poverty and social marginalization, creating a feedback loop where the poor fishers are more likely to become marginalised and vice versa. Navigating these challenges was identified as an important step towards viability. For example, measures such as adopting better social cohesion, increased financial support, legal reforms, and improved fisheries management were reflected in some of the case studies tailored towards transition from vulnerability to viability. Despite the efforts, many of the key issues identified in these case studies remain unaddressed. Factors such as budget constraints, governance and management challenges, and limited involvement of local stakeholders in decision-making processes contributed to the nonresolution of the key issues. Overall, the study recognized the combined role of natural, social and governance and human activities in contributing to small-scale fisheries vulnerabilities. It is recommended that further management approaches recognize the types of opportunities described to promote pathways to viability and work to alleviate the challenges that blocked pathways to viability.

Keywords Small-scale fisheries • Vulnerability to viability • Social-ecological systems • Systems thinking • Fisheries governance • Community wellbeing • I-ADApT framework

1. Introduction

1.1 Background

The Vulnerability to Viability (V2V) Global Partnership for small-scale fisheries project conducts transdisciplinary, community-engaged research aimed at creating socially and ecologically sound small-scale fisheries systems. The V2V Global Partnership is a transdisciplinary knowledge network and partnership that brings together approximately 150 people and 70 organizations from different countries (Dias et al., 2023). It aims to build a global perspective on critical vulnerabilities and opportunities related to small-scale fisheries viability across six Asian countries (Bangladesh, India, Indonesia, Japan, Malaysia, Thailand) and six African countries (Ghana, Malawi, Nigeria, Senegal, South Africa, and Tanzania), and globally. The objective of this study is to explore these small-scale fisheries case studies from Africa and Asia using the I-ADApT (Assessment based on Description and Responses, and Appraisal for a Typology) Framework (Bundy et al, 2016) to further understanding of SSF vulnerability and viability and to identify possible pathways from vulnerability to viability.

1.2. On the importance of small-scale fisheries

Small-scale fisheries (SSF) provide vital economic and food resources, and their loss affects the food security, health, well-being and culture of small-scale fishing communities. Globally, SSF supports over 120.4 million people employed in capture fisheries value chains or engaged in subsistence fishing (FAO, 2024). The small-scale fisheries sector is very diverse and as a result, there is no universal definition for what constitutes small-scale fisheries (FAO, 2015). However, small-scale fisheries practices are specifically place-based (Dias et al., 2023) and if boats are used, they are generally shorter than fifteen meters (Smith & Basurto, 2019). Because boats are small, fishers might not be able to fish far from the coast and would have to utilize less energy-intensive gear. In addition, more than half of the fish that is obtained from the small-scale fisheries sector is for human consumption (McClanahan et al., 2009). Fish are also regarded as one of the healthiest foods on the planet (Bat, 2019), and small-scale fisheries (SSF) have a significant economic impact on the world economy (Isaacs & Witbooi, 2019). They are thought to employ close to 90% of fishery workers (Ocean Wise, 2020) and provide jobs and food security (Bravo-Olivas & Chávez-Dagostino, 2020; Dias et al., 2023; Kittinger et al., 2013). About 40 percent of global captured fish come from SSF, in which 60.2 million people are employed across the entire value chain generating an estimated USD 77 billion in revenue (FAO et al., 2023). Supporting data indicates that small-scale fisheries utilize roughly 11% of fuel, while industrial fisheries consume 89% to generate over half of the world's fish catch

(FAO, 2015; Pauly, 2018). This makes small-scale fisheries sustainable in terms of the carbon footprint they produce and commercially viable (Jacquet & Pauly, 2008). On the other hand, globally, small-scale fisheries are facing crises (Coulthard, 2012). This has been linked to several widespread stresses brought on by the environment and human activities (Amadu et al., 2021). Numerous fish stocks are in danger due to the growing number of detrimental effects of climate change, overfishing, pollution, and illicit, unreported, and unregulated (IUU) fishing (Lam et al., 2016; Petrossian, 2015; Sumaila et al., 2019). These issues in the small-scale fisheries sector are the results of poor planning, regulation, funding, governance, and the exclusion of small-scale fisheries from mainstream sustainability discussions (Chuenpagdee & Jentoft, 2019; Kura et al., 2004). In addition, these problems arising from both human and natural activities have affected the ability of small-scale fisheries to self-organize, adapt and build resilience (Bundy et al., 2016; Folke, 2006). These multiple pressures and issues underscore the vulnerability of SSF and the need to develop pathways to viability, possibly by building on existing strengths and enhancing capacity.

2. Methodology

2.1. The I-ADApT framework

The I-ADApT (Assessment based on Description and Responses, and Appraisal for a Typology) Framework is a decision support tool (DST) based on a systems thinking approach (Bundy et al., 2016). It was developed to support and enable managers, researchers, and local stakeholders to (1) make decisions efficiently; (2) improve their responses; and (3) evaluate where to most effectively allocate resources (Bundy et al., 2016). It builds on concepts such as the Social-Ecological System (SES) (Berkes & Folke, 1998), Driver-Pressure-State-Impact-Response (DPSIR) framework (Patrício et al., 2016), and Interactive Governance (Kooiman, 2003). An important part of the I-ADApT is the human-environment interaction which defines the systems thinking approach (VanWey et al., 2005) and considers the concept of well-being, resilience, social-ecological systems, ecosystem services, and adaptive capacity (Bundy et al., 2016). Assuming that social activities are driven by a variety of governing forces, interactive governance theory emphasizes resolving societal issues through interaction among all the society's actors (Kooiman et al., 2008). The DPSIR framework, on the other hand, emphasizes the connection between stressors, states, impacts, and driving forces. In this regard, the I-ADApT framework has been created as a decision support tool that gives resource managers and decision-makers the chance to draw lessons from the past to adapt to global developments.

The I-ADApT Framework has two main components: a template intended to gather data from SSF SES case studies and a typology that is developed from a database of case studies (Bundy et al. 2016., Guillotreau et al., 2017). For this analysis, only the template was used. The template consists of 30 questions across six major themes: A. (Background information), B. (Description of the stressors and their impacts), C. (Vulnerability), D. (Governance and governability), E. (Response) and F. (Appraisal), see Table 1, Appendix A). The purpose of questions is to gather key information under each of these themes in a common format across a diverse range of case studies. Therefore, the use of a consistent framework ensures that the information collected is standardized, comparable and robust.

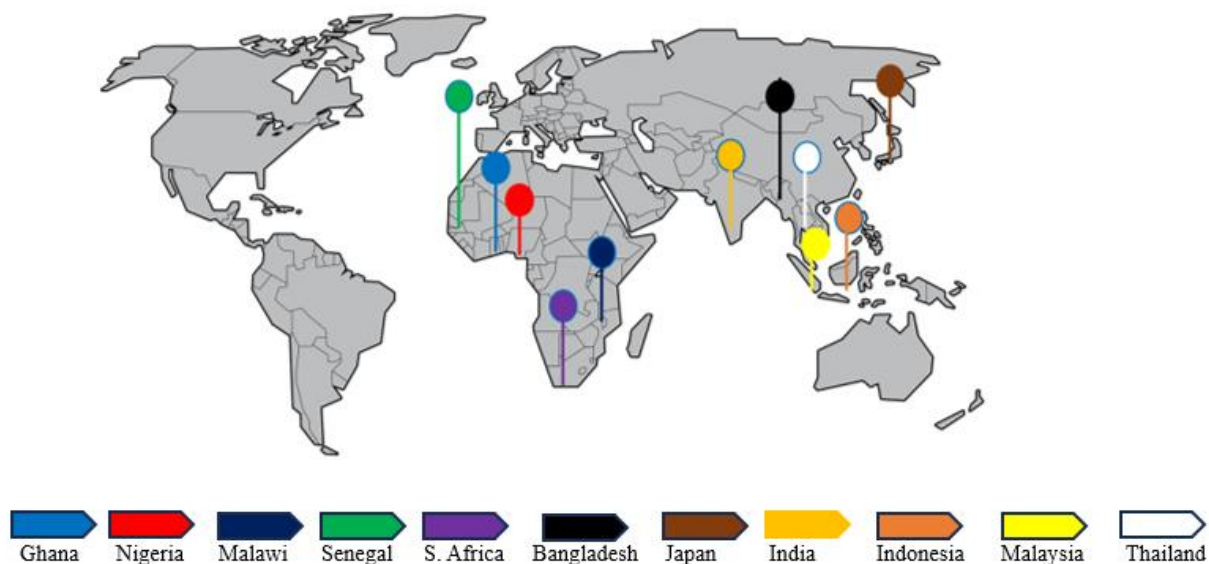
The I-ADApT framework was used here to explore and describe possible pathways between vulnerability and viability. Dias et al. (2023) defined vulnerability as SSF exposure to diverse drivers of change that interfere with the capacity of SSF to cope with those changes, and viability as when SSF are able to navigate the various drivers of change, through adaptation and transformation while building resilience in the process. Important measures of vulnerability and viability in SSF have been identified as lack of, or access to, wellbeing, capitals and resilience respectively (Dias et al., 2023).

As part of the initial work of the V2V program, the I-ADApT framework was tailored to address the V2V program's focus on vulnerability and viability. Vulnerability is addressed through Section C (Vulnerability) and Section D (Governance and governability). There is no specific section for viability, but this is addressed through Sections D (Governance and governability), E (Response) and F (Appraisal). Governance and governability can contribute to both vulnerability and viability and describes the basis of a pathway towards viability. The Response describes a possible pathway towards viability, and the Appraisal provides an analysis on progress towards viability. I-ADApT has also been updated to include gender perspectives to better reflect these important aspects of vulnerability and viability.

Case study templates were completed by V2V country team members based on their existing research and expertise and from literature, reports etc. Before starting this exercise, several online meetings were conducted involving members of the V2V country research teams to discuss, familiarize themselves with the content of the template, and develop a common understanding, further fostering the consistency of the data collected. Eleven V2V countries (Figure 1) contributed to this study: five from Africa (Ghana, Nigeria, Malawi, Senegal, and South Africa) and six from Asia (Bangladesh, India, Indonesia, Japan, and Malaysia, are in Asia). Three of the partner countries in Africa (Ghana, Nigeria, and Senegal) are located in West Africa, while Malawi is in the southeast, and South Africa is in the southern part of the continent. With regards to the partner countries in Asia, Bangladesh and India are in the south, Indonesia, Malaysia, and Thailand are in the south-east, whereas Japan is in the east of Asia.

Figure 1

Map showing the location of the 11 case studies



Sources: Created by the author

2.2. Data analysis process

This study began with an initial meeting with various country leads within the V2V working group to orient them on how to complete the template. The returned, completed templates were then reviewed to ensure familiarity and the accuracy of the information that was provided for qualitative analysis. After familiarizing the data adequately, the completed templates were imported into NVivo 14. NVivo 14 was

chosen to conduct the qualitative data analysis process because of the ability of the program to help track the relationship between different segments of data and clearly show the codes supporting each theme (Allsop et al., 2022). For this study, we used the deductive approach to qualitative data analysis. According to Pearce (2019), the deductive approach to qualitative data analysis will entail approaching data with some preconceived themes that a researcher intends to find based on existing knowledge and past evaluated studies and theories.

The structure of the I-ADApT Case Study Template reflects its origins in interactive governance theory, SES, DPSIR and the framework of the V2V partners (Table 1). These are used to collect information about an “Issue” affecting fisheries and aquaculture that links the natural properties of the marine ecosystem with the social and governance systems. The themes and their descriptions are represented in Table 1. The themes and subthemes were then used as the main foundation for coming up with the code book. A codebook is a conceptual tool that is used to classify, examine, and understand data. The code book was therefore developed through a deductive process that borrowed from past research in the area to come up with theoretically driven themes and subthemes. On the other hand, the codes assigned to the already-established themes and subthemes were constructed inductively based on the content of the case study. Appendix A shows the codebook developed in NVivo 14 to support the full data analysis process during the study. Subthemes were constructed connecting to the main themes to provide a better understanding and onward evaluation of the case studies in each country. The constructed themes and subthemes are represented in Appendix A.

| Table 1 | |
|--|--|
| <i>I-ADApT themes and descriptions</i> | |
| Theme | Description |
| A (Background Information) | This section provides background information about the case study, as well as a clear description of the Main Issue affecting fishing or aquaculture in the case study. |
| B (Description of the stressors and their impacts) | This section aims to gather information about the scale of the affected natural and social systems, the governing systems, the main stressors affecting these systems, the consequent changes that this cause, and their impacts. |
| C (Vulnerability) | This section seeks to understand how SSFs are susceptible to diverse drivers of change or disturbance and with limited capacity to cope with those disturbances. |
| D (Governance and Governability) | The objective of this section is to understand the relevant organizations/ structures responsible for fisheries governance, mode of governance and key rules and regulations. |
| E (Response) | The objective of this section is to evaluate the response of the natural, social and governing systems to the Main Issue. This section asks for information about Short-Term (within 2-5 years) and Long-Term responses for the natural, social and governing systems. |
| F (Appraisal) | The objective of this section is to evaluate the short-term and long-term results that emerged from the responses. The section also helps us to understand the factors that influenced the outcome of the observed results. |

3. Description of case studies

This section provides a brief description of each of the 11 case studies that were analyzed in regional order.

3.1. Bangladesh

The population of Bangladesh has a high dependency on fisheries for food, with fish providing over 60% of animal protein consumption. This case study, Moheshkhali Upazila, which is in the Cox's Bazar district of southern Bangladesh, is focused on the challenges facing small-scale fisheries communities due to the imposition of a 65-day fishing ban since 2015 (the ban occurs between 20 May and 23 July every year). The fishing ban was imposed across all the coastal regions of the country by the government of Bangladesh in response to the problems of overfishing and depleted stocks to allow the fish stocks to recover. However, this is causing many problems for small-scale fishers and small-scale fisheries communities.

3.2. India

The large population surrounding the Chilika Lagoon (approximately 200,000 fishers from 40,000 households), the biggest lagoon on India's eastern coast on Bay of Bengal, depends on the small-scale capture fisheries for their livelihood. This case study in the state of Odisha, surrounding the districts of Puri, Khurda, and Ganjan, focuses on the transformation occurring within the Chilika lagoon and its attendant problems. The small-scale fishery systems in Chilika Lagoon on the Bay of Bengal have been undergoing constant transformation since the late 1980s and early 1990s for multiple reasons. The narrowing of the mouth of the lagoon has caused the salinity level to decrease while simultaneously increasing the amount of silt, pollution, and mangrove loss. Again, the introduction and expansion of illegal shrimp farming within the lagoon following the Chilika lease policy of 1991 continued to transform the ecological system of the Lagoon. These transformations within the lagoon are causing a decline in SSF stock while increasing conflicts between traditional SSF and outside interests, particularly the shrimp aquaculture farmers over rights and access to productive areas within the lagoon.

3.3. Indonesia

Indonesia is a maritime country with about 17,500 islands including the case study Karimunjawa, located in the Java Sea and comprised of 22 islands. It has a total area of 1116 km² and a population of over 8,800 inhabitants. In 1986 Karimunjawa was established as a National Park and is under the management of the Board of Taman Nasional Karimunjawa, while the Central Java Government manages the fisheries resource. Local communities living around the Karimunjawa Islands partly depend on fish as their source of livelihood. This case study is focused on the challenges facing SSF due to the designation of the Karimunjawa Islands as a national marine conservation area and the promotion of Karimunjawa as an ecotourism destination, which is the top goal for the administration. Small-scale fishers who depend on marine resources for their livelihoods are thus being marginalized.

3.4. Japan

For about 2,000 years, women in Japan have been diving into the ocean to gather seaweed, sea urchins, and shellfish that are found on the bottom. These ladies are known as Ama (woman divers). This case study, which is located on the Izu Peninsula in Shizuoka Prefecture, Japan, is focused on the collapsing of traditional knowledge in the SSF sector. The custom of gathering *Tengusa* seaweed (*Gelidium elegans*) has been passed down through the generations in the fishing village of Inatori, Shizuoka Prefecture. But with the last Ama passing away in 2016, there isn't a replacement, and the fishery's legacy could be lost.

Currently, general divers have been employed to harvest *Tengusa* due to a revision in the regulations on exercising fishery rights in the Inatori Branch of the Izu Fisheries Cooperative Association.

3.5. Malaysia

Small-scale fisheries communities in the coastal regions of Malaysia make their living from fishing. This case study is located on the coastal coral islands of Peninsular Malaysia and is focused on several challenges facing inhabitants of the Perhentian Islands and Tioman Island Marine Parks. The Perhentian islands are a small archipelago with an area of about 15 km² and a population of about 2,300, while Tioman island has an area of 133 km² and a population of 3,700. Recently, the government introduced Marine Protected Areas to promote ecotourism, which resulted in a No Take Zone within the MPA. The government established the MPAs in the 1980s to protect coral reef ecosystems and fisheries. As a result, about 42 coral islands have been gazetted as marine parks in Peninsular Malaysia. The promotion of tourism over SSF in this study area has been linked to pollution, sedimentation in coral beds, and physical damage to coral reefs and fish habitats. In addition, there is competition between foreign vessels and the SSF. So, the problem is that the No Take Zone has increased socio-economic vulnerability among the local fishing communities. Also, the presence of foreign vessels has forced SSF from their customary fishing grounds while the competition is causing a decline in fisheries' stock.

3.6. Thailand

Bang Saphan Bay was formerly well-known as a productive fishing area, particularly for squid and anchovies, and served as a source of income in the pre-and post-harvest periods. This case study, Bang Saphan Bay, which is bounded by Mae Ramphung Hill in the north, and Bang Berd Hill in the south, is focused on how regulatory changes are creating disruption and uncertainty in fishing communities. Around the 1980s, the use of light in fishing increased anchovy catches from about 20,000 tons in 1980 to 124,000 tons in 1990. This increase in catch raised many concerns regarding the future sustainability of the anchovies, so the 2015 Royal Ordinance on Fisheries came into effect to limit the use of a surrounding net with a mesh size smaller than 2.5 cm while prohibiting fishing operations at night. Both small- and large-scale anchovy fisheries have been negatively impacted by these new regulations, legal inconsistencies, and incompatibility with local fishing practices. As a result, some fishermen have chosen to give up on the anchovy fisheries entirely or to switch to other fisheries (such as squid and prawns).

3.7. Ghana

The people who have settled along the river Pra in the Western Region of Ghana, depend on it for their sources of livelihood. This case study in the Western Region of Ghana is based on the growing problems in the SSF sector due to unapproved fishing methods. Unapproved fishing methods have been used to appropriate resources from the river Pra. These include illegal, unreported, and unregulated (IUU) fishing; the use of light, dynamite, carbide chemicals (DDT), and other destructive fishing gear, and Saiko fishing (fish transshipment). In addition, there is the degradation of mangroves and other important aquatic habitats; increased water turbidity because of illegal gold mining; and pollution from heavy metals and pesticides among other contaminants. The unapproved fishing methods have become a major challenge for the SSF sector to deal with and have resulted in the decline of fish stocks and catches that the communities in the Western Region depend on.

3.8. Malawi

Lake Chilwa is a shallow, inland lake in southern Malawi. Hundreds of people depend on the Lake Chilwa Basin for livelihood. The resources of Lake Chilwa Basin are under pressure, largely due to their economic

value, high population, rural poverty, pollution, deforestation, catchment degradation, climate change and uncoordinated management. The biodiversity of the basin also risks being lost due to overexploitation and destruction of certain species. Lake water levels also fluctuate quite a lot. There is weak governance of resources due to unclear roles of various actors, governance conflicts between local leadership and government policy, limited empowerment of resources users, poor data management, limited participation, accountability and transparency and illegal activities. This case study is on the vulnerabilities facing SSF.

3.9. Nigeria

The Badagry Creek is a major estuarine system in Lagos, Nigeria. This connects freshwater and marine systems. This connection promotes the migration of artisanal fishermen from neighbouring coastal West African countries, leading to a regional congregation of fishermen in the creek. In addition, the creek is also a local and international gateway to ecotourism. It is also known for delivering other ecosystem services. This case study, which is in Badagry Creek in Lagos, is focused on how certain activities, including both natural and man-made, are affecting SSF in the creek. Sand extraction in the creek has seen the number of extractors increase over the years, in addition to the use of efficient equipment to operate. So, this is causing erosion along the banks of the creek, water to become turbid, a reduction in primary productivity, and an increase in pollution. All these problems affect nursery and fishing grounds, biodiversity loss, and reduced fish catches. Also, in Badagry Creek is the problem of water hyacinth infestation. Similar to the sand extraction, the hyacinth infestation clogs waterways, thus impeding the navigation of fishermen, reducing biodiversity, and increasing microhabitats that serve as disease vectors. All these challenges have consequences for the SSF sector operations within Badagry Creek.

3.10. Senegal

Communities residing on the island of Dionewar and its environs depend partly on shellfish as their source of livelihood. This case study, in which Dionewar is in the Department of Foundiougne, Arrondissement of Niodior, is focused on the impact of the 1987 storm on coastal communities and SSF. Since the storm's impact on Dionewar Island in February 1987, erosion has been taking place, especially along the mouth of the island. Also, following the storm impact that ravaged the Sangomar breach, the surrounding communities witnessed a depletion of fish stocks, especially for shellfish. This led to a problem of serious food shortages and loss of income, causing the outmigration of fishermen in Niodior, Dionewar, and Falia to find work in urban areas. This also had some consequences for coastal agricultural lands, the beach, fishing activities, and tourism.

3.11. South Africa

The Overberg coastal area is home to the highly valued species of abalone (*Haloitidis midae*) and a source of livelihood for the people in this coastal community. This case study, the Overberg coastal area, from Arniston close to the southernmost tip of Africa is concerned about how the poaching of abalone and its link to organized crime networks significantly increase the vulnerability of coastal people. The resource is deemed severely depleted because of overfishing and poaching. In addition, there are strict permit requirements governing fishing in South Africa, and the high demand for abalone in Asian countries aggravates the daily problems within these fishing communities.

Table 2 summarizes the description of the size of the marine area in each case study (km²), the size of the area inhabited by people (km²), and the number of people affected by the main issue. Geographic location and features are summarized in Table 3. The total number of people in each case study is summarized in Table 4.

The size of the marine areas in each case study varies from 15 km² in Perhentian Islands in Malaysia to 2,248 in Lake Chilwa, Malawi). The average size of the marine area is 540 km². The size of the area inhabited by people in each case study also varies from 0.3 km² in Ghana to about 7,499 km² in Lake Chilwa, Malawi with an average of 928 km². Fewer people were affected by the main issue in Indonesia (1,461 people) compared to the number of people affected by the main issue in South Africa (109,892). The average number of people that were affected by the main issue in general is about 13,137 people. The lowest number of people in this study, 5311, was recorded in Japan compared to 1,911,612 people in Malawi with an average of 261,758 people.

Table 2*Detailed description of the study areas*

| Country | Name of the study area | Size of marine area in your case study (km2) | Size of the area inhabited by people in your case study (km2) | Number of people affected by the Main Issue | Total number of people in your case study area |
|----------------|--|--|---|---|--|
| Bangladesh | Moheshkhali Upazila | 250 | 362 | 50,000 | 256,546 |
| Ghana | Pra River Basin | 240 | 0.3 | 15,000 | 23699 |
| India | Chilika Lagoon | 1,165 | - | | 200,000 |
| Indonesia | Karimunjawa | 1,100 | 48 | 1,461 | 9,514 |
| Japan | Inatori, Shizuoka Prefecture | - | 78 | 5,311 | 5,311 |
| Malawi | Lake Chilwa Basin | 2,248 | 7,500 | 20,826 | 1,911,612 |
| Malaysia | Perhentian Islands Marine Park and Tioman Island Marine Park | 15 133 | 15 133 | 6,000 | 6,000 |
| Nigeria | Badagry Creek | 81 | 56 | 2,000 | 100,000 |
| Senegal | Dionewar Island | 171 | - | - | 12,589 |
| South Africa | Overberg Coastal District of the Western Cape | 300 | - | 109,892 | 286,786 |
| Thailand | Bang Saphan Bay, Prachuab Khiri Khan Province | 240 | 162 | 4,500 | 67,000 |
| Average | | 540.4 | 928.3 | 13,137 | 261,758 |

3.12. Geographic location

The geographic location (Table 3) of the participating countries can broadly be categorized into two main types: temperate regions and tropical regions. No case studies were from high latitude regions. Two of the participating countries (Japan and South Africa) fall under the temperate region, while nine countries indicated (including Bangladesh, Ghana, India, Indonesia, Malawi, Malaysia, Nigeria, Senegal, and Thailand) that they are within the tropical region. Regionally, five of the countries (Ghana, Malawi, Nigeria, Senegal, and Senegal) are in Africa, while six (Bangladesh, India, Indonesia, Malaysia, Japan, and Thailand) are within the Asian continent.

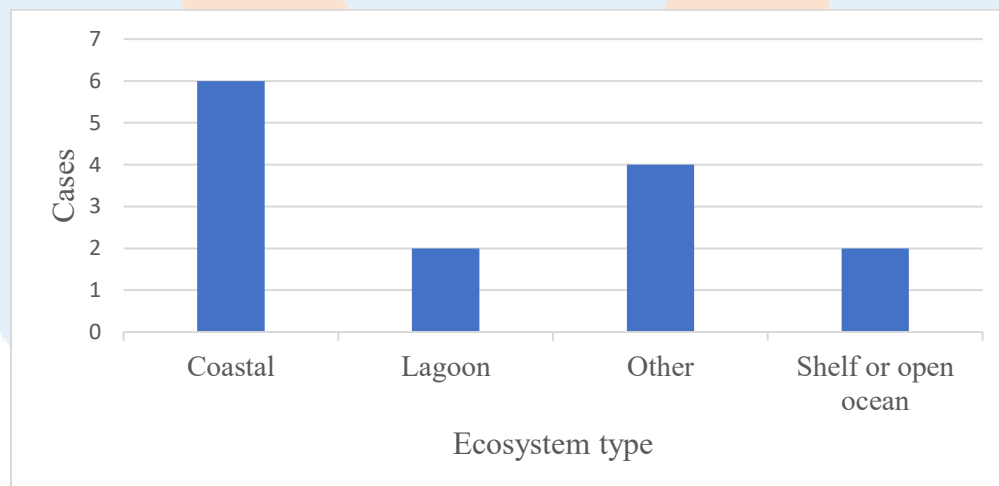
| Table 3 | | |
|-------------------------------|---------------------|---|
| <i>Geographic information</i> | | |
| Region | No. of Cases | Reference |
| High latitude | 0 | 0 |
| Temperate | 2 | Japan, South Africa |
| Tropical | 9 | Ghana, Nigeria, Bangladesh, Malawi, Malaysia, India, Senegal, Indonesia, Thailand |

3.13. Ecosystem type

The ecosystem type (Figure 2) of the participating countries can be broadly categorized into coastal, lagoon, shelf or open ocean and “other”. Six of the participating countries have a coastal type of ecosystem, two as lagoon, two as shelf or open ocean and five described their ecosystem types as “other”. For example, Bangladesh, Indonesia, Malaysia, Senegal and South Africa have coastal ecosystems, India and Ghana (lagoon ecosystem), and Senegal and Japan (shelf or open ocean). Also, countries such as Ghana, Malawi and Nigeria have other ecosystem types in addition to what was stated previously. These include rivers, lakes, mangrove forests, estuaries, marshlands, rocky beaches, and sandy Beaches. These were classified as “other”.

Figure 2

Ecosystem types in 11 case studies



4. Theme A: Background information - main issues

A wide range of issues that affected the case studies were identified including fish stock decline, marginalization of small-scale fisheries, invasive species, resource extraction, climate change as well and loss of traditional knowledge. Three sub-themes were identified to broadly classify these main issues: anthropogenic, natural issues, and others. These sub-themes were based on the causes or origin of the main issue in each participating country and are summarized in Table 4. Main issues such as fish decline in Ghana, Malaysia and South Africa had a component of human activities/causes such as the use of destructive fishing gear and poaching. In Thailand and Bangladesh on the other hand, the main issues

though regulatory, could still be traced to anthropogenic causes and origins. In Thailand, for example, the use of light-luring devices for fishing led to regulatory changes creating disruption and uncertainty for fishing communities. The 65-day ban in Bangladesh, which was a regulatory instrument is a response to the fish decline in the study area. Similarly, in India, the main issue is related to anthropogenic factors where the disturbance in the Chilika lagoon ecosystem in Odisha was primarily due to the construction of the artificial sea mouth at Arakhakuda September 2000 by the Chilika Development Authority (CDA) established in 1992. This resulted in a rapid decline in fish stock due to an influx of excessive marine water that affected their breeding habitat and behavior thereby negatively impacting the livelihoods of local fisherfolk who were primarily dependent on small-scale fisheries in the Chilika lagoon.

On the other hand, infestation by water hyacinth (an aquatic invasive species) in Nigeria and coastal erosion in Senegal, are both natural phenomena that were indirectly related to human activities. The decline in fish stock and catch in India has both natural and anthropogenic origins: seasonal climate events such as cyclones and floods that affected fish stock in India have natural origins while the dredging component of the new sea mouth which has ecological transformations can be traced to human origins.

Japan's case is a bit different (Other), where its main issue was the lack of successors of a traditional *tengusa* (a type of red seaweed) fishery and causing the danger of the fishery to be lost. Background factors for this included the changes in social-economic structures, lack of awareness of the importance of this fishery, and inadequate governance, such as a lack of administrative support due to it.

Several main species were identified in most case studies, although Ghana and South Africa each only indicated one, the black-chinned tilapia (*Sarotherodon melanothron*) and abalone (*Haliotis midae*) respectively. The rest of the participating countries, on the other hand, had more than one species occurring in their respective case studies. The examples below highlight some of the different species mentioned in Senegal, Malaysia and Malawi.

Senegal-main species

Cynoglossus senegalensis, Pseudupeneus prayensis, Pomadasys jubelini, Arius latisculatus, Brotula barbata, Galeoides decadactylus, Cephalopholis taeniops, Epinephelus aeneus, Sardinella maderensis, Sardinella aurita, Parapenaeus longirostris, Palinuridae, Sepiida, Solea Vulgaris, Arius gambiensis, cymbium olla, Cyprinus carpio.

Malaysia-Main Species

There are 323 species of coral and 450 species of fish on the east coast in Malaysia, and 127 species in Perhentian. The multispecies available in the marine fishery include demersal, pelagic, crustaceans and mollusks, and mixed fish.

Malawi-main species

*There are three main fishes that occur in the lake, and these include Matamba (*Barbus paludinosus*), Makumba (*Oreochromis shiranus chilwae*) and Mlamba (*Clarias gariepinus*)*

The main species in the case study live in different aquatic habitats such as mangroves and mudflats (Bangladesh), abalone which feeds on kelp forests (South Africa), marine, river and estuary (Ghana), marshlands, coastal area and coral reefs (Indonesia), *tengusa* seaweed in the coastal ocean, (Japan), emergent, aquatic vegetation (Malawi).

| Table 4 | | | | |
|--------------------------------------|--|-----------------------|-----------------------------|--------------|
| <i>Description of the main issue</i> | | | | |
| Country | The main issue in the case study | Natural origin | Anthropogenic origin | Other |
| Bangladesh | Fish decline- leading to 65 days fishing ban | | ✓ | |
| Ghana | Decline in fish stock and catches | | ✓ | |
| India | Decline in fish stock and catches | ✓ | ✓ | |
| Indonesia | Marginalization of SSF. | | ✓ | |
| Japan | Lack of successor, history/traditional knowledge of the fishery is in danger of being lost | | ✓ | ✓ |
| Malawi | Illegal fishing, climate change and poor governance | | ✓ | |
| Malaysia | The fish stock decline is caused by overfishing and degradation of fish habitats. | | ✓ | |
| Nigeria | Sand mining and Water hyacinth infestation | ✓ | ✓ | |
| Senegal | Coastal erosion is due to climate change and the scarcity of fisheries resources. | ✓ | ✓ | |
| South Africa | Abalone poaching/conflicts | | ✓ | |
| Thailand | Regulatory changes creating disruption and uncertainty in fishing communities | | ✓ | |

5. Theme B: Description of the stressors and their impacts

5.1. Systems boundaries and the administrative levels relating to the main issue

The objective of Theme B was to gather information about the scale of the affected natural, social, and governing systems, the main stressors affecting these systems, and the consequent changes and impacts that these caused (Bundy et al. 2016). The main issues affecting each case study were related to local, regional, national and/or international levels in the natural, social, and governing systems (Table 5). For the natural system, the main issues in all 11 case studies were related to the local level, 3/11 were related to regional, 3/11 were related to national, and 4/11 were related to international. The results for the social and governing

systems were similar. The main issues in all 11 case studies were related to the local level for the social and governing systems, 3/11 and 6/11 were related to the regional level, 4/11 and 6/11 were related to the national level, and 4/11 and 4/11 were related to the international respectively. Therefore, the main issue was related to all levels for natural, social, and governing systems in Malawi, Nigeria, and South Africa, and limited to the local level for all 3 systems for Bangladesh, Japan, Malaysia, and Senegal.

| Table 5 | | | | |
|--|---|---|---|---|
| <i>Administrative level relating to the main issue</i> | | | | |
| System | Local level | Regional level | National level | International level |
| Natural | Bangladesh, Ghana, India, Indonesia, Japan, Malawi, Malaysia, Nigeria, Senegal, South Africa and Thailand | Ghana, Malawi, South Africa | Ghana, Malawi, South Africa | India, Malawi, Nigeria, South Africa |
| Social | Bangladesh, Ghana, India, Indonesia, Japan, Malawi, Malaysia, Nigeria, Senegal, South Africa and Thailand | Malawi, South Africa, Thailand | Ghana, Malawi, South Africa, Thailand | Malawi, Nigeria, South Africa, Thailand |
| Governing | Bangladesh, Ghana, India, Indonesia, Japan, Malawi, Malaysia, Nigeria, Senegal, South Africa and Thailand | India, Indonesia, Malawi, Nigeria, South Africa, Thailand | Ghana, Indonesia, Malawi, Nigeria, South Africa, Thailand | India, Malawi, Nigeria, South Africa |

5.2. Main stressors affecting the systems

5.2.1. Natural sub-system

The stressors of the natural system included habitat alteration, climate change, and pollution, with habitat alteration being the most predominant. In Ghana, the stressors of the natural system included chemical pollution, destruction of habitats such as mangrove forests, and an increase in turbidity levels. The degradation of mangrove ecosystems for human needs and the use of chemicals have the potential to cause environmental alienation, leading to economic stressors. Economic development in Thailand has also been linked to coastal degradation and water pollution. In Japan, habitat alteration in the natural system was in the form of decreased available shelter for organisms and the deterioration of the breeding environment of *tengusa*, a type of seaweed, due to the deterioration of the quality of seawater. The growth environment of *tengusa* has also deteriorated due to damage caused by algae-eating animals (sea urchins, etc.), an increase in nutrients due to domestic and agricultural wastewater, the occurrence of red and blue tides, and the deterioration of the coastline due to the construction of ports in Japan. Sand-mining activities in Nigeria have the potential to alter the surrounding habitats through sediment resuspension and sand removal. Physical damage to coral reefs and fish habitats was the main concern regarding the natural system in Indonesia.

Sand mining in Nigeria was identified as a source of pollution in the natural system. Oil fumes discharged from dredgers were noted in the Badagry Creek, an important commercial center in Lagos State. In the Chilika Lagoon case study from India, pollution from domestic, industrial, agricultural and aquaculture wastes, excess sediment inputs, land reclamations for human settlement, and aquaculture practices such as intensive prawn aquaculture were sources of pollution in the natural system. Sea water intrusion, lost fishing nets, and extraction of coral reefs were also problems in Malaysia. The emergence of tourism also contributed to the pollution of the natural system in Malaysia. Furthermore, in Indonesia, the movement of barges around the natural system, and oil spills in combination with tourism activities contributed to

increased plastic waste, carbon waste and coral reef pressure. Increased inorganic nitrogen and phosphate loads in coral ecosystems intensified aspergillois, yellow blotch disease, and coral bleaching were also increasing problems in the natural system in the case of Indonesia.

Climate change was a major stressor in the Dionewar area in Senegal. In this natural system, sea level rise and salinization of the soil have decreased available farmlands for cultivation, and climate change has been predicted as the cause. Also, water hyacinth, as a natural stressor in Nigeria, has social implications such as the destruction of fishing gear, disturbance of fishing and spawning grounds, blockage of fishing routes, and damage to nets and boat engine propellers.

5.2.2. Social sub-system

Three main types of social stressors were identified: Economic and social, educational and illegal fishing.

5.2.3. Economic and social stressors

Economic and social stressors were noted in almost all countries in this study. In the social system, these stressors were identified as the loss of livelihoods of the traditional small-scale fishers. In India, for example, traditional fishers who depended on fishing as a larger part of their livelihoods witnessed a decrease in jobs as well as a decrease in income generation following the creation of the artificial sea mouth in Chilika Lagoon. Also, SSF in Malaysia experienced a loss of income from fishing, coupled with inadequate financial support to invest in tourism activities.

5.2.4 Education

Lack of education can become a social stressor, such as the usage of fishing gear which was detrimental to the environment and SSF. Furthermore, fishers' lack of education and understanding of the significance of conservation areas can also have some negative environmental consequences. This was the case in Indonesia, where a lack of education as a stressor led to fisheries resource exploitation and limited knowledge in applying technology to their benefits. Lack of education as a stressor has also contributed to the use of chemical fishing in Ghana, and harmful fishing gear in Indonesia and Bangladesh for example. Such fishing methods in Bangladesh and Senegal were reported to have contributed to the issue of fish decline.

5.2.5 Competition

Competition for fish between large-scale fisheries and SSF combined with illegal unregulated and unreported fishing were identified as stressors in the social system in South Africa, Malawi and Malaysia. These activities were noted to be a common contributing factor to declining fish catches in these regions where fishers would want to maximize catch returns through illegal means. The encroachment by commercial foreign vessels and local fishing vessels in SSF zones created conflicts and competition over access to and resource use was a common observation in Malaysia and South Africa.

5.3. Governing system

The main governing stressors in this section are broadly discussed under two main themes, fishing restrictions and management problems.

5.3.1. Fishing restrictions

Fishing restrictions at certain periods of the year were imposed in some case studies to respond to excess fishing pressure or conservation measures such as marine protected areas. While these restrictions may benefit the fish and ecosystem, they impose stresses on the fisheries dependent communities. Moments like this make SSF vulnerable and require periods of coping and adaptation. In Malaysia for example, local fisher organizations were restricted from fishing due to the focus on tourism in MPAs. Periods of fishing restrictions or bans were also common in Bangladesh and Ghana, such as the 65 days ban in the former. In the Dionewar case study from Senegal, periods of fishing restriction were 3 months for shells and 6 months for oysters. Fishing restrictions, however, can have unintended consequences. In South Africa, for example, fishing restrictions led to an increase in illegal fishing activities, contributing to fisheries decline.

5.3.2. Management problems

Management problems were identified across all the countries in this research. For example, despite the classification of Karimunjawa (Indonesia) as a national conservation area, there were management problems such as insufficient coordination, a lack of fishers' participation in the conservation efforts, issues of compliance, and enforcement of rules. In Malawi, Nigeria, South Africa and Malaysia, however, weak fisheries management was the main stressor of the governing system. The conflicting sectorial policies, permit conditions, poor coordination and policy synchronization, and limited physical and financial resources contributed to management problems in Malawi and Malaysia. Management problems in Thailand were related to a lack of uniform understanding of whether anchovies were juvenile or mature fish. This lack of consensus has been observed to create disruption and uncertainty in the management of this fish which is caught by both large and small-scale fisheries. In addition, the use of light fishing in the early 1980s further contributed to issues of anchovies over exploitation.

5.4. Changes in the natural system due to stressors

Two main types of changes caused by stressors were identified in the natural system: changes in biological productivity and habitat modification.

5.4.1. Biological productivity

The main cause of change in the natural system was linked to climatic variations leading to changes in the distribution and seasonality of fish. For example, in Thailand, the distribution of anchovies has changed due to climatic variation. Over-exploitation of fisheries resources was one of the other reasons for the changes in the biological productivity of the natural system and one of the main outcomes of the stressors on the natural system. For example, changes in primary production, which affect trophic interactions and food supply, is an ongoing phenomenon in the Pra River and Estuary in Ghana. In Indonesia, changes in the biological productivity of the natural system have been marked by deterioration in the carrying capacity of the environment in Karimunjawa caused by a variety of activities in the surrounding community. Changes in biological production due to over-exploitation of fisheries resources, for example, in Bangladesh, South Africa, Malaysia, Senegal, and Malawi, have led to a decline in fish catch in the affected communities.

5.4.2. Habitat modification

Stressors within the natural system can lead to habitat modification. Habitat modification of the natural system in Chilika lagoon, India, for example, affected key species of fish, crabs, and shrimp, along with associated species such as Irrawaddy dolphins (*Orcaella brevirostris*) and migratory birds, leading to altered species composition and food webs. In addition, the introduction of a culture fishery, high saline

water influx and pollution due to shrimp aquaculture have altered the breeding habitats of key species in the lagoon. In Indonesia, the level of habitat modification of coral reefs at Karimunjawa reached 26% and it requires nearly 65 years for a complete recovery. Another consequence of the stressor on the natural system was water pollution where uncollected grass in Japan caused deterioration in water quality. Similarly, excessive sand mining exploitation in Nigeria has resulted in turbid waters, bank erosion, increased depth of the creek, and pollution, among several others. Water hyacinth on the other hand has been noted to modify surrounding habitats by preventing sunlight penetration, blocking the waterways, increases evapotranspiration and depletion of dissolved oxygen. Excessive tourism in Malaysia was another stressor that contributed to habitat modification through, sedimentation in coral beds, and physical damage to coral reefs and fish habitats.

5.5. Changes in the social system due to stressors

The changes within the social system due to the stressors included unemployment, lack of access to financial leverage, loss of common pool resources and loss of income. Unemployment was a notable change in the social system in Bangladesh, South Africa and Malaysia especially during periods of fishing ban. Fishers who rely solely on fisheries suffer during such moments and become jobless for the time being until the ban is lifted. In South Africa, in particular, high unemployment rates have contributed to young men getting involved in illegal fishing. The situation was further exacerbated by the lack of access to financial institutions for financial support during periods of fishing ban.

5.5.1. Loss of income and livelihoods

Loss of livelihood which directly translated into loss of income was also another outcome of the stressors within the social system. In Japan, the inability of small-scale fishers to sell their catch at the fishery cooperative's direct sales, caused by fewer fishing activities, contributed to the fishers' financial problems. And scarcity of fisheries resources in Senegal and Nigeria is also leading to low-income gains among fishermen and women fish processors. The destruction of fishing gear by the water hyacinth and limiting access to fishing grounds in Nigeria also presented extra financial costs to SSF. It has been argued that tourism and infrastructure development can destroy coral reefs, and this has the potential to affect the livelihoods of local fishers when fish stock fails to recover. Further, government decisions to prioritize eco-tourism over fisheries in Indonesia have marginalized the SSF sector and their livelihoods. Similar results were reported in Ghana and Thailand, where changes in the social system were leading to loss of livelihoods. For example, in Thailand, these changes led to the switching of fishing gears and the exit of some fishermen.

5.5.2. Loss of common pool resources

Another outcome of the changes in the social systems was the loss of common pool resources. For example, in India and Ghana, mangroves served several purposes, such as sources of firewood and as habitats for juvenile fisheries development. Cutting mangroves is not only a loss of common pool resources but also exposes fishers to the dangers of tree stumps and further destroys fishing nets. A further consequence for the social system of the loss of common pool resources was less ability to share fish and support to poor families was eroded due to the commodification of the fish to the market. This has implications for food security as coastal communities get to eating less fish and cheaper forms of protein like chicken.

5.6. Changes in the governing system due to stressors

The changes in the governing system caused by the stressors were mostly in the form of rules, regulations or management measures. The outcome of these changes could be positive, negative or both. The 65-day ban in Bangladesh can be regarded as a form of management measure to ensure fisheries recuperations

which is a positive outcome. On the other hand, fishers lose their source of livelihood during such period which can also be regarded as a negative outcome from this management measure. The introduction of prawn aquaculture in Chilika Lagoon in India, provided an extra source of income to non-fishers. This decision also comes with some negative consequences for the SSF sector such as water pollution, conflicts, over-allocation of fishing grounds, competition between the traditional fishers and the non-fishers over the use of resources and encroachment of the fishing areas in the context of Chilika lagoon. Another additional factor that negatively impacts on SSF sector in terms of fish stock has been the loss of access to customary fishing grounds and the loss of political voice among fishers in many conflicting situations. The decision to intensify conservation in Indonesia also has both positives and negatives to offer as conservation is important for the environment on the one hand and small-scale fishers become marginalized on the other hand. Although a decision in Japan to help fishers get stable prices for their *tengusa* seaweed was positive, higher expenses made it impossible to make profits. It is important to mention that there are some challenges in implementing some of these rules, regulations and management measures within the governing system. These challenges include jurisdictional conflicts, lack of standards, and poor coordination among regulatory bodies. There are also weak governance structures such as in Malawi and Malaysia that curtail the ability to preserve coral reefs to enhance fish stock. Contrary to the above observations, changes in the governing system due to the stressors led to collaborative governance in Thailand where fishermen were involved in decision-making.

5.7. Impacts of the changes

5.7.1. Natural system

Two main types of impacts of change, ecological and physical, were identified in the natural system. Some of these ecological impacts include the decline in fish stock and catch (Ghana, Indonesia, Malawi, Malaysia, Senegal and South Africa), extinction of key species as well as the emergence of new species. In Ghana, for example, the Pra Estuary serves as a key habitat for both fish spawning and growth but was degraded by the use of light and carbide in fishing, leading to a decline in fish catch and possible extinction of some species. These impacts in Ghana are very similar to the observed impacts in Nigeria, where spawning sites are destroyed. While extinction of species is a possibility in Ghana, there is, however, the emergence of new species in India, which were initially not present in the Chilika Lagoon, but the dredging made this possible. The dredging of the Lagoon in addition to the ecological impacts, has physical impacts such as the widening of the mouth of the lagoon, and an increase in tidal flow, which makes it difficult for fishers to anchor their canoes. Similarly, the physical impacts have increased water turbidity in Badagry Creek, increased erosion, and coastal flooding in Nigeria.

5.7.2. Social system

The social impacts arising from the main problem were loss of jobs, livelihoods, food security, outmigration, reduced income and conflicts. To some extent, most of the countries within this study are developing countries and depend more on fisheries as their main source of income, livelihoods and food security. In the social system, therefore, a ban on fishing, for example, has an impact on fishers' source of livelihood and income. The loss of income and livelihoods provided fertile grounds for conflicts to arise. For example, the influx of abalone divers from areas outside of the coastal areas in South Africa was not only a ground for conflicts but also brought other social problems like drug and alcohol-related issues. Out-migration became an option for those unable to cope with the loss of livelihoods and income.

5.7.3. Governing system

The consequences of the main issues on the governing system varied from penalties, increased concern for the environment, loss of rights and access to fishing grounds, and too much power, to corruption in

governments. For example, it has been described that the authoritative nature of the governing system in India has given governments “too much power,” resulting in decisions that have not been beneficial to fisher folks. Some of these decisions have led to the loss of rights and access to fishing grounds. Violating regulations attracts some forms of penalties such as in Bangladesh. On the other hand, the rules and regulations have also increased government concerns about marine protection in Indonesia while leading to increased awareness creation and increased participation of fishermen in decision-making in Thailand. In Senegal, the impact includes the reduction of social management conflicts through shared resource management. On the contrary, weak governance in Malawi has not helped meet some of the sustainable fisheries management objectives, and not meeting coral reefs conservation and fish stock enhancement management objectives in Malaysia. Weak governance resulted in poor monitoring and enforcement of fisheries regulations in Nigeria and has only provided temporal solutions to criminal poaching activities in South Africa. Also, due to governance issues, there is an existential crisis due to the lack of successors and difficulties in the succession of knowledge and skills in Japan.

6. Theme C: Vulnerability

6.1. Ecological status of the system

The ecological status of the system was generally described as richer in both fauna and flora prior to the emergence of the main issues. The initial status of the Pra estuary in Ghana, for example, was described as a more multiple-species fishery comprising marine, brackish water and freshwater fin and shellfish. Chilika Lagoon in India was described as a biodiversity hotspot along the Indian east coast with an estimated 217 fish species before the 1980s, decreasing to about 69 species after 1985 (Ghosh et al, 2006). Similar trends of a richer and more biodiverse environment were reported in Japan, Malawi, Nigeria and South Africa. The exception was Indonesia where damage to coral reefs was noted.

6.2. Productivity of the system

The productivity of the system was higher prior to the main issue compared to after the main issue occurred across all the countries in this study except in Indonesia and Thailand where the productivity was described as medium during both time periods. The more productive status across most countries reflects the initial ecological status of the system described as more rich, biodiverse and healthy.

6.3. Main livelihood activities directly affected by the main issue

Most of the countries indicated that fishing was the main livelihood activity that has been directly affected by the main issue. In addition to fishing, water transport, rice farming and bird hunting, coconut plantation, and farming were also active livelihood activities directly affected by the main issue in Malawi and Nigeria respectively.

6.4. Other livelihood opportunities present in the affected area

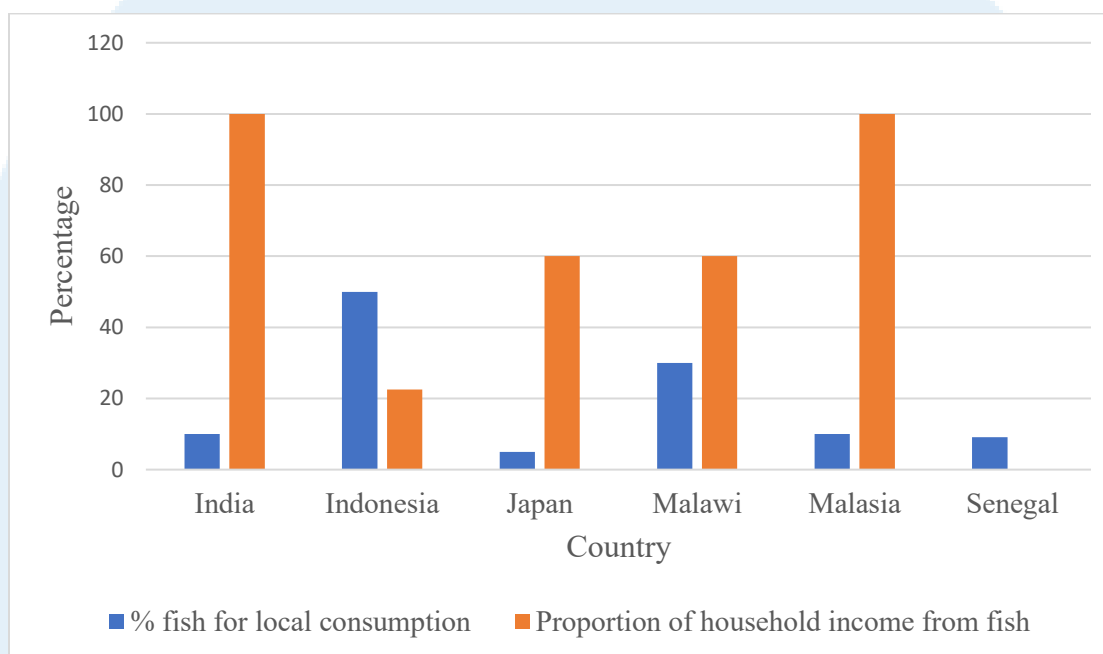
Several other livelihood opportunities were also present in the affected area before the main issues. These include farming and petty trading (Ghana), forestry and farming (India), tourism (Indonesia, Japan and Thailand), mining, trading, tailoring, bricklaying and farming (Nigeria), craftsmanship and tourism (Senegal), farming and forestry (Malawi). By count, farming was the second most dominant livelihood opportunity followed by tourism after fishing (the main livelihood opportunity) except in Malaysia where they did not report other livelihood opportunities in the affected area.

6.5. Percentage of the total catch/production from fisheries and aquaculture that was used for household consumption

For the 6 case studies that completed this question, the percentage of the total catch or production from fisheries that was used for household consumption before the main issue ranged from 5 percent in Japan to about 50 percent in Indonesia (Figure 3). In addition, before the main issue, 22.5 to 100 percent of household income came from fish that was caught or produced locally. This suggests that the higher the reliance on fish as food and income from fishery, the greater the vulnerability.

Figure 3

Percentage of fish for local consumption and proportion for household income



6.6. Emerging issues - women's vulnerabilities in SSF

Dias et al., (2023) defined emerging issues as concerns that were found to be surprising or that represent aspects that country teams thought were becoming more important, particularly when it comes to SSF viability and vulnerability. Consequently, Dias et al. (2023) identified gender as one of the emerging issues in the SSF sector. Women in particular play an important role in SSF, where an estimated 45 million women participate in SSF activities (FAO et al., 2023). That is, 4 out of 10 people in the fisheries sector are women.

Gender questions were not included in the original I-ADApT template but were subsequently added because of V2V discussions with country teams. Unfortunately, since these were sent out as an extra set of questions after the original template, they were only completed for 8/11 case studies. The roles of women in these 8 case studies included fish processing (5/8), marketing and selling of fish products (6/8), domestic work (1/8), community engagement (1/8), harvesting (2/8), repairing of fishing nets (2/8), and buying of fresh fish to be resold (2/8). This study indicates that (7/8), 60-100 percent of women were involved in these livelihood activities before the main issue. Senegal was the only country in the 8 case studies where the percentage of women involved in these livelihood activities could not be determined. The increasing recognition of the importance of women in the context of SSF activities translated into a high regard (6/7)

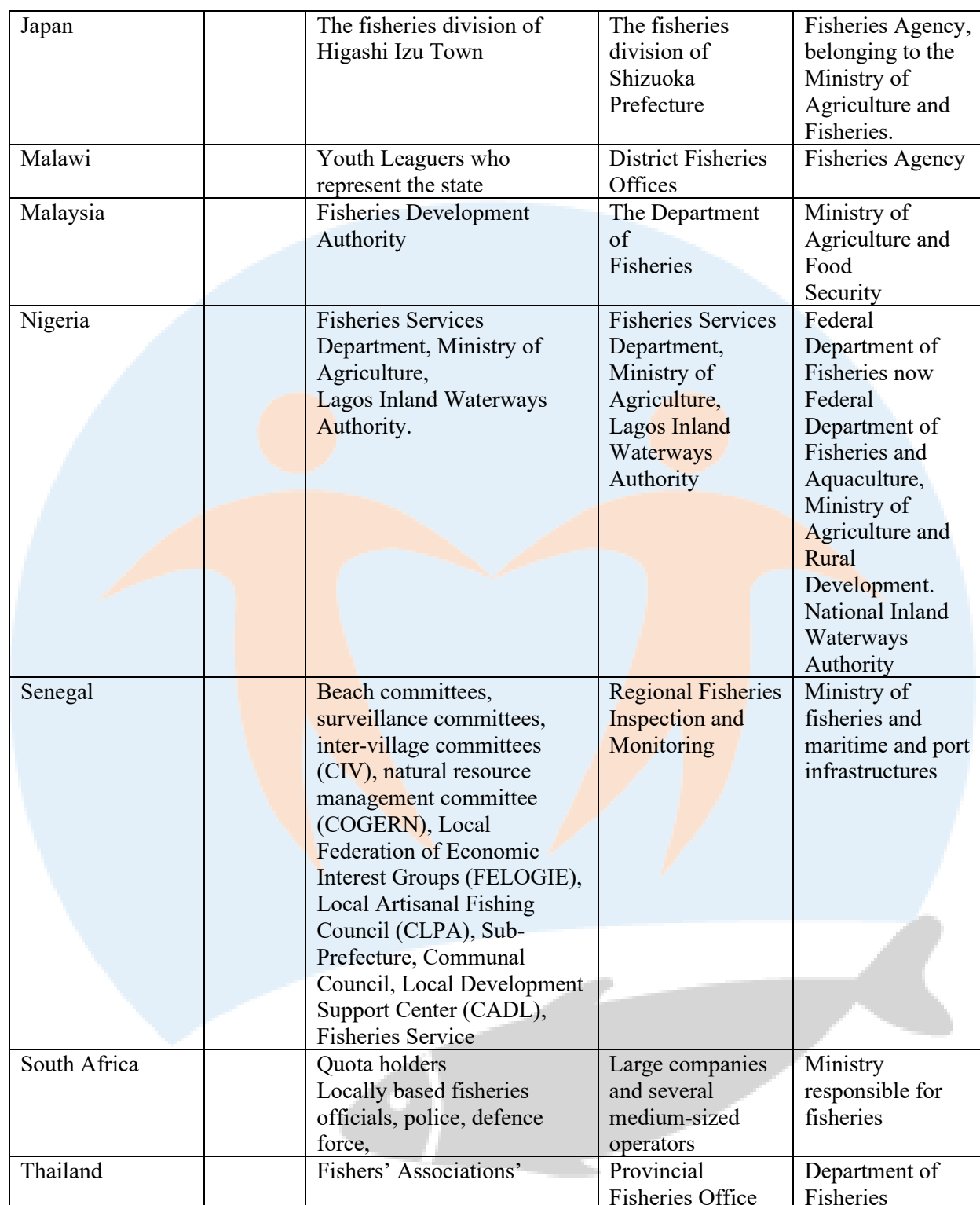
for women's role in livelihood activities prior to the main issue. The only exception to this observation was in Malaysia (1/7) where little regards were paid to women's role in livelihood activities prior to the main issue.

7. Theme D: Governance

7.1. Relevant organizations responsible for fisheries governance

Most of the 11 case studies identified organizations or individuals responsible for the governance of fisheries and aquaculture (including state, market and civil society) at local, regional and national levels before the main issue. Detailed information on these organizations can be found in Table 6. Fisheries governance at the district level occurred only in Ghana under the responsibility of the Planning Department and Business Advisory.

| Table 6 | | | | |
|---|-----------------|---|--|--|
| <i>Organizations responsible for fisheries governance</i> | | | | |
| Country | District | Local | Regional | National |
| Bangladesh | | Fish traders, Boat owners, Money Lenders/Dadonder, Local government representatives, NGO | District fisheries officer | Department of Fisheries (DoF), Bangladesh |
| Ghana | | Chief fishermen Planning Department; Business Advisory Unit | Pra Estuary Co-Management | Ministry of Fisheries and Aquaculture Development and the Fisheries Commission |
| India | | | Central Fishermen's Cooperative Marketing Society, traditional village council, Jati Pachayatas or caste council Odisha state department of fisheries. | |
| Indonesia | | Karimunjawa National Park Hall (Balai Taman Nasional Karimunjawa -BTNK), marine Fishing port, fishermen's Association, tourist services | Pemda Jepara, Bappeda, Balitbang, BPN, Dinas Pariwisata, Dinas Perikanan dan Dinas Perhubungan, wisatawan, LSM WCS, UNDIP | Ministry of fisheries and marine affairs, wildlife conservation society |



| | | | | |
|--------------|--|---|--|---|
| Japan | | The fisheries division of Higashi Izu Town | The fisheries division of Shizuoka Prefecture | Fisheries Agency, belonging to the Ministry of Agriculture and Fisheries. |
| Malawi | | Youth Leaguers who represent the state | District Fisheries Offices | Fisheries Agency |
| Malaysia | | Fisheries Development Authority | The Department of Fisheries | Ministry of Agriculture and Food Security |
| Nigeria | | Fisheries Services Department, Ministry of Agriculture, Lagos Inland Waterways Authority. | Fisheries Services Department, Ministry of Agriculture, Lagos Inland Waterways Authority | Federal Department of Fisheries now Federal Department of Fisheries and Aquaculture, Ministry of Agriculture and Rural Development. National Inland Waterways Authority |
| Senegal | | Beach committees, surveillance committees, inter-village committees (CIV), natural resource management committee (COGERN), Local Federation of Economic Interest Groups (FELOGIE), Local Artisanal Fishing Council (CLPA), Sub-Prefecture, Communal Council, Local Development Support Center (CADL), Fisheries Service | Regional Fisheries Inspection and Monitoring | Ministry of fisheries and maritime and port infrastructures |
| South Africa | | Quota holders Locally based fisheries officials, police, defence force, | Large companies and several medium-sized operators | Ministry responsible for fisheries |
| Thailand | | Fishers' Associations' | Provincial Fisheries Office | Department of Fisheries |

7.2. Mode of governance prior to the main issue

Different modes of governance were reported across the 11 case studies (Table 7) including bottom-up (1/11), co-governance (3/11), hierarchical (4/11), mixed (2/11) and self-governance (1/11) modes. For

example, in India, the mode of fisheries governance in the Chilika lagoon was largely self-governance while Bangladesh, Malawi, Malaysia and South Africa reflected a more hierarchical mode of governance. Co-governance was mode of governance reported in Indonesia, Senegal and Japan. This implied that the hierarchical mode of governance was widely used in fisheries governance followed by co-governance, mixed and self-governance.

Table 7

Mode of governance before the main issue

| Mode of Governance | Country |
|---------------------------|---|
| Bottom-up | Ghana |
| Co-governance | Indonesia, Japan and Senegal |
| Hierarchical | Bangladesh, Malawi, Malaysia and South Africa |
| Mixed governance | Nigeria, Thailand |
| Self-governance | India |

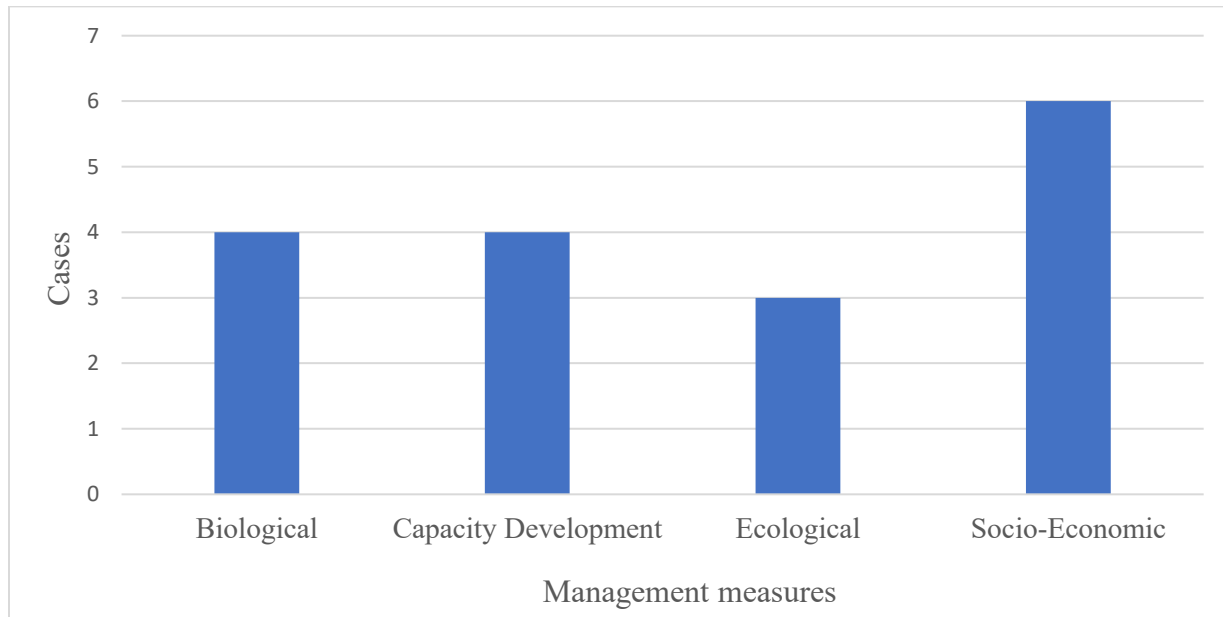
7.3. Long term management objectives before the main issue

Long-term management objectives included increasing the biological productivity of the system, capacity development of fisher folks, ecological improvement, and socio-economic improvements for fisher folks (Figure 4).

Most of the long-term management objectives were tailored towards socio-economic development to improve the living standards of local fishers by enhancing profitability. There was less priority for ecological development of the natural systems that aimed to restore degraded ecosystems. In South Africa, for example, the long-term socio-economic objective was a great expectation of restitution, redistribution and transformation of management within the fisheries industry and a great need for social, economic and political transformation. In Nigeria, also, the socio-economic objective was to manage fisheries resources that ensured sustainable exploitation to maintain food security and provide sustainable livelihood for artisanal fishermen and fisheries communities in Badagry. The objective was tailored towards capacity development for example in Ghana and, seeks to develop capacities of local communities as well as the district assembly in a way that will promote sustained ecosystem management and achieve the district's objective of making the Pra estuary-associated ecosystem an eco-tourism hub. In Thailand on the other hand, capacity development included technological development of fisheries products for quality control and standardization. The biological objective in Senegal was to conserve biological resources and habitats, to promote effective stakeholder participation in resource management, and to improve the development of fisheries resources.

Figure 4

Long-term management objectives prior to the main issue



7.4. Key rules employed to achieve management objectives

A range of rules, regulations and measures were in place prior to the main issue. In Bangladesh for example, measures included registration and certification, fishing licenses, fisheries awareness building and motivation. These were led by the Ministry of Fisheries and Livestock under the Government of Bangladesh as part of the preparations for their long-term objectives. The formation of associations and limiting of fishing areas were helpful in Senegal and Nigeria to achieve long-term management measures. Japan also adopted propagation of collection methods by non-fishermen divers; and processing techniques for better qualities of the *tengusa*. Under the Fisheries Act of 1946, Malawi, instituted catching minimum allowable sizes for most commercially important fish species and observing closed season to achieve their long-term goal. Similar to the implementation of fishing licenses in Bangladesh, Malaysia and South Africa also introduced the limited entry license through zoning, quota systems, mesh size regulation, and artificial reefs as measures towards achieving their long-term goal. Thailand however, under the 2105 Royal Fisheries Ordinance initiated key rules such as regular control and surveillance activities, gear and seasonal restrictions, and stock assessment for managing SSF.

7.5. Informal rules and regulations in fisheries governance before the main issue

In general, these key rules and regulations as well as measures were also supported by informal rules and regulations. Some of these informal rules and regulations included traditional or customary rules of fishing closure and opening, informal ways of resolving conflicts among fisher folks, the moral obligation of the individual, and promoting sustainable and responsible fishing practices. SSF in Thailand for example adopted the crab bank project as an informal rule where female crabs bearing eggs were released back into the water when caught. Also, in India, informal institutional rules and regulations, run by the village council and caste council, were related to fishing practices such as the ban on fishing during the breeding season

(monsoon) among several other rules to achieve their objectives. Informal rules and regulations were, however, not noticeable on record prior to the main issue in Malawi.

7.6. Nature of the relationship between the different sectors or livelihood occupations

The nature of the relationship between the different sectors, that is, the various groups, organizations or occupations involved in the fishery varied. The relationship was neutral in five cases, two indicated cooperative relationships and one indicated conflict (Table 8). For example, in Malawi, this type of neutral relationship was described as “Relationships among various sectors were quite informal since their policies and legislations were not properly harmonized. The sectors were in fact working in isolation over the management of resources such as fish species, forest species and water, among others”. Greater cooperation was, however, evident in Bangladesh and India among local stakeholders and fishermen. Examples of cooperation were evident in Malaysia, Senegal and Thailand, with conflict being the main form of observed relation in South Africa. Mixed relations were also observed in Indonesia where both conflict and cooperation thrived among the various stakeholders.

| Table 8. | | |
|---|--------------|--|
| <i>The nature of the relationship between the different sectors</i> | | |
| Nature of Relationship | Cases | Reference |
| Conflict | 1 | South Africa |
| Cooperation | 2 | Bangladesh, India |
| Near conflict | 0 | 0 |
| Near cooperation | 3 | Malaysia, Senegal, Thailand |
| Neutral | 5 | Ghana, Indonesia, Japan, Malawi, Nigeria |

7.7. Emerging issues - women in governance

Most countries described women’s participation in the governance of SSF as negligible or not involved in decision-making. For example, in Malaysia, women could neither take part in fishers' associations nor take part in local development projects. This current observation is consistent with the findings of Dias et al. (2023), where regulations to back up women’s engagement in decision-making are not sufficient. In Nigeria, however, women’s participation in governance and decision-making is beginning to be recognized. So, in Nigeria, women, especially educated women, took leadership positions in fisheries governance, thus breaking the traditional boundaries to be involved in decision-making affecting fisheries management. In Dionevar in Senegal, women were initially not involved in the governance of fisheries until after 2004, where their involvement increased. So, the results of this study indicate that the participation of women in fisheries governance ranges from 0 percent in Japan and South Africa to 50 percent in Thailand. Consequently, only 1/8 of this case study indicated high regard (respect and care) for women in fisheries governance, 3/8 little regard, 4/8 and no regard. Table 9 provides a summary of women’s involvement in governance and decision-making.

Table 9*Women's participation in governance and decision making*

| Country | Percentage of women involved in governance and/or decision-making prior to the main issue | Women's participation (decision-making or governance) | Regards for women in fisheries governance |
|--------------|---|--|---|
| India | 10-15 | Negligible or no role | Little or no |
| Indonesia | Less than 10 | Mostly not involved in decision-making or governance | Little |
| Japan | 0 | Women were not involved in decision-making or governance | No |
| Malaysia | 0 | Women's participation was always ignored | No |
| Nigeria | 5 | Women took leadership positions and helped in making decisions | Little |
| Senegal | No data available | Women were not involved in decision-making | Little |
| South Africa | 0 | Women were not involved in decision-making | No |
| Thailand | 50 | Women were not involved in decision-making | High |

7.8. Power dominance and concentration prior to the main issue

The stakeholders within the social system who wielded the most social power (Table 10) might have also determined the kind of relationship that existed among the various stakeholders. In South Africa, the dominant power in the hands of white-owned fishing companies supported by the Apartheid State favoured them with rights allocation, market access, and secured their economic domination in the fishing industry, which may have influenced the conflicts that existed in there. In contrast, when traditional or local leaders wield power, such as the Aratdar/dadondar in Bangladesh, it often fosters cooperation and may explain the observed cooperative relations in Bangladesh and in India. When power is, however, in the hands of the government, many decisions are not always in favour of the fishers. This may not offer complete cooperation between various stakeholders and governments, thus, may explain the level of cooperation observed in Ghana, Malawi, Malaysia, and other countries. Social power (Table 11) was also concentrated in nearly half of the countries in this study, except in Ghana (neutral), Indonesia, Senegal, Nigeria (almost dispersed), and Japan (Dispersed).

Table 10*Power dominance prior to the main issue*

| Country | Power dominance |
|------------|---|
| Bangladesh | Aratdar or dadondar (middlemen and money lenders) |
| Ghana | Governmental organizations |
| India | Primary Fisherman Cooperative Societies (PFCSSs) |

| | |
|--------------|---|
| Indonesia | Karimunjawa National Park Hall (BTNKJ) |
| Japan | The Inatori Branch of the Izu Fisheries Cooperative Association |
| Malawi | Government |
| Malaysia | The government agencies |
| Nigeria | Boat Operators |
| Senegal | Traditional chiefs and the heads of the deconcentrated State services |
| South Africa | Apartheid regime's allocations of rights to white-only fishing companies and individuals. |
| Thailand | The Au-Bor-Tor (Sub-district Office Administration) |

Table 11

Concentration of social power prior to the main issue

| Social Power | Cases | Reference |
|---------------------|--------------|---|
| Disperse | 1 | Japan |
| Almost disperse | 3 | Indonesia, Senegal, Nigeria, Thailand |
| Neutral | 1 | Ghana |
| Almost concentrated | | |
| Concentrated | 5 | South Africa, Bangladesh, India, Malawi, Malaysia |

7.9. Structural changes in the governing system prior to the main issue

Most of the countries confirmed the absence of any structural changes in the governing system or individuals prior to the main issue. The only exceptions were in India, Japan and South Africa. Some of the main structural changes in India were the emergence of private sector investments in shrimp aquaculture on the Chilika lagoon and the declaration of Nalabana as a Protected Area. These changes interfered with local fishing grounds that were previously owned and used by local fishers. The structural change in Japan was when the eight fisheries cooperatives in Izu Peninsular, including the Inatori cooperative, were brought under one umbrella in 2009 to strengthen the cooperative management base. The noticeable structural changes, for example, in South Africa were the end of Apartheid and the first democratic elections in 1994 which paved way for redistribution of fishing rights and transformation of the fishing industry.

7.10. Changes to the key rules prior to the main issue

Of the countries that recorded structural changes prior to the main issue, only South Africa also recorded changes to key rules, regulations, instruments and measures. These included the introduction of the Individual Transferable Quota (ITQ) system in 1983, the first democratic elections in South Africa in 1994 and the introduction of the Marine Living Resources Act in 1998, targeting transformation within the fishing sector. Three other case studies (Senegal, Nigeria and Malaysia) also recorded changes to key rules, regulations, instruments and measures before the main issue. Malaysia introduced the no-fishing rules in the marine protected areas (MPAs) areas, which aimed to strictly protect the marine habitat from overfishing and encroachment of trawl fishing, and to generate income from ecotourism activities in the MPA areas. The new instrument in Nigeria was the introduction of sand mining licenses under the office of the Special Adviser of Solid Minerals to the Governor, Lagos State in 1999. This later merged with the Lagos State Ministry of Waterfront Infrastructural Development in 2007. In addition, MPAs, periods of

biological rest on oysters, and selective arch exploitation baskets were introduced in Senegal as the new rules and regulations.

8. Theme E: Responses

The objective of Theme E was to evaluate the response of the social and governing systems to address the main issue for the natural, social and governing systems. Two-time frames were used, the short term (within 2-5 years) and long-term responses (6+ years) to capture the temporal reality of effecting change.

8.1. Social system - long-term and short-term responses

The responses in the social system can be classified into five main areas: behavioural, economic, ecological, capacity building and rules amendment. These five areas emerged during the coding process.

8.1.1. Behavioural responses

Behavioural responses here are defined as any changes in behaviour adopted by a fisher as a short-term or long-term response to the challenges posed by the main issue. Fishers in Bangladesh for example, adopted a behavioural response such as migration during periods of fishing bans. Similar patterns of behavioural responses were observed in India, where fishers adopt intra and inter-state seasonal labour migration among the traditional fisherfolk as a short-term response in the Chilika lagoon. The same response patterns were observed in Nigeria within the West African Region during periods of low fish yield and water hyacinth infestations. This caused artisanal fishermen to migrate from their traditional fishing grounds to other further areas relatively free of the infestation for fishing. In addition, illegal fishing has also been recognized as a form of behavioural change in Malaysia where locals fished illegally in the MPA waters during the monsoon months as it is dangerous to fish in the open sea. Increased fishing efforts, as well as increased poaching have also been noted in Ghana and South Africa as short-term behavioural responses to the main issue. Where alternatives were completely absent, exiting the fishing sector was the only solution and long-term response to the pressures, such as in Malawi and Thailand.

8.1.2. Economic responses

Many of the case studies reported the adoption of some forms of economic responses because of the main issue. Changing jobs, involving completely exiting the fishing sector and venturing into new economic sectors such as tourism, was one of the economic responses in India. Some fishers also owned local businesses as an alternative source of income. On the contrary, fishermen in Malaysia took up fishing rather than tourism during the monsoon months when tourism activities come to a halt. Such economic short-term response approaches have also been observed in Nigeria and Thailand, where fishermen have adopted livelihood diversification, combining fishing with transportation, farming, aquaculture, or trading. In the long term, aquaculture was introduced to reduce the fishing effort and satisfy the national demand for fish. This required developing spaces dedicated to aquaculture activities, strengthening the technical skills of aquaculture actors, and developing the value chain of the fisheries.

8.1.3. Ecological responses

Indonesia undertook some ecological responses by installing artificial patch reefs and artificial reef apartments to support coral reef rehabilitation. The response aimed to conserve coral reefs through rehabilitation activities by implementing artificial coral reef innovations. Japan also introduced the "Izu Inatori Seaweed Bed Conservation Association in 2016. Together with other stakeholders, they remove

unwanted seaweed and undertook monitoring. Non-destructive fishing methods such as limiting the use of DDT and light fishing were also proposed as some of the short-term responses in Ghana.

8.1.4. Capacity building

A short-term response that was implemented in Indonesia towards building the capacity of fishers was to increase the participation of associations and organizations of the local community. For example, several stakeholders and local community members were trained in different capacities emphasizing sustainable development in fisheries, implementation of scientific studies, and monitoring ecological conditions such as coral reefs in Karimunjawa National Park. In Senegal, infrastructural development such as the rehabilitation of fishing landing docks, the modernization of local product processing equipment, as well as the improvement of women's capacities to adapt to climate change through the diversification of processed products were the responses. These responses could also be evaluated as long-term responses since the knowledge and skills gained in the capacity-building process become ingrained and part of fisherfolk or individuals.

8.1.5. Rules amendment

Other short-term and long-term responses were directed toward amending the rules and regulations that govern the social system. Such was the case of India where traditional fisherfolk asked for recognition of their customary rights and claims over their fishing activities in the Chilika lagoon, in addition to, a call for a permanent ban on illegal prawn aquaculture, relaxation of stringent forest laws, and better small-scale fisheries-based livelihoods. Such calls for change in rules and regulations also emerged in Malaysia where more flexible MPA rules such as allowing fishing in the MPA for own consumption using non-destructive methods were proposed. Adaptive co-management as a governance option, which encourages knowledge sharing and collaboration between the stakeholders was also proposed as a long-term response. This would encourage local fishing communities to take joint responsibility for conservation and harvesting controls in the MPAs for more effective fisheries management.

8.2. Governing system - long-term and short-term responses

The main long-term and short-term responses in the governing system included management responses such as giving incentives to fishers, and the formation of formal structures to strengthen their role in decision-making.

8.2.1. Management responses

8.2.1.1. Incentives

The problems presented by the main issues challenged the livelihood sustainability of most fisherfolk. As a way of reducing the burden on fisherfolk and their families, fishers in Bangladesh received incentives such as food during periods of fishing ban as a form of livelihood support. Fishers were formally registered and presented with a tag which allowed them to receive food in the form of rice from the government.

8.2.1.2. Formal structures

The formation of formal structures by fishers stems from the recognition that there is power in unity. The formation of formal groups allowed fishers to articulate their views and take part in decision-making affecting the fishing sector at the local, regional and national levels. Such a response approach was taken by traditional fisherfolk in India to form the primary fisherman cooperative societies (PFCS) to have more

bargaining power and better livelihood outcomes. Community-based organizations such as Chilika Matsyajibi Mahasangh (CMM) were also common and with the support of Civil Society Organizations enabled them to make informed decisions against illegal prawn aquaculture and corporate entry into traditional fishing zones. This resulted in the long-term ban on shrimp aquaculture in 1993 by the state High Court and in 1996 by the country's Supreme Court. Senegal also ensured the creation of inter-village committees, established local artisanal fishing councils in all the communities and improved participation and involvement of women in the local management of fisheries. In Thailand, parliament has been involved in helping reduce conflicts since the introduction of the Royal Fisheries Ordinance. The existence of formal structures also created economic opportunities for fishers through for example the Natural Disaster Aid Scheme and Fishermen Welfare Scheme. This also created marketing channels such as the Fisheries Development Authority of Malaysia (LKIM) portal, which provides an online platform for selling fresh fish and fishery products in Malaysia.

8.2.2. Regulatory measures

8.2.2.1. Ban on issuing licenses

In response to the environmental degradation caused by sand mining activities in Nigeria, the government proposed a ban on issuing new sand mining licences to miners. The ban particularly restricted sand mining in the shallow areas of the creek. This ban by the government was in response to the excessive sand mining activities in some parts of the state. This regulatory response was not very effective as artisanal mining activities persisted illegally. Also, the embargo on mining activities was lifted shortly again as economic gains from sand mining prevailed over sustainable environment concerns. In contrast to banning the issuance of licenses, Indonesia adopted methods to facilitate boat registration, licensing and certification as a way of improving enforcement and compliance within the fishery sector. This approach was in support of enlarging the capacity of fleets and manpower numbers for surveillance activities. Empowering the functional units of the governing bodies in Malawi to enforce rules was the long-term and short-term response in the governing system. Rules were also revised in Japan, for example, the Inatori Branch of the Izu Fisheries Cooperative Association revised the rules for exercising fishing rights to allow the non-fishing divers to harvest the seaweed. Revisions of rules were also implemented in South Africa leading to quotas cut from 1996 onwards, suspension of recreational fishing for abalone in the 2003/2004 season, and the closure of commercial fishery for the 2008/2009 season in February 2008 (re-opened in 2019/2010), preceded by the reduction of TAC to 75 tons for this 2007/2008 interim arrangement in October 2007.

8.3. Social and governing systems – long-term and short-term objectives

The varied nature of both the short-term and long-term objectives for the social and governing systems reflected the differences in the main problem across the various countries in this study (Tables 12 and 13). Despite the varied nature of these objectives, common themes such as economic improvement of fisherfolk, developing coping mechanisms to better adapt to the main issues, sustainable resource conservation and use of rules and regulations that better address the needs of the local communities were identified. The diversity of objectives observed for the social system was reflected in the objectives for the governing system. Common themes emerging from the governing system, therefore included environmental stewardship, developing adaptations to cope with rules and regulations, the need to develop regulatory structures to monitor sustainable resource use, and the involvement of locals in decision-making that affects the fisheries sectors. In some cases, there were no long-term objectives, for example, Japan.

| Table 12 | | |
|---|--|--|
| <i>Objectives of the short-term and long-term responses for the social system</i> | | |
| Country | Short Term Objectives | Long Term Objectives |
| Bangladesh | Building coping mechanisms | Adapt to the long-term impacts of the fishing ban period by fishers. |
| Ghana | Sustainable fishing practices | Improve the well-being of fishermen |
| India | Building coping mechanisms, achieving socio-economic improvements | To adapt to the issues associated with longer-term vulnerabilities and social and environmental insecurities |
| Indonesia | Achieving socio-economic improvement | Educational improvement among fisherfolks |
| Japan | Maintaining catch, keeping local traditions | Not applicable |
| Malawi | Creating a population of law-abiding fishers | To ensure sustainable utilization of fisheries resources |
| Malaysia | Economic improvement | To achieve less rigorous rules and regulations for fishermen. |
| Nigeria | Provide alternative livelihoods, removal of water hyacinth | Provide sustainable income and food security for the fishers and their families, complete riddance of water hyacinth |
| Senegal | Economic improvement through the value chain in fisheries, promotion of high-value products in the artisanal segment | Promote entrepreneurship through the National Federation of Fishing, ensure decent jobs and sustainable incomes |
| South Africa | Economic improvement, fishers' rights improvement | Increase the abalone sector's contribution towards job creation and poverty reduction, reduce the social and economic ills brought by lack of recognized fishing rights and criminal activities, increase the contribution of abalone aquaculture/mariculture towards GDP and job creation |
| Thailand | Make it possible for fishers to have income and food security. | Make it possible for fishers to continue with their fishing livelihoods. |

| Table 13 | | |
|--|--|--|
| <i>Objectives of the short-term and long-term responses for the governing system</i> | | |
| Country | Short Term Objectives | Long Term Objectives |
| Bangladesh | To adapt to the short-term impacts of the fishing ban period by local responders | Adapt to the long-term impacts of the fishing ban period by local and regional governance. |
| Ghana | Reduce the use of destructive practices | Promote sustainable fishing, and improve the quality of the ecosystem health to enable good productivity |
| India | To cope with changes, rules and regulations | To strengthen the local community institutions of traditional fisherfolk to |

| | | |
|--------------|---|---|
| | | improve their stake in formal governance mechanisms |
| Indonesia | Structural development | To encourage sustainable development practices |
| Japan | To support the activities in the social response | Set up a vibrant governance structure that would ensure efficient and effective enforcement of fisheries regulations |
| Malawi | Execute regulatory services in an efficient and timely manner | |
| Malaysia | Reduce dependence on middlemen for fishers to get a better rate of return and profit margin, allow for long-term sustainable tourism, and ensure recovery of coral reefs | To allow for sustainable local development, to improve the quality of decision making by including input of local stakeholders, and long-term improvement of livelihoods. |
| Nigeria | Stop the excessive sand exploitation and restore sanity to the sector, curtail the movement and infestation of water hyacinth across ferry channels | Ensure sustainable use of the resource and maintenance of the ecosystem integrity of the creek. |
| Senegal | Monitoring and surveillance of fisheries, management of conflicts, Provision of access rights to the resource, monitoring and surveillance of fisheries, and management of conflicts. | Transformation of regulatory structures to monitor natural resource use |
| South Africa | Creation of more equitable rights, distribution systems, and an inclusive and co-governance management system | Stop the over-exploitation and destruction of the abalone resource resulting from poaching and illegal fishing, creation of a more equitable rights distribution system, an inclusive and co-governance management system |
| Thailand | Reduce ambiguity and contradiction. | Improve the laws/regulations to achieve fisheries sustainability. |

9. Theme F: Appraisal

9.1. Results of the short-term and long-term response for the natural system

The responses to the main issue in the natural system resulted in mixed outcomes. Positive outcomes included ecological improvement and increased adaptation to extreme events. In Thailand for example, the responses to the main issue yielded a reduction in fishing pressures. There was speculation that the reduction in pressure would lead to an improved fisheries system in Thailand. It was also anticipated that the installation of the artificial patch reefs and artificial reef apartments would increase the fisheries resources carrying capacity of the natural system in Indonesia. It was further projected that improved compliance of fisheries actors and tourism actors would also lead to increased fisheries' carrying capacity and their livelihoods. However, the future ecology of the natural system is at stake as tourism may cause damage to the fisheries sector in the long term. The promotion of sustainable management, mangrove reforestation campaigns, biological rest of shellfish sites, new oyster farming techniques, shellfish seeding operations, and installation of a coral reef corridor, were some of the short-term results in Senegal. The results in Bangladesh were, however, increased adaptation to extreme events. The long-term results were that fishers in Bangladesh were better positioned to deal with future crises by building coping mechanisms.

Negative short-term results were, however, realized in India, Japan and Nigeria. For example, the lack of collaboration to involve the community in India in the context of the Chilika lagoon to assess the chemical pollution loads of the Chilika lagoon and their trophic transfer has not produced significant results. A new sea mouth was dredged in front of Sipakuda village in 2001 to increase the tidal flux of the lagoon and to create a more “ecologically beneficial hydrologic regime”, however, this did not result in any significant favourable changes to the coastal ecology of the lagoon or benefits to the local fishers. The exclusion of locals in the scientific process of the study has been mentioned as the reason for the failure of the restoration of the lagoon and it has been perceived by the local fishers as an economic and ecological disaster to the local fisher communities. In Nigeria, the short-term results from the embargo that was placed on sand mining were described as insignificant. This was due to the short nature of the ban to produce considerable results, so in the long term, it was a failure. Similarly, the “conservation (no longer harvested by fishers)” of the *tengusa* fishing grounds led to an increase in other seaweed populations in the natural system, which then negatively affected the populations of *tengusa* in Japan. In South Africa, however, abalone poaching has continued. There has been a long-term decline in abalone, especially in the areas where abalone was most abundant. This has resulted in a shift from poaching in the Overberg Coastal District of the Western Cape to other areas such as Robben Island.

9.2. Results of the short-term and long-term response for the social system

There were also positive and negative results of the short-term and long-term responses to drivers of social change. For example, fishers in Bangladesh and India became capable of handling the main issue, such as the fishing ban, by developing short-term survival mechanisms, such as eating less and venturing into alternative livelihood businesses. Fishers in India engaged mostly in industrial aquaculture and other work, such as weaving industries, to supplement their family income during such periods of hardship. Similar results have also been recorded in Nigeria, where fishers supported their livelihoods by venturing into alternative sources of income. Responses such as exiting the fisheries system led to a reduction in fishing pressures in Malawi, while, the formation of the Izu Inatori Seaweed Bed Conservation Association in Japan, contributed to the formation of a cooperative relationship in the community to revitalize the *tengusa* fisheries, and the development of modern processing fishery equipment in Niodior, Senegal through financial support (microcredit funds) for women. The presence of tourism also helped to produce some positive results in Indonesia by increasing the household incomes of fishers. This, however, produced some unintended long-term consequences such as damage to coral reefs and marine ecosystems. While the responses worsened the situation of fishermen in Ghana (increased illegal fishing activities), local communities in Malaysia were also struggling with livelihood problems. In addition, the implementation of management committees and an increase in permit restrictions and regulations online fishing have negatively impacted fishing community livelihoods in South Africa.

Regarding the results of the long-term response for the social system; income and livelihood diversification into artisanship, trading, and migration for economic sustenance in Nigeria were achieved. Similar livelihood diversification approaches were observed in Bangladesh where fishermen adopted saving initiatives to prepare for future eventualities. Also, in Senegal, the response led to the acquisition of land, storage facilities for products, mutual savings societies, fishing docks, women's stores, drying equipment, modern processing sites, training in marketing techniques, accounting, financial management and research into financing and partnerships, empowerment of women through the granting of credits and capacity building. The results of the long-term response in the social system also improved conflict management between fishers and non-fisher caste groups in India to ensure sustainable use of the resources in the Chilika lagoon. In South Africa, on the other hand, the long-term response increased convergence from the 90s between abalone poaching and criminal groups based in Cape Town that were part of the drug syndicates. In Indonesia, it has been argued that the cultural shifts that resulted from the shift from fishing to tourism may lead to a loss of identity in the long term.

9.3. Results of the short-term and long-term response for the governing system

One of the short-term results of the governing system in Nigeria was the continued existence of sand mining companies and increased revenue for the government. The generation of revenue for the government may explain why the ban did not produce positive results in the natural system. Another notable result in Nigeria was the government initiative in collaboration with NGOs to train about 200 youths and women to turn water hyacinth into handicrafts such as baskets. In Bangladesh, the result was financial support in the form of loans for fishers. The loan supported fishers financially and helped them to obtain food for their families before setting up fishing expeditions. Partial results have also been achieved in India as a result of the strength in numbers that enabled them to challenge government decisions on prawn aquaculture. In Japan, the short-term result was in the form of institutional and financial support to help revitalize the *tengusa* fishery that was almost extinct. Similar approaches were adopted in Malawi where there have been institutional setups to enforce fisheries regulations. The responses in Senegal resulted in for example, the integration of the sustainability aspects of small-scale fisheries in the Communal Development Plan (CDP), the regulation of vulnerable sites, the decree on the internal regulations of the MPAs, the reinforcement of women's capacities in the management of small pelagic breeding sites, awareness raising and advocacy on the sustainability of small-scale fisheries.

The results of the long-term response to the governing system in Bangladesh for example, included government support to increase yearly fish production. In Indonesia, also, there was successful policy implementation due to the participation of all stakeholders in policy formulations. However, there was a lack of coordination between the district government, provincial government, and Karimunjawa National Park in the management of Karimunjawa. Similarly, positive results of the long-term responses were achieved where there was the establishment of well-informed enforcement institutions in Malawi, and increased involvement of fishers in the decision-making process in Thailand. In Nigeria, however, sand mining continued to flourish, and the water hyacinth infestation continued to persist despite the long-term responses from the governing system.

9.4. Addressing the main issue

Table 14 depicts the levels to which the main issue has been addressed in each country. Four case studies indicated that the main issue was either not (No) or partially addressed. Also, two case studies indicated the main issue was “Partially Not” addressed with only one case study successfully addressing the main issue.

| Table 14. | | |
|--------------------------------------|---------------------|--|
| <i>Was the main issue addressed?</i> | | |
| Was the Main Issue Addressed? | No. of cases | Country |
| Fully addressed | 1 | Malawi |
| Not addressed | 4 | Ghana, Malaysia, Nigeria, South Africa |
| Partially addressed | 4 | Bangladesh, India, Indonesia, Japan |
| Partially Not addressed | 2 | Senegal, Thailand |

9.5. Factors that contributed to the successful short-term and long-term results

9.5.1. Natural, social and governing systems

Information on the factors that contributed to the successful short-term results in the natural system was limited. Though it has been determined that the main issue was fully addressed in Malawi, and partially addressed in Bangladesh, India, Indonesia and Japan, the factors that contributed to the success were not

cited due to lack of information. However, financial support to construct artificial patch reefs and artificial reef apartments has been deemed necessary for short-term success in Indonesia. On the other hand, several factors contributed to successful short-term and long-term results in the social system. The short-term factors included social cohesion, collaboration, financial support, research, and awareness creation (Table 15). For example, social cohesion existing among the artisanal fishers and coastal communities in Nigeria was key in contributing to short-term results. The presence of social cohesion led to better collaboration and partnership, and strong bonding relationships with neighbours in Thailand and Bangladesh respectively. Providing guidance and assistance to entrepreneurs to engage in crafts, especially those related to tourism was key to producing short-term results in Indonesia. Meanwhile, community awareness of the danger of losing traditional fishing, and the formation of an informal organization helped to achieve results in Japan.

The long-term factors that played a role in achieving results in the social system included financial support from governments, availability of business opportunities, adherence to regulations such as sticking to the net size, social cohesion and local leadership (Table 15). For example, selective fishing using specific net sizes and acceptable fishing methods were some of the factors adopted to achieve some long-term results in Malawi. In Ghana, Nigeria and Senegal, financial support in addition to human capital and social cohesion were primarily the factors that contributed to the long-term results. On the other hand, there was a lack of data in South Africa, India, Malaysia, and Thailand about the factors that promoted the long-term results in these countries.

| Table 15 | | |
|--|---|--|
| <i>Contributing factors for success in the social system</i> | | |
| Country | Short term factors | Long term factors |
| Bangladesh | Social capital, strong bonding relationship with neighbors | Community structures for mutual assistance. Local leadership |
| Ghana | No data | Increased financial support from projects and government and capacity-building efforts. |
| India | No data | No data |
| Indonesia | Providing guidance and assistance to entrepreneurs engaged in crafts, especially those related to tourism, facilitating cleanliness in tourism objects | Opening widespread business opportunities to private parties who want to invest in the tourism sector in Jepara Regency, especially in Karimunjawa |
| Japan | Community awareness of the danger of losing traditional fishing, formation of an informal organization, fishery rights system, co-management system, leadership initiatives, sense of community, willingness to enhance fishery practice and economic situation | Not applicable |
| Malawi | Fishers were made aware of specific rules and regulations about fisheries management, fishers were warned about serious consequences of violating fisheries regulations. Such consequences included penalties, fees, confiscation of illegal gear, burning illegal gear, exclusion from fishing practices and imprisonment, among others. | Fishing households were only using acceptable (legal) fishing gear. Fishers were only targeting fish species of recommended take-able sizes. |
| Malaysia | No data | No data |

| | | |
|--------------|---|---|
| Nigeria | Social cohesion exists among the artisanal fishers , and physical, financial and human capital is available to the fishers . Physical and human capital and sometimes financial capital are available | Social cohesion exists among the artisanal fishers , and physical, financial and human capital is available to the fishers . |
| Senegal | Technical and financial support from the state, partners, NGOs; women's leadership at the local level | Support for the commercialization of products; long entrepreneurial experience of the Niominka women of Dionewar, rotating credit systems, creation of income and self-sufficiency of women |
| South Africa | The presence of small-scale lobster rights, kelp harvesting, and the formation of cooperatives. | No data |
| Thailand | Better communication and collaboration between fishers, as well as partnership with research institutions. | No data |

The factors that contributed to the successful short-term and long-term results of the governing system are summarized in Table 16. While cooperation and involving fishers in decision-making, played a crucial role in achieving short-term results in Ghana, better coordination between the government and local communities was one of the factors in Indonesia. Also, the availability of legal structures to regulate fishing activities combined with government support in the form of subsidies and financial support contribute to the short-term results in Japan, Malawi, Nigeria, Thailand and Senegal.

Like the short-term factors that contributed to the results in the governing system, the long-term factors also included good institutional arrangements, awareness and advocacy, improved coordination among stakeholders and punishment for rule breakers.

| Table 16 | | |
|---|--|---|
| <i>Contributing factors for success in the governing system</i> | | |
| Country | Short-Term Factors | Long-Term Factors |
| Bangladesh | No data | No data |
| Ghana | Cooperation and involvement with fishers in fishing communities | Repression and punishment of those who do not comply with the regulation. |
| India | No data | No data |
| Indonesia | Increase public legal awareness not to get involved in forestry violations/crimes | Improve coordination between local governments, Karimunjawa National Park halls and the community in the management of Karimunjawa |
| Japan | Government subsidies, institutional and financial support. Community awareness of the danger of losing traditional fishing. | Not applicable |
| Malawi | Good institutional arrangement for enforcement of fisheries regulations, modest funding of governance institutions, rational staff placement of the enforcement institutions, staff motivation and appraisal | Good institutional arrangement for enforcement of fisheries regulations, modest funding of governance institutions, rational staff placement of the enforcement |

| | | |
|--------------|--|--|
| | | institutions, staff motivation and appraisal |
| Malaysia | No data | No data |
| Nigeria | Government policy on periodic clampdowns on illegal sand miners. | No data |
| Senegal | New fishing code, technical and financial support from the state, partners, NGOs, existence of women's organizations | Sweeping of artificial reef corridor areas, awareness and advocacy |
| South Africa | Small-scale fishing rights were allocated so some successes | No data |
| Thailand | Government for small-scale fisheries, especially with the development and the implementation of the SSF Guidelines. This international, non-mandatory commitment, including SDGs, such as SDG 14, is a major contributing factor | No data |

9.6. Factors that prevented the short-term objectives from being fully achieved

9.6.1. Social and governing system

Despite achieving some short-term and long-term results in the natural, social and governing system, the success rate was not 100 percent. This section therefore examines the various factors that prevented the short-term objectives from being achieved. In Table 17, the short-term factors are outlined for both the social and governing systems. In the social system, the determinant factor was finance, the lack of which prevented the achievement of short-term results in Nigeria and Bangladesh. In Indonesia and Malawi, however, the factors were of social capital in nature, such as limited expertise to solve problems and a lack of social cohesion to derive management processes. Other factors were also regulatory, such as limiting the licensing of fishing boats.

In the governing system, the determinant factors included regulatory factors, such as the need to possess an ID to benefit from government support during the period of the fishing ban in Bangladesh. Other forms of regulatory barriers, failure to enforce rules, coupled with conflicts, contributed to the failure in Nigeria, Malawi, and Malaysia. Also, the inability to address the root cause of the main issue in India prevented the short-term goals from being achieved in the governing system, while the lack of institutional and financial support and the lack of publicity on the attractiveness of the *tengusa* fishery were important factors in Japan.

| Table 17 | | |
|---|--|---|
| <i>Factors that prevented the short-term objectives from being fully achieved</i> | | |
| Country | Social system | Governing system |
| Bangladesh | Inadequate financial support and social networks | Only fishers with IDs received support from the government during the ban |
| Ghana | Overfishing | No data |
| India | No data | Not addressing the existing issues |
| Indonesia | Undeveloped road networks, limited expertise in the development of tourist attractions | low awareness of ecological enforcement of Karimunjawa National Park |

| | | |
|--------------|---|--|
| Japan | Lack of successors, low gender awareness, technological inadequacies | Lack of institutional and financial support, lack of publicity on the attractiveness of <i>tengusa</i> fishery |
| Malawi | Lack of social cohesion, exiting of some fishermen | Regulatory barriers, |
| Malaysia | Fishing licensing problems, no subsidies | Regulatory barriers |
| Nigeria | Lack of financial support, the ability of water hyacinth to spread and colonize new areas | Lack of enforcement, conflicts, costs associated with equipment and manpower |
| Senegal | High pricing | No data |
| South Africa | No data | No data |
| Thailand | Regulatory processes | Communication barriers, not considering the views of fishing committees. |

9.7. Factors that prevented the long-term objectives from being fully achieved

9.7.1. Social and governing system

Several factors (Table 18) prevented long-term objectives from being fully achieved in both the social and governing systems. For example, in the social system, some fishers did not have access to loans, and there was a lack of knowledge to explore alternative sources of income. Cooperation, which was identified in Bangladesh as a factor that was needed to derive the development of the social system, was absent and was exacerbated by conflicts. Removing water hyacinths from waterways in Nigeria was associated with cost. Globalization was a determinant factor in both Indonesia and Thailand. For example, globalization led to the loss of identity in Indonesia and a lack of interest on the part of younger generations in Thailand to take part in fishing.

In the governing system, conflicts, regulatory barriers, politics and a lack of finance and social cohesion restricted the success of the long-term objectives. For example, a limited financial budget was observed as one of the factors in Bangladesh. The lack of willpower to enforce the law ensured that illegal mining continued in Ghana, non-compliance with the use of the right mesh size in Senegal and maintaining continuity in certain policies and programs in Thailand. Conflicts in Nigeria and Malawi also determined the success of the short-term objectives.

| Table 18 | | |
|--|---|--|
| <i>Factors that prevented the long-term objectives from being fully achieved</i> | | |
| Country | Social system | Governing system |
| Bangladesh | Inability to access loans during the pandemic, limited skills and knowledge about alternative sources of income | Limited finance budgets, poorly defined rights and representation in decision-making processes, limited government support |
| Ghana | No data | Continuation of illegal mining and development of other destructive practices |
| India | Lack of cooperation and cohesion between the fishers' and non-fishers' community, conflicts | No data |

| | | |
|--------------|---|---|
| Indonesia | Globalization leads to loss of identity, lack of environmental stewardship | Lack of social cohesion and social capital in maintaining ecology |
| Japan | Not applicable | Not applicable |
| Malawi | Conflicts | Lack of harmonized policies leading to conflicts |
| Malaysia | No data | No data |
| Nigeria | Cost of removing hyacinth | Conflicts between state and national regulatory agencies, inadequate monitoring, high cost of clearance, inadequate personnel and equipment |
| Senegal | High food prices, accessibility to local communities | Non-compliance with regulations on net mesh size, and difficulties in harmonizing natural resource management rules. |
| South Africa | No data | No data |
| Thailand | Problems with succession plan, as younger generations are not interested in fisheries | Thailand lacks political stability, and it is difficult to maintain continuity in certain policies and programs. |

9.8. Formal evaluation of responses

There has been no formal evaluation of the responses in the 11 case studies. While there was no formal evaluation of these responses, *per se.*, other forms of evaluation may occur. In Indonesia, for example, the zoning system approach of the Karimunjawa National Park is evaluated every five years. The purpose of the evaluation is to assess how the zoning approach impacts ecology, socioeconomics, tourism, fisheries and conservation of the park. This then informs management, the community and stakeholders (Suliswati and Prihatinningsih 2018; Ray and Ing 2016).

9.8.1. Benefits related to costs of the short-term response

Only three of the case studies provided information on the benefits related to the costs of the short-term responses in the social and governing systems. Indonesia reported an income increment, and more jobs leading to less pressure on fisheries while Thailand indicated stronger organizational bonds and increased collaboration. In Japan, it was also pointed out that the benefits outweigh the cost notwithstanding the fact the main issue was not fully addressed. Similar results were observed in the governing system where only three case studies reported benefits. Indonesia for example expressed better coordination between institutions while the benefits in Japan were like those observed in the social system. Thailand was the third country that expressed some benefits due to improved governance.

9.8.2. Benefits related to costs of the long-term response

Indonesia, Senegal and Thailand also reported benefits related to the cost of the long-term responses for the social system. These benefits included an increased standard of living, and cultural and behavioural changes in Indonesia with Thailand reporting the same benefits in the short term for the long term. Senegal, however, reported increased catch per unit effort, which translated into more income for fishers. Concerning long-term benefits, two case studies, Senegal and Indonesia, indicated some forms of long-term benefits, including increased obedience to rules and regulations and increased voluntary participation in management respectively.

9.9. Were other options considered for the short and/or long-term responses?

Consideration of other options was only reported for Indonesia and Thailand. In Thailand for example, it was reported that the government had the choice to ignore the concerns of the fishers but chose a collaborative management approach. Similarly, fishers also had the option of violating management rules and regulations but chose the option of obeying the rules and regulations.

10. Discussion

The main objectives of this study were to explore 11 small-scale fisheries case studies from Africa and Asia using the I-ADApT Framework (Bundy et al., 2016) to further the understanding of SSF vulnerability and viability and to identify possible pathways from vulnerability to viability. In this study, we were able to identify the main issues affecting small-scale fisheries, their origins and impacts in the 11 case studies. The study also highlights the various attempts that were made at social and governance levels to resolve the identified problems. Of the 11 case studies, one reported that the response objectives were fully met, four reported partial success, two reported more mixed results, and four reported that the objectives were not met. Factors that contributed to achieving the desired results and those that may have prevented results were identified and are discussed further below.

While this study accomplished its objectives, it also acknowledges the existence of caveats. The I-ADApT Framework was developed to enable comparative analysis of vulnerable SES across multiple dimensions. It necessarily reduces complex information into a standardized format for analysis. Since there are many variables across the Natural, Social and Governance dimensions that could be reported, only a subset is used in I-ADApT to enable analysis. The I-ADApT template used here consisted of 30 main questions and additional background information (Appendix 1). This number was a balance between the tractability of the template and the breadth of information captured (Bundy et al. 2016). With greater use of I-ADApT, additional questions may be added to the template. This has already occurred through the V2V partners, which identified the absence of questions concerning gender. This report is the first analysis to use I-ADApT with these additional gender questions.

10.1. Comparative studies

The main issues in our study were categorized into the following subthemes: 1) Declining fish stocks, 2) Climate Change, 3) Invasive Species, 4) Resource extraction, 5) Marginalization of SSF, 6) Regulatory changes and 7) Risk of loss of history/traditional knowledge of fishery. These are consistent with what is termed wicked problems in literature (Jentoft & Chuenpagdee, 2009; Rittel & Webber, 1977). They are complex and surpass the first-order challenges, which Kooiman (2002) and Kooiman et al., (2005) recognized as simple daily challenges in the lives fishers that are easy to deal with. The complex nature of these problems in this study means that there is no one-size-fits-all solution to transition SSF from a state of vulnerability to viability. According to Chuenpagdee & Jentoft (2019), there is a lack of clarity regarding what constitutes wicked problems, why they exist and ways of solving them. Yet these wicked problems threaten the livelihood and well-being of over 492 million people who make a living by engaging fully or partially in SSF (FAO et al., 2023). The relative prominence of the main issues at the local level in the natural, social and governing systems in our case studies further suggests that SSF at the local level bears the brunt of these problems. Moreover, most of the main issues affecting SSF in this study were directly caused by human activities. This is also likely to be the case globally.

In a review study by Islam & Chuenpagdee (2022), the main issues we identified in our case studies are what they called “attributes or factors” responsible for vulnerabilities in SSF. Consequently, these factors were classified into biophysical, social, economic, technological, and governance based on the five

sustainability pillars. Under these classifications, four of the main issues identified in this study (fish decline, coastal erosion, sand mining, and water hyacinth infestation, noted as invasive species) occurring in seven of the case studies are comparable to the biophysical factors. According to FAO (n.d.), (<https://www.fao.org/family-farming/detail/en/c/1696402/>), the percentage of fish stock within biologically sustainable levels has decreased from 90 percent in 1990 to 65.8 percent in 2017. In the Gulf of Thailand, for example, Satumanatpan & Pollnac (2020) have reported the recent decline in fish populations within the SSF. According to Per Utete et al. (2019), declining fish stock played a role in the observed decrease in revenue in Zimbabwe. Also, under the biophysical factors, Islam & Chuenpagdee (2022) recognized invasive species as one of the biological hazards responsible for fisheries vulnerabilities. In this case study, water hyacinth as an invasive species was one of the main issues reported in Nigeria. According to Villamagna & Murphy (2010), water hyacinth is among the most invasive aquatic plants, causing both ecological and socio-economic effects. Some of the ecological effects mentioned include a change in the purity of the water and a reduction in the amount of dissolved oxygen, nitrogen, phosphorus, heavy metals, phytoplankton production, and other toxins. The socio-economic impacts are associated with the uses of the impacted waterbody, the cost of control methods and the response to control efforts (Kateregga & Sterner, 2009). Moreover, in Nigeria, the water hyacinth interfered with navigation and prevented direct sunlight from going through the water column, which might serve as a vulnerability in fisheries survival. This kind of habitat alteration has since been identified as a key vulnerability in the tropics (Islam & Chuenpagdee, 2022). Climate change is an increasingly important stressor in the small-scale fisheries sector (Bennett et al., 2016), where it causes changes in fish distribution, disruption of marine ecosystems that support small-scale fisheries, and contributes to declining fish stocks. These observations are consistent with the findings in this study, in which climate change is a major stressor in Senegal and Malawi. In Malawi, for example, climate change impacted ecosystem service delivery in the natural systems which supported small-scale fisheries. In Senegal, climate change was linked to sea level rise, coastal erosion and declining fish stock. The impacts of climate change on small-scale fisheries are anticipated to significantly affect the lives of people making a living from the small-scale fisheries sector (IPCC, 2014).

The main issue the “History/ traditional knowledge of the fishery is in danger of being lost,” fits with the technological factors responsible for fisheries vulnerabilities in the review conducted by Islam & Chuenpagdee (2022). Oles (2007) argues that knowledge of traditional fishing techniques has weakened due to an increasing dependence on mechanical crafts and foreign technology. In this study, technological factors are leading to a complete disappearance of traditional knowledge that was once used to harvest *Tengusa* in Japan. For example, Ray & Garada (2018) have linked the dependence on mechanized fishing techniques to increased water pollution, disturbing fish breeding areas, lower fishery productivity, and diminishing fish catches in Chilika Lagoon. In addition to that, the introduction of intensive aquaculture led to the loss of access rights, customary institutions and loss of fishing grounds. The dredging of the new sea mouth further accelerated the problem by choking channels, and loss of juvenile’s bycatch, which further created marginalizations for the fishers in the Chilika lagoon (Pattanaik, 2007).

Similarly, our main issues, “SSF marginalization and regulatory issues,” fit into the category of governance, one of the factors identified by Islam & Chuenpagdee (2022) to cause vulnerabilities in SSF. Regulatory issues in terms of weak governance can lead to marginalization in SSF. Despite the importance of SSF to society, research indicates that SSF marginalization occurs in political as well as in economic settings (Dias et al., 2023; Salmi & Svendsen, 2022). SSF in Namibia for example, are marginalized to the extent that they are not recognized (Sowman & Raemaekers, 2018), hence fishers cannot take part in decision-making affecting the SSF sector. Similar forms of marginalization were reported in Alaska where SSF villages are still fighting for local sovereignty over their resources and way of life (Lyons et al., 2016).

Gender issues, overfishing, user conflicts, and unsustainable fishing practices such as the use of light and DDT for fishing in Ghana were noted as some of the social factors responsible for fisheries vulnerabilities in Islam & Chuenpagdee (2022). In the current case studies, gender issues were identified as emerging

issues; while overfishing and unsustainable fishing practices were recognized as the drivers of the main issues. Conflicts were, however, the outcome of competition to gain access to and use of limited resources. Chuenpagdee & Jentoft (2019) alluded to the existence of conflicts in small-scale fisheries, such as those observed in South Africa to the breakdown of the moral fabric of communities, which leads to the undermining of community collective actions. Also, while debt, high interest rates and unemployment were suggested by Islam & Chuenpagdee (2022) as social attributes responsible for fisheries vulnerabilities, we recognized these as some of the impacts arising from the unsolved or unresolved main issues. Also, fishing was identified as the main source of livelihood in over half of the case studies. Such dependency on fishing can be a major source of vulnerability to SSF communities. Moreover, Quiros et al., (2018) have noted a similar situation in the Philippines' Calatagan region fishers' where the sole dependence on fisheries led to vulnerabilities during the lean season or stock failure.

Several factors may help explain the mixed results in resolving the main issues in most of the case studies. For example, the problems are complex, hence simple behavioral responses such as migration and changing diet, as observed in our case study in India, may not be enough to address the problems. These are temporary responses which do not tackle the root cause of the main problem: fisheries decline. Similarly, many of the proposed responses observed are geared towards building resilience, which is important for achieving future viability. However, when building resilience is the focus without addressing the root causes of the main issues, the main issue remains. We, however, agree with research that better resilience is achieved when the governing approach is flexible and inclusive, which allows actors to participate in decision making while learning through experience (Berkes & Folke, C, 1998; Carpenter et al., 2001; Folke, 2006). In this regard, Jentoft & Chuenpagdee (2009) suggest that complex problems like those identified in this study are better addressed by adopting second-order and meta-order governance approaches. The second-order governance has been described as the structure of institutions, especially how they permit and restrict social interactions such as decision-making and problem-solving (Jentoft & Chuenpagdee, 2018). Meta-order governance on the other hand, has been described as providing outlets and processes to go beyond the institutional framing that currently exists to be creative and transformative in our approach (Kooiman & Jentoft, 2009). It also includes principles, norms, and values.

The type of governance mode reported in the case studies might have played a role in the mixed success in addressing the main issue and associated objectives (Figure 5). The hierarchical approach which is the most common observation in our case studies is comparable to the approach and practice across the European Union Common Fisheries Policy (Björkvik et al., 2020). Four case studies reported a hierarchical governance structure, but with mixed results: one reported fully addressing the main issue, one reported partial success and two reported that the main issue was not addressed. Co-governance achieved more consistent results, with two cases reporting partially addressing the main issue and one "partially no" addressing the main issue in some respects. The remaining modes of governance had more mixed results or were only represented by one case study. These results indicate that no form of governance might be considered the best approach for SSF management, but a combination of them may yield better results. However, other studies have underscored the value of more cooperative governance (Isaacs & Witbooi, 2019). Conley & Moote (2003) noted that many nations have realized the value of cooperation in natural resource management and are departing from the original regulatory frameworks for managing natural and cultural resources. According to Armitage et al., (2008), environmental governance is being re-examined from the standpoint of adaptive processes, feedback learning, and flexible partnerships. So, we recognize that shifting from the dominant mode of governance (hierarchical) and self-governance in our case study to more flexible and inclusive approaches may be useful in addressing the main issues as well as their vulnerabilities in our case studies, in which the results are time-bound.

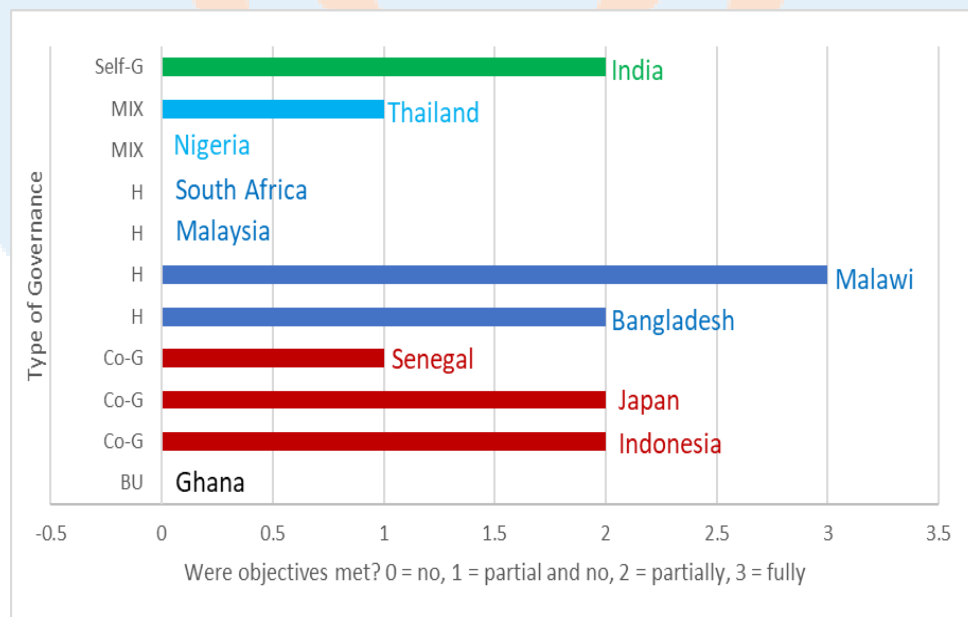
Obedience to specific rules and regulations in fisheries management, such as the use of only acceptable fishing gears in Malawi, in addition to several other factors, might in part explain the success of this case study and might be an important pathway towards viability. According to Dias et al. (2023), the governance

of IUU fishing methods provides grounds for achieving viability. The partial success in some of the countries can also be attributed to factors such as the development of coping mechanisms, such as in India and Bangladesh (eating less, job diversification), financial support from the government in Japan and the involvement of all stakeholders in decision matters in Indonesia.

On the other hand, many of the set objectives were achieved in the various countries. Several factors, such as social capital, knowledge of specific rules and the associated consequences for defaulters, social cohesion, better communication and collaboration, government support in the form of subsidies, and local leadership, contributed to the success of the set objective and may influence viability. For example, strong community cohesion played an important role in achieving some of the objectives in Bangladesh and Nigeria, while better communication and collaboration were some of the factors in Thailand and Nigeria. Hardy et al. (2016) note that collaboration is important in maintaining ecological sustainability, promoting food security, and cash availability, and ultimately strengthening resilience, which may contribute to viability. Also, the contribution of financial management as a pathway to viability in the case of Senegal was one of the many factors Satumanatpan & Pollnac (2020) noted in their study. For example, Satumanatpan & Pollnac (2020) outlined alternative job availability, adapting to the problems as well as the ability to compete, capacity building by learning new skills, financial management and coping with the changes as some of the potential responses to the issues in SSF for achieving viability. These factors are similar to those we identified in our current study, adopted by some of the countries in our case studies. The mixed outcomes (failure to address the main issue and success of some objectives) thus provide some learning opportunities about what did work and what didn't work. These different factors reflect the numerous ways in which viability can be achieved in the SSF economic sector. We, however, recognize that the factors representing success or failure are context-specific by the observation of Plummer et al. (2012) and should be adopted with caution.

Figure 5

Comparison of governance mode vs outcome. Self-G – Self-Governance, mix = combination of governance modes, H – hierarchical governance, Co-G = co-governance and BU – bottom-up governance.



10.2. Conflicts

Conflicts in small-scale fisheries are multifaceted and can significantly impact on the livelihoods of millions of people who depend on this sector. Several studies (Charles, 1992; Murshed-e-Jahan et al., 2009; Pomeroy et al., 2007; Stevenson & Tissot, 2013) have highlighted the existence of conflicts in the SSF sector. Four categories of conflicts related to fisheries were identified by Charles (1992): 1. Conflicts arising from stakeholder interactions, 2. Who owns and controls access to what, 3. How policies are implemented, and 4. Conflicts originating from "external" groups. Bennett et al. (2001), however, categorized conflicts in fisheries into five types: 1. Who controls the fishery, 2. How are the fisheries controlled, 3. Relations between the fishery users, 4. Relations between fishers and other users of the aquatic environment and 5. Relationship between fishers and non-fishery issues. The findings in our case studies are similar to those categories identified by Charles (1992) and Bennett et al. (2001). For example, in South Africa, conflicts were caused by several factors, such as competition for the declining abalone between SSF and large-scale fishers. In India, the initial source of the conflicts was the result of competition for space between SSF and aquaculture operators on the Chilika lagoon. Weak governance, such as the situation in South Africa, has been noted as another source of conflicts in the SSF sector (Ameyaw et al., 2021). For example, in South Africa, the ongoing disagreement between the government and SSF groups on rights and resource access, and legislation does not consider the needs of the SSF. This observation of legislation not favoring the SSF sector was also present in most of the case studies we analyzed. One of the main sources of conflict between the government and coastal communities, according to a recent study on conflict drivers in South African coastal communities (Hara et al, 2021), is that SSF has lost faith in governments that make major decisions on behalf of SSF. Some of these governments have been described as lacking accountability in our case studies. According to Pauly (1990), Pomeroy et al. (2016), and Williams (1996), inadequate governance and management of fisheries in developing countries can result in overfishing and increase the likelihood of conflict, endangering the durability of fisheries. Despite the observed conflicts, there were some efforts to reduce these conflicts. In India in particular, continued protests fishers' rights that led to private investors exiting from the fisheries sector were a measure that contributed to a reduction in the conflicts between private investors and the SSF. Also, the court ruling banning prawn culture on the lagoon and the subsequent destruction of some prawn farms in a way contributed to a reduction in conflicts between private investors and the SSF.

10.3. Marginalization and poverty nexus

10.3.1. Marginalization

Evidence of marginalization in the SSF sector was present in this study. We identified four marginalization factors (economic, social, class and power) based on Béné (2003) in our case studies that describe the status of fishermen in the SSF sector. In India, for example, the conversion of about 60 percent of the Chilika lagoon in 2012 for use as aquaculture farms signaled the beginning of the economic marginalization of SFF (Nayak et al., 2014). The process alienated traditional fishers from the environment, thus denying them access to fertile fishing grounds and taking part in fishing economic activities. This economic exclusion from fishing further impoverished local fishermen, causing them to seek alternative livelihoods through migration. This case study also provides some understanding of social and class marginalization in the SSF sector. In this case study, diversification activities forced fishers to alienate themselves from fishing both as a part of their caste identity and as a culture that built and sustained a sense of community (Robson and Nayak, 2010). In addition, power plays an important role as one of the tools that can be used to marginalize the SSF sector. Most often, power in the form of political disempowerment is used to make decisions that do not favor SSF, such as restricting access to resources (Nayak, 2011). Political disempowerment was visibly present in most of our case studies and resulted in conflicts such as in South Africa in addition to poverty. In this regard, we argue that 1. Marginalization can lead to poverty within the SSF sector, 2. Being marginalized within the SSF sector lowers the societal status of fishers and, 3. The societal status of fishers

can contribute to fishers becoming marginalized within the SSF sector. So, in these case studies, these four factors of marginalization (economic, social, class and power) or societal status of fishermen in the SSF sector have contributed to the observed economic hardships (poverty). In our case studies, there were also attempts to reduce the level of marginalization among fishers. In Indonesia, for example, fishers were considered in decision-making processes, support was provided to build their capacities at the local level and access to online marketing platforms was created to enable them to improve their livelihoods.

10.3.2. Poverty

The supply of resources is an important factor in the context of poverty literature (Nayak et al., (2014), and poverty in SSF communities has been attributed, in part, to low levels of natural resources because of overexploitation (Copes, 1989; Gordon, 1954). This has generated interest in the environment-poverty nexus, where poverty is thought to contribute to increasing fish stock exploitation and declining fish stock contributing to poverty (Béné & Friend, 2011). The results from analyzing the 11 case studies in this current study are partly consistent with the environment-poverty nexus and may explain why the loss of livelihood was one of the components of economic stressors in the social system. For example, poverty contributed to the use of unapproved fishing methods in Ghana and Bangladesh. The effect was environmental degradation leading to declining fish stocks in the natural system, which was largely one of the main issues in our case studies. The resulting responses to these effects were regulations such as the 365-day ban in Bangladesh, which had consequences in the social system, such as livelihood problems, impoverishment and marginalization. In South Africa, the depleted abalone resource is contributing to economic hardships, illegal fishing and criminality, which has intensified resource exploitation beyond the Overberg coastal area. The main issues identified in this study, thus, demonstrate the potential exposure of fishers at local levels to the vulnerability of poverty. However, the fish stock decline may not be the only explanation for the observed economic hardship and the associated unemployment problems reported in most case studies, especially in fishery-dependent communities. Marginalization, as one of the interlinked factors in addition to the societal status of fishermen, can contribute to poverty, such as the observed hardships in our case studies. On the other hand, we observed that 1. Being poor within the SSF sector can cause fishers to become marginalized 2. Being poor within the SSF sector affects one's power in decision making, affects one's economic status, and the class to which a fisher belongs, which eventually makes them socially disadvantaged and 3. The societal status of fishers within the SSF sector can also contribute to poverty. These further advance our understanding that the observed economic challenges in our case studies are multidimensional and result from interlinked factors (Narayan et al. 2000b, Béné et al. 2007) such as marginalization and gender.

10.3.3. Gender and marginalization

Gender inequality and discrimination can also lead to marginalization, a situation that challenges the social, economic and environmental sustainability of the SSF sector (Koralagama et al., 2017). Despite the key functions of women in the SSF sector, their roles have been described as invisible, unrecognized, undervalued, and underrepresented (Deb et al., 2015; Fitriana & Stacey, 2012; Santos, 2015). In this current study, we identified several crucial roles women play in the SSF sector such as fish processing, marketing and selling of fish products, domestic work, community engagement, harvesting, repairing fishing nets, and buying fresh fish to be resold. Also, the notion that most activities within the SSF sector are male dominated, makes room for women to be discriminated again further marginalizing them (Branch & Kleiber, 2017; Lentisco & Lee, 2015; Zhao et al., 2013). Koralagama et al. (2017) identified three factors of gendered discrimination: restriction on access, restriction on participation in decision making and identity-based discrimination. These factors can contribute to gender marginalization in the SSF sector. Restriction to access production has been noted in the literature to be gendered (Hauzer et al., 2013; Thorpe et al., 2014). However, women's involvement in decision-making was reported to be negligible in most of our case

studies. This form of marginalization is in line with the observation of Dias et al. (2023) on the issue of gender in the SSF sector and consistent with what has been reported in the literature.

11. Conclusions

SSFs are faced with multiple, complex problems that compound their vulnerability. Based on the results of this comparison of 11 V2V case studies using the I-ADApT Framework, we have identified possible pathways to viability including social cohesion, financial support, knowledge of rules and regulations governing the sector, government support in the form of subsidies, enhanced communication and collaboration. Several problems constituted the main issues in this study, but they were mostly related to declining fish stock, coastal erosion, climate change, regulatory reforms, and the value of traditional knowledge. Human use activities, exacerbated by poverty and marginalization, played a dominant role in shaping the vulnerability of the communities to the main issues in the natural, social and governing systems. This study suggests that marginalized individuals in the SSF sector are more likely to experience poverty, while poor individuals are likely to be marginalized. These observations in addition to other factors might have contributed to shifting the initial productive and viable ecological systems that supported livelihoods to the present problems in the case studies. The main issues were mostly of anthropogenic origin and caused by a range of stressors in the natural, social and governing systems. The interaction among the stressors in the natural system, social system, and governing system formed a complex socio-ecological relationship, giving rise to several vulnerabilities within the fisheries sector in each country. Fisheries management occurred mostly locally, involving stakeholders such as district fish officers, money lenders, traders, etc. The most prominent long-term management objectives of fisheries were socio-economic outcomes in most countries, with few focusing on capacity development and biological rejuvenation of the natural system. The governance and management of fisheries in each country employed formal and informal rules to achieve some results. In addition, adapting to the stressors and vulnerabilities generated by the main issues requires responses in natural, social, and governing systems. The responses yielded some results that were both positive and negative. In general, more of the main issues were not addressed than were addressed. Several elements, including budgetary limitations, legal restrictions, and governance problems like the exclusion of locals from management procedures, caused the inability to resolve the primary concerns. Given that our study suggests the crucial role human activities play in contributing to problems in the SSF sector, we recommend that management options be tailored toward addressing human activities. Our closing remark is that, despite the numerous vulnerabilities identified in this study, achieving future viability within the SSF sector is still possible. This includes identifying the problems and setting up the right framework, initiatives and interventions in collaboration with the necessary stakeholders within the sector. For example, initiatives and interventions such as adopting better social cohesion, improved financial support for fishers, legal reforms and better policies for fisheries management are important for achieving viability within the small-scale fisheries sector.



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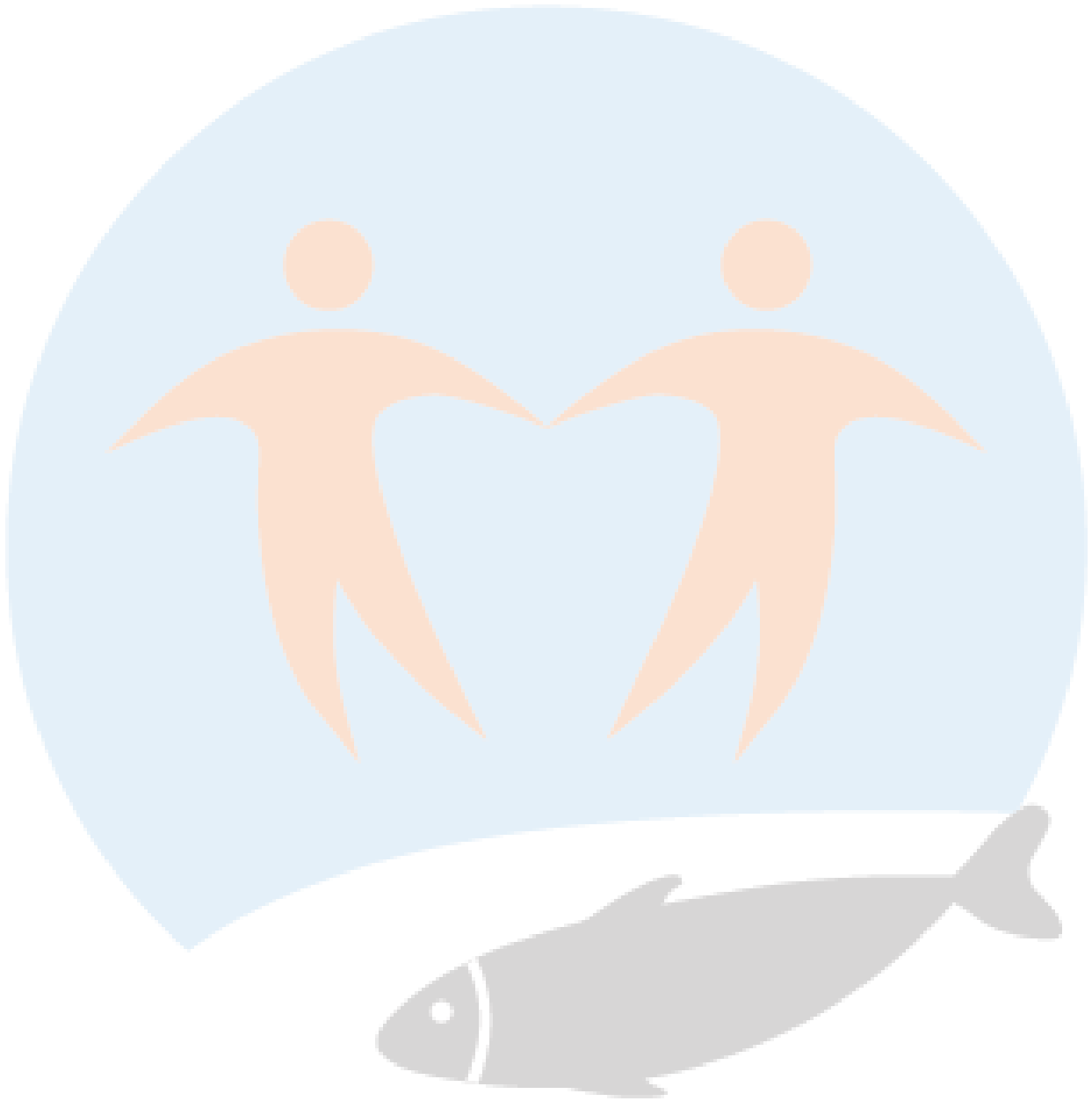
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Appendix A - codebook

| Name | Files | References |
|---|-------|------------|
| A (Background Information) | 12 | 190 |
| Country with jurisdiction | 10 | 10 |
| Ecosystem type | 11 | 15 |
| Coastal | 6 | 6 |
| Lagoon | 2 | 2 |
| Other | 4 | 5 |
| Shelf or open ocean | 2 | 2 |
| Geographic location | 10 | 10 |
| High latitude | 0 | 0 |
| Temperate | 2 | 2 |
| Tropical | 8 | 8 |
| Main issue | 12 | 142 |
| b (When did the main issue occur) | 10 | 11 |
| c (Other affected geographical areas) | 10 | 12 |
| Description of main issue | 9 | 27 |
| Key stakeholders | 11 | 13 |
| Location | 9 | 9 |
| Main habitats | 11 | 12 |
| Main species | 11 | 14 |
| Number of people affected by main issue | 10 | 11 |
| Size of area inhabited by people | 9 | 10 |
| Size of marine area | 10 | 11 |
| Total number of people in your study area | 11 | 12 |
| Name of study area | 11 | 13 |
| B (Description of the stressors and their impacts) | 10 | 226 |
| 1 Systems boundaries | 10 | 31 |
| Governing | 10 | 10 |
| Natural | 9 | 10 |
| Social | 10 | 11 |
| 2 Levels | 10 | 67 |
| Governing | 10 | 25 |
| International | 4 | 4 |
| Local | 8 | 9 |
| National | 5 | 5 |
| Regional | 5 | 5 |
| Regional and Local | 2 | 2 |

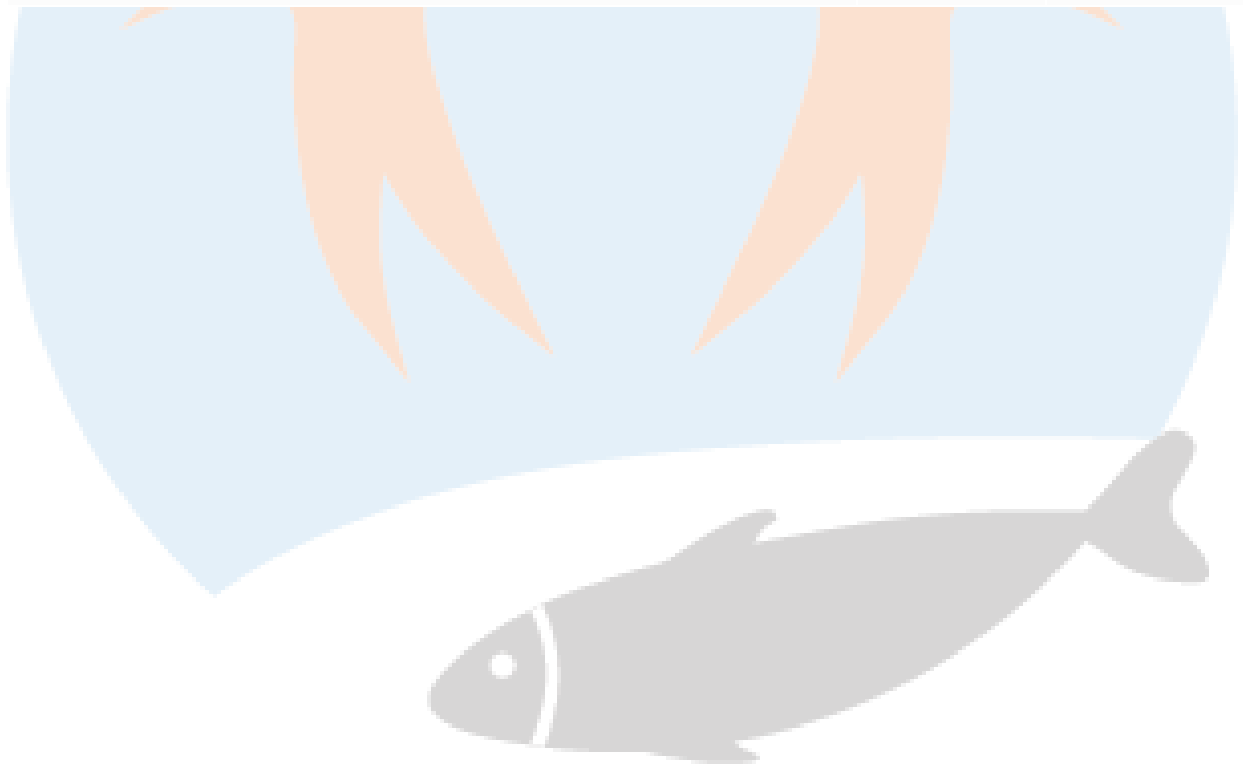
| | | |
|--|----|-----|
| Natural | 10 | 22 |
| International | 4 | 4 |
| Local | 10 | 12 |
| National | 3 | 3 |
| Region | 3 | 3 |
| Social | 10 | 20 |
| International | 3 | 3 |
| Local | 10 | 12 |
| National | 3 | 3 |
| Regional | 2 | 2 |
| 3 (What are the main stressors affecting the systems) | 10 | 57 |
| Governing | 8 | 18 |
| Natural | 10 | 17 |
| Social | 10 | 22 |
| 4 (What changes do the stressors cause in the systems) | 10 | 33 |
| Governing | 9 | 10 |
| Natural | 10 | 12 |
| Social | 10 | 11 |
| 5 (What are the impacts of the change) | 10 | 38 |
| Governing | 9 | 11 |
| Natural | 10 | 12 |
| Social | 10 | 15 |
| C (Vulnerability) | 10 | 58 |
| 6 (What was the ecological status of the system) | 7 | 9 |
| 7 (What was the productivity of the system) | 10 | 10 |
| High | 9 | 9 |
| Low | 0 | 0 |
| Medium | 1 | 1 |
| 8 (What were the main livelihood activities directly affected by the main issue) | 10 | 10 |
| 9 (What other livelihood opportunities were there in the affected area) | 10 | 16 |
| 10 (What percentage of fish caught was used for household consumption) | 7 | 7 |
| 11 (What proportion of household income came from fish caught before main issue) | 6 | 6 |
| D (Governance and Governability) | 10 | 163 |
| 12 (Relevance organizations responsible for fisheries governance) | 10 | 30 |
| District | 1 | 1 |
| Local | 10 | 13 |
| National | 8 | 8 |

| | | |
|--|----|----|
| Regional | 8 | 8 |
| 13 (What was the mode of governance prior to the main issue) | 10 | 11 |
| Bottom up | 1 | 1 |
| Co-management | 2 | 2 |
| Hierarchical | 5 | 5 |
| Mixed | 1 | 1 |
| Self | 2 | 2 |
| 14 (What were the long-term management objectives before the main issue) | 10 | 22 |
| Biological | 4 | 4 |
| Capacity Development | 4 | 4 |
| Ecological | 3 | 3 |
| Socio-Economic | 6 | 9 |
| 15 (What were the key rules, etc employed to achieve management objectives) | 9 | 21 |
| 16 (Were there informal rules, regulations in fisheries governance before the main issue) | 8 | 20 |
| Measures | 3 | 8 |
| Rules, Regulations | 8 | 12 |
| 17 (What was the nature of the relationship between the different sectors) | 10 | 15 |
| Conflict | 1 | 1 |
| Cooperation | 2 | 2 |
| Near conflict | 0 | 0 |
| Near cooperation | 3 | 2 |
| Neutral | 5 | 5 |
| Were there any special circumstances in their relationships that should be noted | 5 | 5 |
| 18 (Who dominated the most power prior to the main issue) | 10 | 11 |
| 19 (How concentrated power was prior to the main issue) | 10 | 10 |
| Concentrated | 4 | 4 |
| Dispersed | 1 | 1 |
| Near concentrated | 0 | 0 |
| Near dispersed | 3 | 3 |
| Neutral | 2 | 2 |
| 20 (Were there any structural changes in the governing system prior to the main issue) | 8 | 13 |
| 21 (Were there any changes to the key rules etc prior to the main issue) | 9 | 10 |
| E (Response) | 10 | 53 |
| 22 (Short term/ long term responses of the social and governing systems to the main issue) | 10 | 53 |

| | | |
|--|----|----|
| a (What were the short-term responses of the social and governing system to the main issue) | 10 | 53 |
| Governing | 10 | 21 |
| Local | 10 | 16 |
| Local and National | 0 | 0 |
| National | 0 | 0 |
| Regional | 3 | 4 |
| Resistance | 1 | 1 |
| Natural | 1 | 1 |
| Local | 1 | 1 |
| National | 0 | 0 |
| Regional | 0 | 0 |
| Social | 10 | 31 |
| Local | 10 | 30 |
| National | 0 | 0 |
| Regional | 0 | 0 |
| b (What were the long-term response of the social and governing system to the main issue) | 0 | 0 |
| Governing | 0 | 0 |
| Local | 7 | 9 |
| National | 1 | 1 |
| Regional | 1 | 2 |
| Natural | 0 | 0 |
| Local | 2 | 2 |
| National | 1 | 1 |
| Regional | 1 | 1 |
| Social | 0 | 0 |
| Local | 8 | 15 |
| National | 1 | 1 |
| Regional | 0 | 0 |
| 23 (Objectives of the short/long term social and governing responses for the natural, social and governing systems) | 0 | 0 |
| a (What were the objectives of the short term social and governing responses for the natural, social and governing system) | 10 | 24 |
| Governing | 9 | 10 |
| Natural | 2 | 2 |
| Social | 10 | 12 |
| b (What were the objectives of the long term social and governing responses for the natural, social and governing systems) | 9 | 22 |
| Governing | 9 | 9 |
| Natural | 2 | 3 |

| | | |
|--|----|-----|
| Social | 9 | 10 |
| F (Appraisal) | 10 | 167 |
| 24 (Results of the short term/long term response for the natural, social and governing systems) | 10 | 29 |
| a (What were the results of the short-term response for the natural, social and governing systems) | 10 | 29 |
| Governing | 9 | 10 |
| Natural | 6 | 8 |
| Social | 10 | 11 |
| b (What were the results of the long-term response for the natural, social and governing systems) | 0 | 0 |
| Governing | 7 | 8 |
| Natural | 6 | 6 |
| Social | 8 | 9 |
| 25 (Was the main issue addressed) | 10 | 18 |
| Fully | 1 | 4 |
| No | 4 | 7 |
| Partially | 4 | 6 |
| Partially No | 1 | 1 |
| Undetermined | 0 | 0 |
| 26 (Factors contributed to the successful short/long term results) | 7 | 43 |
| a (What factors contributed to the successful short-term results) | 7 | 26 |
| Governing | 6 | 9 |
| Natural | 3 | 4 |
| Social | 6 | 13 |
| b (What factors contributed to the successful long-term results) | 6 | 17 |
| Governing | 5 | 5 |
| Natural | 4 | 4 |
| Social | 6 | 8 |
| 27 (Factors that prevented the short term/long objectives from being fully achieved) | 9 | 49 |
| a (What factors prevented the short-term objectives from being fully achieved) | 9 | 28 |
| Governing | 8 | 10 |
| Natural | 3 | 3 |
| Social | 8 | 15 |
| b (What factors prevent the long-term objectives from fully achieves) | 7 | 21 |
| Governing | 6 | 8 |
| Natural | 4 | 5 |
| Social | 6 | 8 |
| 28 (Has there been a formal evaluation of response) | 0 | 0 |

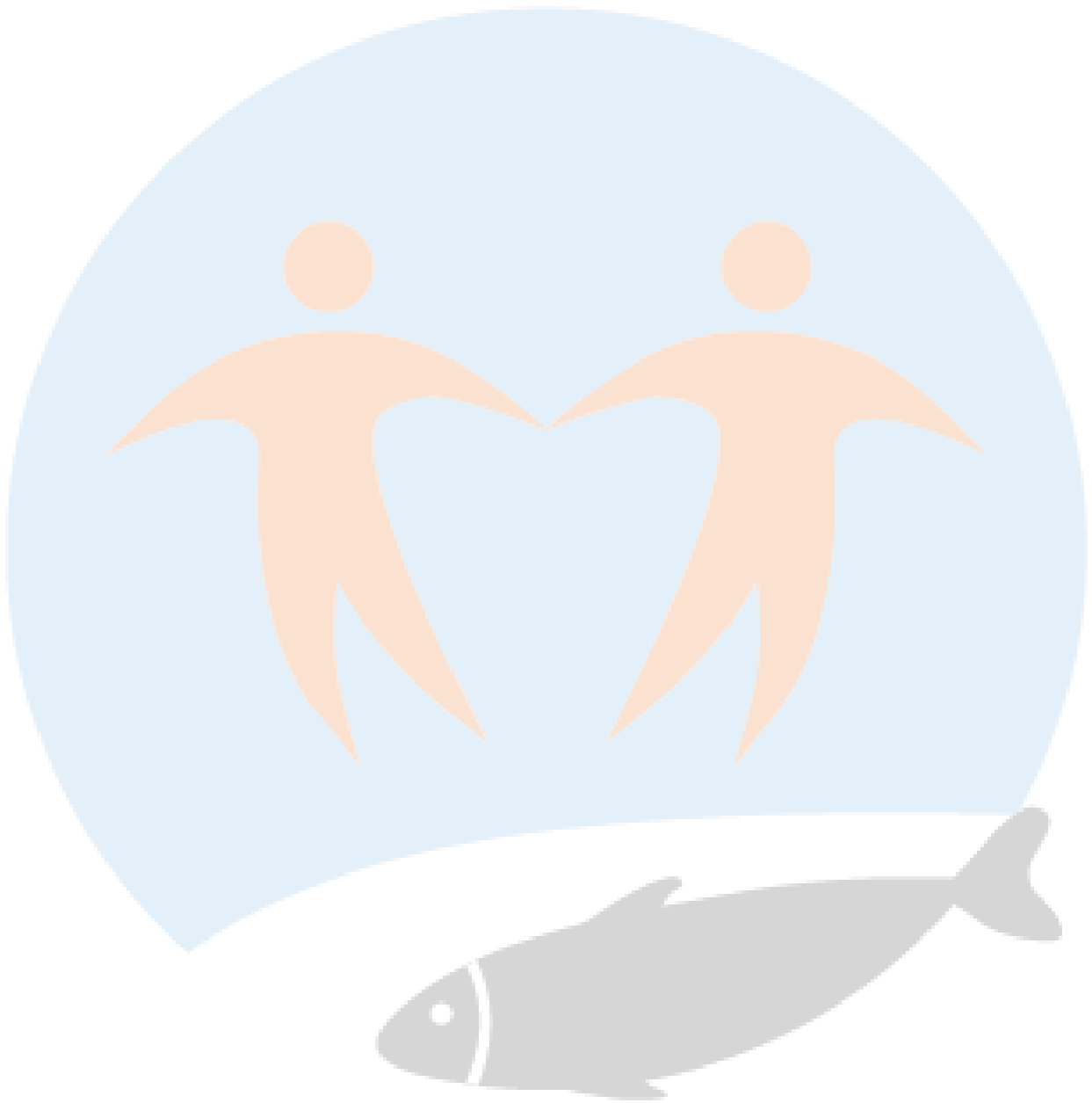
| | | |
|---|---|----|
| Governing | 4 | 4 |
| Natural | 4 | 6 |
| Social | 4 | 4 |
| 29 (Benefits related to costs of the short/long term response) | 5 | 19 |
| a (What were the benefits related to costs of the short-term response) | 4 | 9 |
| Governing | 4 | 4 |
| Natural | 2 | 2 |
| Social | 3 | 3 |
| b (What were the benefits related to costs of the long-term response) | 4 | 10 |
| Governing | 4 | 4 |
| Natural | 3 | 3 |
| Social | 3 | 3 |
| 30 (Were other options considered for the short- and long-term responses) | 4 | 9 |
| Governing | 3 | 3 |
| Natural | 2 | 2 |
| Social | 3 | 3 |



Appendix B - codebook for gender question

| Name | Files | References |
|--|-------|------------|
| Role of women in the livelihood activities prior to the main issue | 8 | 19 |
| Marketing and selling | 6 | 6 |
| Fish processing | 5 | 5 |
| Harvesting | 2 | 2 |
| Repairing of fishing nets | 2 | 2 |
| Buying of fish | 2 | 2 |
| Domestic roles | 1 | 1 |
| Community engagement | 1 | 1 |
| % of women involved in these livelihood activities prior to the main issue | 7 | 8 |
| Undetermined | 1 | 1 |
| Role of women in governance and decision making | 8 | 8 |
| Very negligible | 6 | 6 |
| Appreciative | 2 | 2 |
| Regard for women's role in governance and decision making | 8 | 8 |
| No regard | 4 | 4 |
| Little regard | 3 | 3 |
| High regard | 1 | 1 |
| Regard for women's role prior to the issue | 7 | 7 |
| High regard | 6 | 6 |
| Little regard | 1 | 1 |
| No regard | 0 | 0 |
| % of women in governance or decision making | 7 | 7 |
| Undetermined | 1 | 1 |





Vulnerability to Viability (V2V) Global Partnership

The Vulnerability to Viability (V2V) project is a transdisciplinary global partnership and knowledge network. Our aim is to support the transition of small-scale fisheries (SSF) from vulnerability to viability in Africa and Asia. Vulnerability is understood as a function of exposure, sensitivity and the capacity to respond to diverse drivers of change. We use the term viability not just in its economic sense but also to include its social, political, and ecological dimensions.

The V2V partnership brings together approximately 150 people and 70 organizations across six countries in Asia (Bangladesh, India, Indonesia, Japan, Malaysia, Thailand), six countries in Africa (Ghana, Malawi, Nigeria, Senegal, South Africa, Tanzania), Canada and globally. This unique initiative is characterized by diverse cultural and disciplinary perspectives, extensive capacity building and graduate student training activities, and grounded case studies from two regions of the world to show how and when SSF communities can proactively respond to challenges and creatively engage in solutions that build their viability. Further information on the V2V Partnership is available here: www.v2vglobalpartnership.org.

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**VULNERABILITY TO VIABILITY
GLOBAL PARTNERSHIP**