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A Situational Analysis of Small-Scale Fisheries in Peninsular Malaysia: From Vulnerability to Viability

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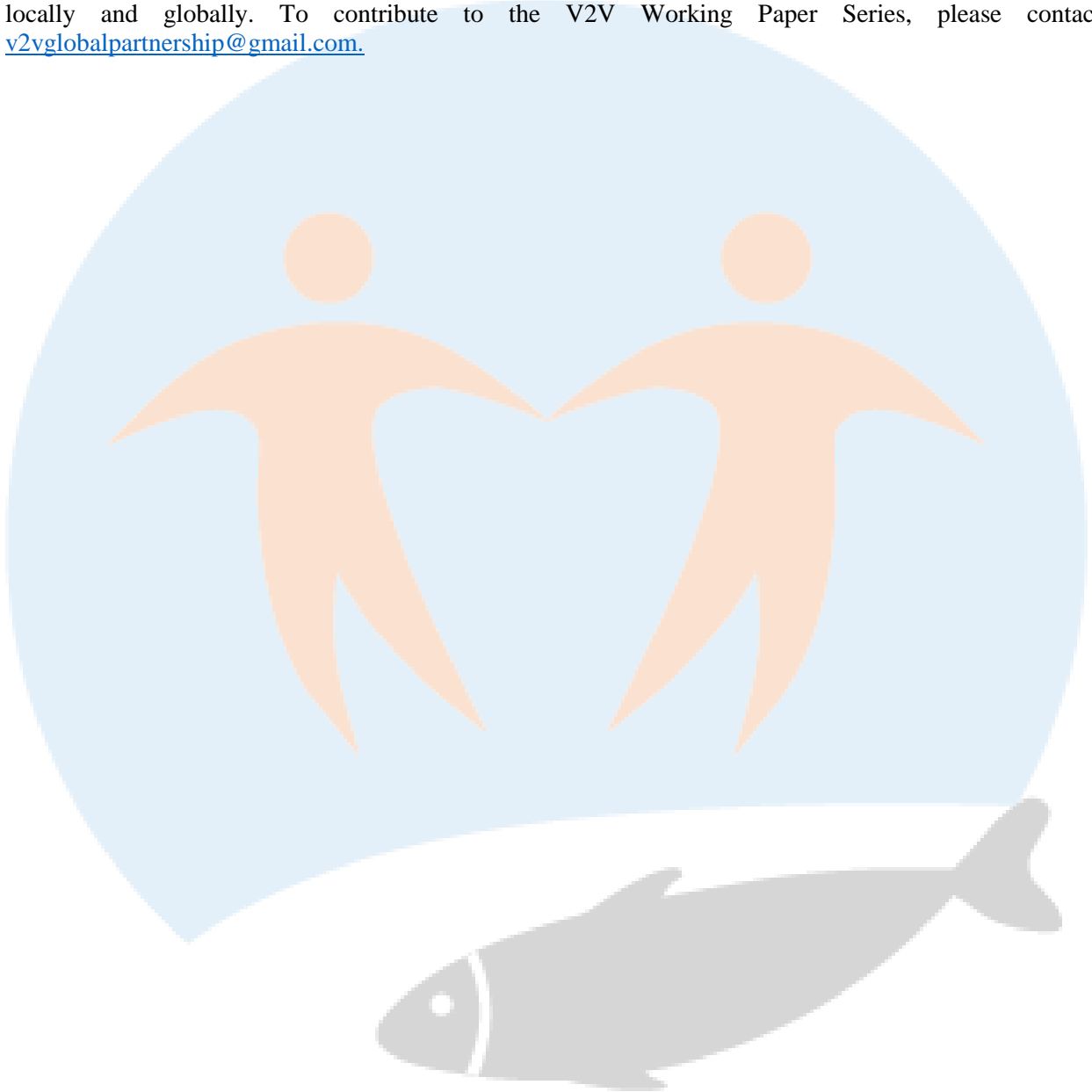
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A V2V Situational Analysis of Small-Scale Fisheries

SSFs are an important economic resource, both at the local and global level; their depletion has ramifications on fundamental aspects of life, spanning from food security to society's wellbeing and culture. On the global scale, SSFs provides food security, and a source of livelihoods and income for more than 100 million people. The objective of the V2V Situational Analysis is to build a global perspective on key vulnerabilities and opportunities associated with SSF viability across six countries in Asia (Bangladesh, India, Indonesia, Japan, Malaysia, Thailand) and in six countries in Africa (Ghana, Malawi, Nigeria, Senegal, South Africa, Tanzania). Each country level situational analysis identifies the key social-ecological drivers of change, emerging issues and challenges confronting small-scale fisheries, and important policy and governance concerns.

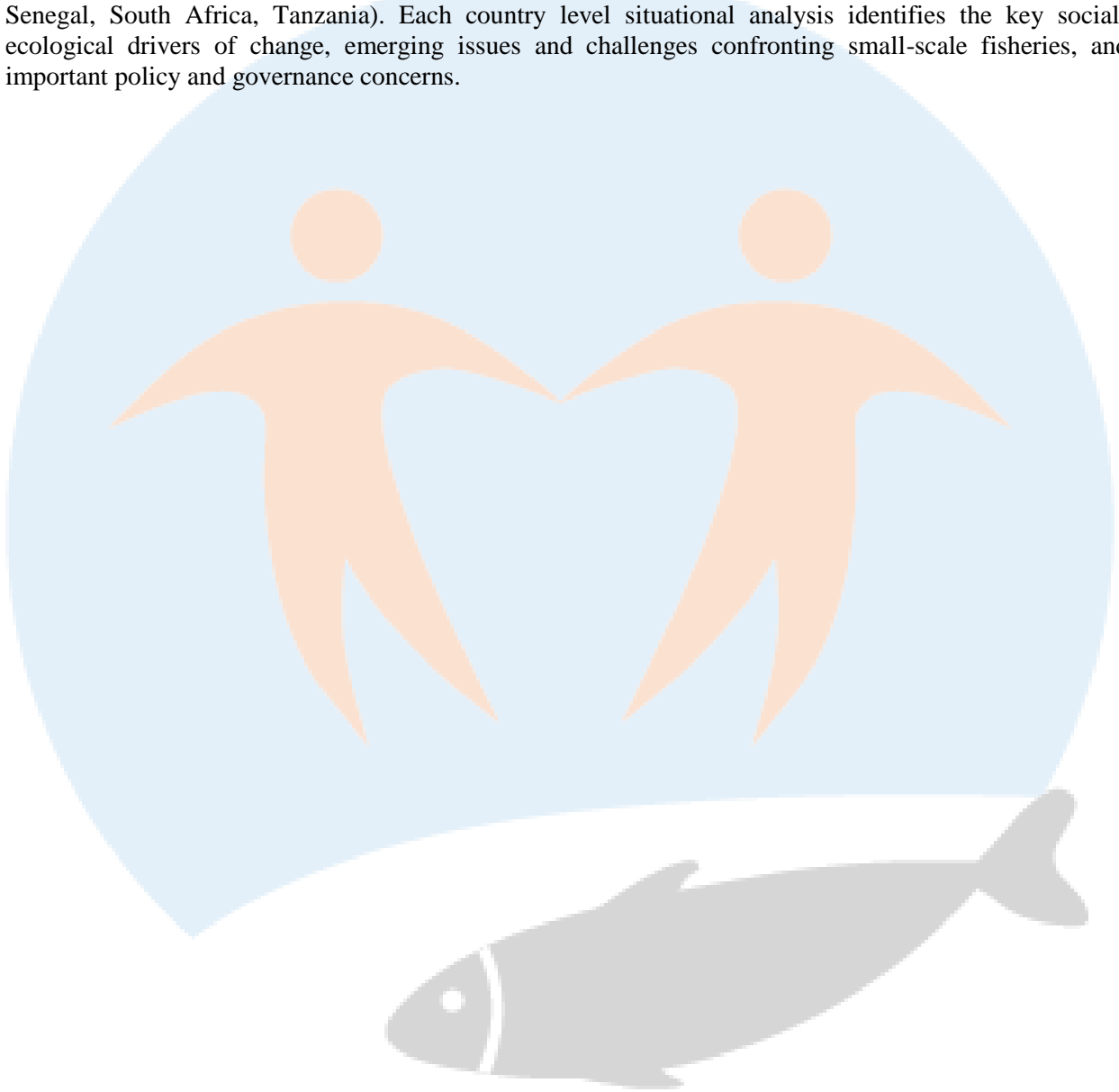
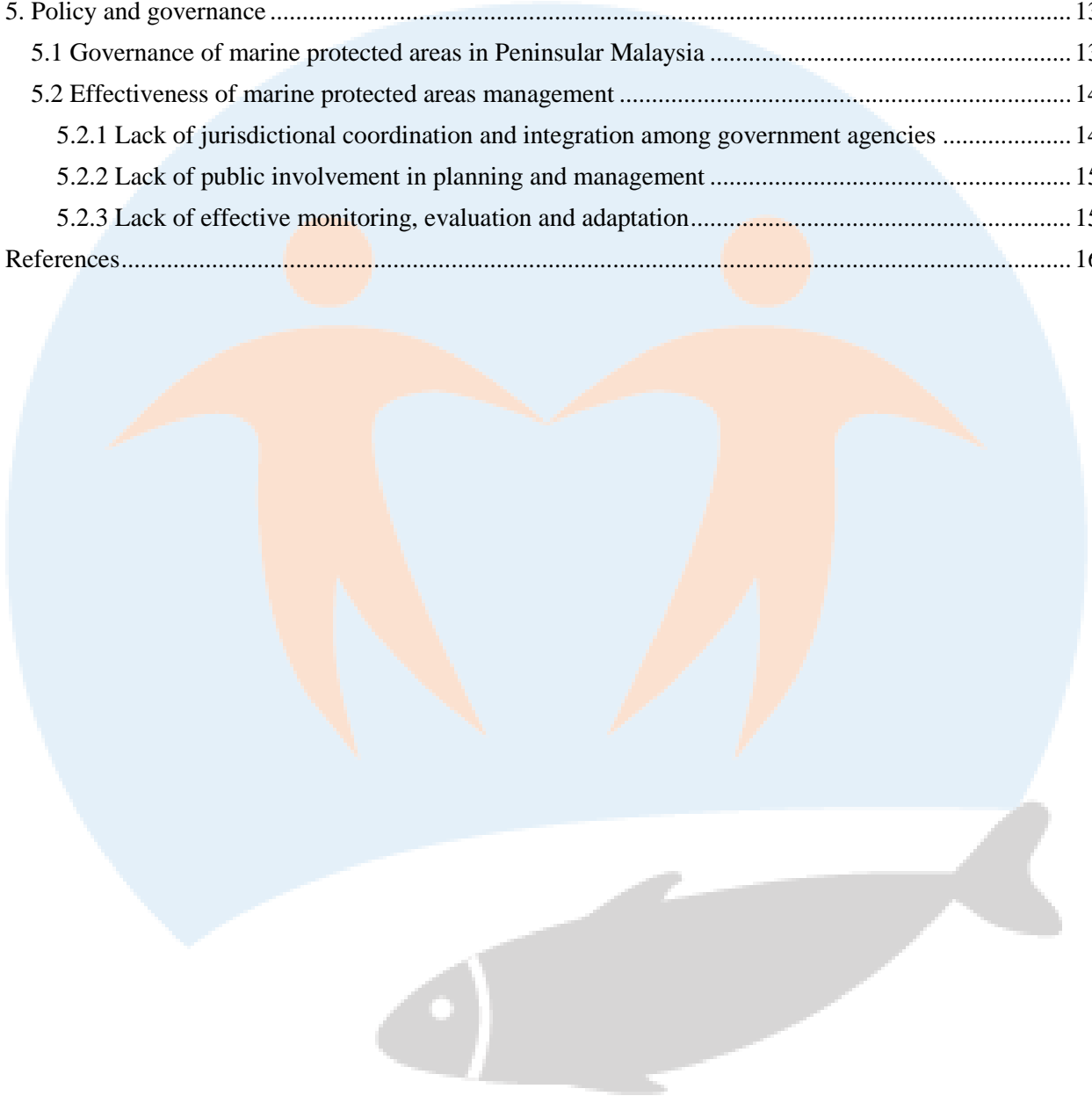


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A Situational Analysis of Small-Scale Fisheries in Peninsular Malaysia: From Vulnerability to Viability

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1. Introduction

Malaysia is one of the twelve mega biodiverse countries in the world. Malaysia's total sea area comprises of 614,159 km², equivalent to the double of its landmass area. The size of Malaysia's Exclusive Economic Zone (i.e., 200 nautical miles from shore) alone consists of 453,186 km² according to the Maritime Institute of Malaysia. Malaysia has a total coastline of 4,675 km, comprising 2,068 km in Peninsular Malaysia and 2,607 km in East Malaysia (Biusing, 2001; Gopinath & Puvanesuri, 2006; Islam et al., 2014a).

Marine fisheries in the waters of Peninsular Malaysia are diverse and this is a multi-stocks, multi-species and multi-fishing gear sector. SSF diversity in Malaysia is attributed to the country's geographical location and environmental conditions. The west coast of Peninsular Malaysia faces the Straits of Malacca, while the east coast faces the South China Sea. The existence of various species is measured based on the biologically identified areas in each of the regions of Peninsular Malaysia (Biusing, 2001; Gopinath & Puvanesuri, 2006; Talib et al., 2003).

The seabed off both coasts of Peninsular Malaysia are largely sedimentary and are suitable for trawling (Aglen et al., 1981), and a large number of commercial species (approximately 70 species or species-groups). This large number of species can be broadly categorized into five groups: demersal, pelagic, crustacean, molluscs and mixed fish (Biusing, 2001; Gopinath & Puvanesuri, 2006; Islam et al., 2011).

The fishing fleets of Peninsular Malaysia can be generally categorized into commercial and traditional fleets. The commercial fleet consists mainly of vessels operating trawl and purse seine gears, while the traditional fleet operates gears such as drift/gill nets, hook and lines, traps, and bag nets. The commercial fleets can be further classified by tonnage classes as specified by the Annual Fisheries Statistics of Malaysia which include: (1) less than 25 gross tonnages, (2) between 25 and 39.9 gross tonnage, (3) between 40 and 70 gross tonnage, and (4) greater than 70 gross tonnage. At each tonnage class, the catching power of the vessel varies accordingly (Biusing, 2001; Islam et al., 2014b). The small-scale fishers faced further deterioration of their position due to disruption or displacement by the advent of trawling that took place in the marine fisheries of Malaysia (Tai, 2014).

The fisheries in these areas grew significantly in the late 1960s and early 1970s, with landings increasing from 300,000 tons in 1967 to 650,000 tons in 1981. The stocks of both demersal and pelagic fish in the inshore fishing area have been intensively exploited as in the east coast of Peninsular Malaysia. The rapid development of Malaysian fisheries in the early 60s and 70s placed small-scale fishers who used traditional gears in a vulnerable position. In addition, technological advances such as mini-trawl fishing started competing with traditional fishermen for space and stock (Talib et al., 2003; Viswanathan et al., 2000; Biusing, 2001).

Malaysia is rich in coral reefs (i.e., total coral cover of 3,600 km²). Coral reefs support an abundance of economically important fish species which serve as a source of protein for millions of people. Fish per capita consumption in the country is one of the highest in the world (approximately 59 kg/year). Despite its contribution to the nation's economy, coral reef habitats are seriously degraded. This situation puts fishers' livelihoods in seriously vulnerable positions in marine parks (Islam et al., 2013; Reef Check Malaysia, 2011; Saharuddin, et al., 2011; Harborne et al., 2000).

1.1 Fisheries regulatory framework in Malaysia

Fisheries management policies were adopted in 1981 to protect fisheries from overexploitation and overcapitalization. A minimum mesh size of trawl nets of 38 mm was introduced. A Fisheries Licensing Policy was formulated to eliminate competition over fishing grounds between the traditional and trawl fisheries. Under this policy four fishing zones were established to allocate fishing grounds. The first zone (up to 5 miles from the shore), is reserved for owner-operated traditional fishing gears. Other zones were allocated for trawls and purse-seiners.

Following this, other fisheries management approaches have been adopted to protect the inshore fisheries from trawls and enhance fisheries stock. Deployment of artificial reefs project has been implemented. Marine protected areas have been implemented in the marine parks in Malaysia to conserve overexploited fish stocks (Islam, et al., 2014b; Islam et al., 2016). This policy is not based solely on conservation of stocks, major consideration is also given to economic, social and political aspects (Islam et al., 2014; Islam et al., 2016; Saharuddin, et al., 2011).

1.2 Marine protected areas in Malaysia

To address the problems of overfishing and depleting fish stocks, the government of Malaysia introduced 42 Marine Protected Areas (MPAs) in the form of no-take marine parks. This project has the primary goal of protecting and conserving coral reef ecosystems to ensure sustainable benefits from fisheries and tourism services (Islam et al., 2013; Islam et al., 2016). The marine parks comprise the waters at low tide mark from the outermost points of the islands to a distance of 2 nautical miles from the shore. The establishment of such no-take zones (NTZs) creates a marine protected area which is permanently set aside from direct human disturbance where all methods of fishing and extraction of natural materials, dumping, and dredging or construction activities are prohibited, with only non-extractive uses allowed (Islam et al., 2016; Shuib et al., 2018). Fishing is banned in the MPAs, while a variety of non-extractive activities like snorkeling, diving, and boating are permitted.

1.3 Social-ecological issues in no-take marine protected areas

The offshore marine islands in Malaysia are rich in coral reef ecosystems that provide valuable economic and biological resources. Physical damage to the reef occurred as a result of direct pressure from construction (e.g., damage to substrate, sedimentation, dredging), land reclamation activities, and use of corals as a source of lime for cement production (Islam et al., 2016; Shuib et al., 2018; Harborne et al., 2000; Tamblyn et al., 2005; Tai 2014). Indirect pressure relates to the development in coastal areas and it increases sedimentation and nutrient runoffs. High levels of sedimentation generate limited processes of photosynthesis and cause coral bleaching. Poor wastewater treatment leads to high nutrient loads, resulting in algal blooms. These pressures can have significant negative impacts on coral reefs and 23% of corals in Malaysia are damaged by coastal development activities (Zakariah et al., 2008).

The reef is threatened from both natural and human activities in marine parks areas of Peninsular Malaysia. A massive physical infrastructural development has taken place in marine parks over the last decade. Several studies highlight that the coral habitats in marine park islands (MPAs) have been damaged due to expansion of tourism activities (Harborne et al., 2000; Tamblyn et al., 2005). The main causes of coral degradation are: large number of tourists visiting this island, construction of land-based tourism infrastructures, fishing, and pollution through waste disposal and littering (Reef Check Malaysia, 2011).

1.4 Economic issues in marine protected areas

The setting up of the NTZ MPAs has adversely affected the livelihoods of local artisanal fishers who depend on fishing as a source of food and income (Islam, et al., 2016). Fishing ban in the waters of the MPAs, local fishers struggle to make a living because their small fishing boats only allow them to travel short distances from the shore. The implementation of MPAs generally affects resources, socio-economic and environment conditions of local stakeholders, including fishers, tourism workers and businesses (Islam et al., 2016; Shuib et al., 2018).

The majority of fishers from the islands now work in tourism. The tourism industry has undergone rapid growth over the recent decades, and accounts for the country's second largest source of foreign exchange earnings (Islam et al., 2016). Tourism has become the main source of income for the local people, and it generates employment for men, women and youth. However, during the monsoon season, tourism activities halt completely for four months, and the only available source of income is fishing. Accordingly, people understand that tourism activities alone cannot provide year-round income and fishing activities should be permitted during low seasons (Shuib, et al., 2018; Dulguun, 2018).

1.5 Inequitable distribution of benefits

Stakeholders in marine park islands, small-scale fishers particularly, feel that they are at the losing end of the implementation of MPAs. In fact, unequal distribution of the impacts of MPAs is one of the unsatisfactory situations often cited among the small traditional fishers (Dulguun, 2018; Islam, et al., 2016). Fishers in the marine parks are more concerned with the losses caused by illegal encroachment of fishers from outside the areas. Tourism operators, on the other hand, are concerned with the management of marine parks and deal with congestion and pollution. Stakeholders' view of the benefits of the establishment of the NTZs are skewed towards the short-term tangible effects due to their limited knowledge, understanding and awareness of the long-term consequences of conservation of the marine resources (Shuib et al., 2018).

1.6 Governance issues

The marine park of Malaysia is governed on three levels, namely federal, state and local governments (Islam, et al., 2017; Saharuddin, et al., 2011). In this system, the federal government is responsible to formulate policies governing national development. The state government decides on the programs and policies for local governments.

Marine parks are administered by the Department of Marine Parks Malaysia, under the Ministry of Natural Resources and Environment, which has the legal rights to protect and conserve marine ecosystems (Islam et al., 2011). However, the Department of Marine Parks Malaysia has limited control over marine resources located two nautical miles off the sea. In fact, all estuarine and marine resources are under the jurisdiction of the federal government, while the islands are under the control of the state government (Gopinath & Puvaneshuri, 2006; Islam et al., 2017; Saharuddin, et al., 2011). Therefore, coordination between the federal

and state government is necessary for sustainable resource management. However, lack of coordination between the federal and the state government is one of the main constraints for the sustainable management practices of marine resources in Malaysian marine parks (Gopinath & Puvanesuri, 2006). Overall, management is not well coordinated with the Department of Fisheries and other important stakeholders (Islam et al., 2017).

2. Meaning and status of small-scale fisheries in Malaysia

2.1 Small-scale fisheries contribution to Malaysia

The Department of Statistics Malaysia Official Portal reports an economic contribution from the marine fisheries of 0.9% (12.4 million Ringgit Malaysia) of the GDP of Malaysia in 2018. This corresponds to a total marine fish landing of 1,476.9 thousand tonnes in 2018. In 2017, the total marine fish landing was 1,465.1 thousand tonnes.

Trawlers are the most efficient vessels, taking up 56% of the catches, followed by the purse seiners, with a share of 22%. Despite their greater number, only 10 % of the landings are taken by vessels operating drift/gill nets. The remaining 22% of catches are taken by small-scale traditional vessels operating hook-and-line, bag nets and other miscellaneous fishing gears in 2004 (FAO, 2019). A Recent study found that the catches by SSF are estimated to be less than 35% of total marine catches (Teh & Pauly, 2018). In Peninsular Malaysia, about 83% boats are operating traditional gears. Generally, the demand for fish is higher and per capita consumption of fish in Malaysia is about 59 kg, which is one of the highest in the world (Goh, 2018).

Terengganu is known as the cradle of the Malay civilization in Peninsular Malaysia. The majority of the population is Malay Muslim, who have rich cultural heritage. The people of Terengganu have a reputation for being socially conservative and devout Muslims. Terengganu is famous for the variety of local cuisine. Most food products and snacks items are made from different types of fish. Women are involved in the business. Silk weaving is a popular tradition in Terengganu, and it is used for wedding events and official ceremonies. Weaving handicrafts has been part and parcel of the local community for centuries.

2.2 Small-scale fisheries profile in Malaysia

The coastal fishing communities are broadly categorized into traditional/ artisanal (i.e., SSF) and commercial fishers. The majority of artisanal fishers use outboard-engine fishing boats. They also use inboard-powered boats that are fitted with an average horsepower of 25. The smaller fiberglass boats (locally called sampan) are more commonly used in the artisanal fishing community. Fishers in Terengganu use a variety of fishing gear, such as hand lines, long lines, traps, gill nets, and drift nets. However, each gear type has several different designs and sizes to catch different types of fish, shrimp and squid species. The department of fisheries is the authority to issue licenses for traditional fishers based on the boat, gear use and fishing in zone A (up to 7 nautical miles from the shore). There are three categories of traditional fishers: full-time, part-time and subsistence fishers. Traditional fishers work six days a week and usually conduct day fishing, going to the sea in the early morning and returning in the late afternoon. Fishing activities are conducted throughout the year in the east coast of Peninsular Malaysia. However, due to strong winds, fishing activities are minimal between November and January (Busing, 2001; Gopinath & Puvanesuri, 2006; Islam et al., 2011; Islam et al., 2014a). Table 1 summarizes the key features of SSF in Peninsular Malaysia.

Terms used in SSF	Gear types	Vessel types	Ecosystem types	Ecosystem detailed types
<ul style="list-style-type: none"> • Artisanal • Coastal • Small boat • Small scale • Subsistence • Traditional 	<ul style="list-style-type: none"> • Gillnets • Hooks and lines • Seine nets • Traps • Trawls • Drift nets • Squid jigs (for squids), • Trammel nets (for shrimps and crabs) 	<ul style="list-style-type: none"> • Fiberglass 	<ul style="list-style-type: none"> • Marine 	<ul style="list-style-type: none"> • Archipelago • Intertidal • Coastal • Coral reef

2.3 The relevant linkages between ecosystems and small-scale fisheries in Malaysia

There are different marine ecosystems in Malaysia. Coral reef ecosystems in the marine parks offer a variety of fish, turtles and other flora and fauna. Each island has several islets that provide habitat for fisheries. The coastal ecosystems are habitats for important fish species, such as shrimp and squid, and inshore ecosystems includes several breeding and nursery habitats (Islam et al., 2014b).

Traditional fishers use various fishing methods to catch different types of fish species. Fishing time and location also vary by season. The mainland fishers who use lines and traps fish near marine parks, targeting valuable fish species such as groupers (*Plectropomus pessuliferus*) and snappers. During the squid season, fishers travel to locations for squid jigging (Islam et al., 2014b).

3. Social-ecological changes and key drivers

The small-scale fisheries in the marine parks in Peninsular Malaysia have been subjected to various social-ecological changes over the last decades. Below, we address the main drivers of change affecting SSF in this region.

3.1 Key social-ecological drivers

3.1.1 Overexploitation of fish stocks

Marine fishing in Malaysia contributed to more than 80% of the total fish supply between 1990 and 2007. However, this trend has declined since 2007. Landings consist of numerous species of demersal, pelagic, crustaceans and mollusks. Studies have shown that almost all fish stocks are either fully or overexploited by excessive fishing and fleet overcapacity in Malaysia. Over-capacity is caused by both the number of licensed boats and the substantial number of illegal boats. However, illegal fishing is now so entrenched into the economy that removing them would be socially and politically unacceptable.

The demersal fish resources in marine ecosystems of Malaysia have been overexploited and fishing is being conducted at an unsustainable rate. In addition, marine ecosystems are threatened by tourism activities, siltation and pollution from land-based activities such as construction of tourism infrastructure, improper waste disposal, littering and run-offs from agricultural activities as well as illegal fishing that pollute and

degrade critical coastal habitats. This threatens sustainable yield of fish stocks and may lead to changes in species composition (Tai, 2014; Viswanathan et al., 2000; FAO, 2019; Goh, 2018).

3.1.2 Overexploitation of other flora and fauna

Four out of seven sea turtle species are found in Malaysia, namely, leatherback (*Dermochelys coriacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and olive ridley (*Lepidochelys olivacea*). The East Coast of Peninsular Malaysia, particularly Terengganu, had been popularly known for the unique and abundant nesting of sea turtles in the 1970s and 1980s. Malaysian sea turtles declined sharply over the last 20 years due to poaching, use of illegal fishing gear and lack of awareness among the fishers and tourism workers (Mortimer, 1990; Ali et al., 2004; Tamblyn, et al., 2005). The loss of valuable sea turtles and illegal fishing by commercial fishing boats create a crisis in fisheries in coral reef habitats.

3.1.3 Coral reef degradation

Coral reefs provide relevant food and other resources such as jewelry, aquarium items, construction materials, pharmaceuticals, and industrial chemicals. They are also grounds for tourism and recreational activities, such as snorkeling and diving. Perhaps most importantly, they provide biological support to other ecosystems while also protecting coasts from erosion. Coral reefs offer safe refuge for fish to breed, feed and grow, and they support an abundance of economically important coral fishes. Coral reef tourism provides revenue for the national income. Despite their importance, coral reefs have been degraded over the decades causing several concerns for small-scale fishers who depend on coastal fishing. The coral reef resources are threatened from both natural and human activities in the marine parks of Peninsular Malaysia (Reef Check Malaysia, 2011; Islam et al., 2013; Department of Fisheries Malaysia, 2012).

3.1.4 Water pollution

Sea water pollution is one of the main causes of coral reef degradation, which endangers fisheries resources and negatively impacts the livelihoods of small-scale fishers in the affected areas (Tai et al., 2014). Sewage, oil, grease, and grey water are the most hazardous problems affecting coral reefs (Zakariah et al., 2008). There are large numbers of hotels, resorts and chalets in marine parks in the east coast of Peninsular Malaysia that are discharging untreated sewage directly into the ocean (Reef Check Malaysia, 2010). Pollution generally occurs from discharges from chalets, littering on the beach, dumping of discarded fishing equipment, rubbish from restaurants, wastewater from households, and boats anchoring on the coral reefs (Islam et al., 2014a).

3.1.5 Rebuilding fish stocks through construction of artificial reefs

Artificial reef (AR) is a kind of artificial fish habitat which provides living, shelter and breeding grounds for aquatic organisms. ARs protect and support the development of biodiversity and abundance of fishery resources. In Malaysia, ARs were introduced as a tool to prevent the encroachment of trawlers, reduce conflict between commercial and traditional fishers and increase the opportunities for small-scale fishers to make a livelihood from fishing (Islam, et al., 2014b). The impact of the artificial reefs as ecosystem-based fisheries management approach indicates that fishing effort has increased among the traditional fishers. The conservation objectives of artificial reefs in marine water have not been achieved (Islam et al., 2014b). Studies found that the majority of artisanal fishers were not able to derive the benefits from ARs because medium-sized trawls were allowed to fish in the inshore areas, during the monsoon season, which are zones

usually dedicated to artisanal fishers. This finding suggests that artificial reefs may not be a viable strategy for socioeconomic improvement of artisanal fishing communities in Malaysia (Islam et al., 2014b).

3.2 Key drivers of ecological change

3.2.1 Trawl fishing

Trawl fisheries are an important component of the capture fisheries sector in Malaysia. Trawl fisheries contribute around 50% to the overall landings. Fishing grounds are divided into three fishing zones, A, B and C based on distance from the coastline. The area less than five nautical miles from shore (zone A) has been reserved for artisanal fishers. The larger boats (zones B and C) use trawl and purse seine fishing beyond five nautical miles. However, encroachment of trawlers in zone A has been identified as one of the main causes of overfishing. Trawlers tend to land a high proportion of trash fish, which includes juveniles of commercially important species. Fishing effort increased as well as competition with other fishing methods, such as drift/gill netters, for pelagic and semi-pelagic resources. The Perhentian Islands beaches were considered prime breeding grounds for turtles. Encroachment of trawlers and illegal fishing by outside fishers are critical issues in the marine parks. In addition, the increasing number of people visiting and staying on the beaches is altering marine ecosystems, including relevant habitats of turtles (Maidar, 2018; Islam, et al., 2017).

3.2.2 Encroachment by commercial fishers

Encroachment and illegal fishing by commercial fishers are a common problem in the MPAs, especially during monsoon season. The unscrupulous activities of such commercial fishers are depleting the fish stock in the vicinity of the MPAs and reducing the catches of local fishers in surrounding waters. Local fishers are clamoring for stricter enforcement of MPA and fishing regulations by the authorities (Islam et al., 2016; APEC, 2008).

3.2.3 Establishment of no-take marine protected areas

The government of Malaysia set up 42 MPAs in Peninsular Malaysia to address the problems of overfishing. The establishment of no-take zones and fishing ban up to two nautical miles from the shore threatens the livelihood of small-scale fishers who depend on those zones for fishing. With their small low-powered boats and traditional gears, small-scale fishers experience great difficulty fishing outside the 2 nautical mile border of the MPAs.

The NTZs caused much hardship on small-scale fishers by depriving them of the means to make a living. Even greater difficulty is created during the monsoon season when strong winds and heavy rain make it unsafe for fishing in the open sea. Although the main objective of the MPAs is to conserve marine resources, it is equally important not to neglect their social, cultural and economic impacts on the local community (Shuib et al., 2018). Researchers propose that a multi-use community-managed zone be created in the MPAs to allow local fishers to fish for subsistence needs (Islam et al., 2013; Islam et al., 2016; Shuib et al., 2018).

A number of threats have degraded the coral resources where fish species seek food and shelter (Islam et al., 2013; Harborne et al., 2000; Tamblyn et al., 2000; Burke, 2002). These arise from increased tourism activities, siltation and pollution from land-based activities such as construction of tourism infrastructure, improper waste disposal, littering and run-offs from agricultural activities as well as illegal fishing (Reef

Check Malaysia, 2011). In addition, there are overlapping jurisdictions between the government agencies in charge of MPA management.

There is an urgent need to regulate the number of tourists allowed in the parks in a manner that matches with the local environment capacity. Equally important are measures to reduce the number of coral reef-related activities, such as diving and snorkeling. It is also suggested that environmental impact of permitted activities is considered during the planning and design of future development projects (Islam et al., 2013; Haddock-Fraser & Hampton, 2010).

One of the main stumbling blocks for effective MPA management in Malaysia is the lack of community involvement (Islam et al., 2014). To address this issue, researchers propose adaptive co-management as a governance option, an approach that encourages knowledge sharing and collaboration among stakeholders (Maidar, 2018). In addition, it is recommended that local fishing communities take on joint responsibility for conservation and harvesting controls in MPAs for more effective fisheries management (Islam et al., 2014).

3.2.4 Rapid growth of tourism in marine parks

Massive infrastructural development has been taking place in marine parks to meet the increasing demands of the tourism industry. The development of these infrastructures went beyond the carrying capacity of the islands, resulting in soil erosion, pollution and destruction of coral habitats and turtle beaches (Tamblyn et al., 2005). While tourism in the MPAs provides economic benefits and while it covers some of the expenses for marine resource preservation, if not managed in a sustainable manner it can lead to long-term damage to the environment thereby further threatening the livelihoods of small-scale fishers.

The complex nature of social-ecological systems, environmental protection, and habitat destruction connected with economic development and increasing number of tourists are pressuring the natural carrying capacity (Nasir et al., 2017). The government intends to set up marine parks to manage and market parks as eco-tourism destinations. The government has promoted tourism development in marine parks over the last two decades, which has turned the marine parks into thriving tourist spots.

The number of tourists, boats, hotels and other tourism infrastructures has been growing steadily. Tourism has flourished in the marine park of Perhentian, Redang and Tioman islands, which experienced increasing influx of tourists over the past 2 decades, both local and international (Islam et al., 2013; Shuib et al., 2018). The once remote and isolated islands have been transformed into bustling tourist destinations. The main tourist activities are scuba diving, snorkeling and swimming. The number of tourist arrivals on the islands has been increasing yearly. In addition, people from the mainland are attracted to work and carry out business in the tourist trade on the islands: in fact, many of the hotels and dive shops are managed and owned by expatriates (Islam et al., 2016).

A large number of locals living in MPAs have taken up employment or started small businesses in the tourism sector. Fishing is no longer the main source of income for the people in marine parks (Islam et al., 2013). Some of the villagers resorted to breaking the law by fishing in the no fishing zone (Islam et al., 2013). Theoretically, the tourism industry could provide jobs for the villagers, but in reality, the jobs are seasonal, which means they have systemic sustenance limitations (Islam et al., 2013; Dulguun, 2018).

3.2.5 Massive infrastructure development

Land-based constructions alter the physical make-up of the environment. Over the last 2 decades, massive physical infrastructural development has taken place in marine park islands. These infrastructures consist of three jetties, a primary school, a health clinic, a police station and a post office. A generator was installed in 1994 for electricity supply; and a water treatment plant was established to provide piped water in the village. A few resorts and large numbers of chalets, dive shops, souvenir shops, restaurants and tea stalls have sprung up (Islam et al., 2013). The infrastructure development in the MPAs has brought many social and economic benefits to the local population but has also polluted and damaged the ecosystem (Shuib et al., 2018). The protection of coral reefs in no fishing zones are in danger because of the growing tourism related activities in the MPA (Islam et al., 2013). The destruction of coral reef ecosystems is caused by drivers, such as littering and poor waste management enhanced by the growing unsustainable tourism practices (Islam et al. 2013; Islam, et al., 2017).

3.3 Social change

3.3.1 Livelihood of fishers

The NTZ in the marine parks have changed the sociocultural characteristics of traditional fishers in the marine park islands. Local fishers use hook and lines, traps, gill and drift nets and trawl nets using small boats in the short distances (Islam et al., 2013). They fall short of financial means and capacity to engage in long-distance fishing outside the 2 nautical miles (Islam et al., 2013). The occupations of the majority of the population of these marine parks have shifted from fishing to coral based tourism activities. In terms of income, 84% of fishers earn less than 1,000 Ringgit Malaysia per month compared to 19% for those earning income from tourism. Of those involved in tourism activities 44% have monthly income above 2,000 Ringgit Malaysia in contrast with a mere 2% for fishers (Tai et al., 2014). During the monsoon, tourism activities halt completely, and the only available source of income is fishing. Furthermore, people understand that tourism activities alone cannot provide year-round income and other sources of income must be introduced (Dulguun, 2018).

3.3.2 Fisheries subsidies

In Malaysia, input subsidies such as fuel subsidies and grants for new fishing vessels and gears are given to fishers. These subsidies increase profit and thus, the income of fishers. These subsidies reduce fishing costs and create incentives for continued fishing. On the other hand, since catches are declining, overfishing, fleet overcapitalization, reduced economic efficiency and dissipate resource rent are becoming a serious concern (Islam, et al., 2016).

3.3.3 Marine protected area governance

The government has enacted rules to regulate fishing activities in MPAs. Studies show that local fishers understand the importance of MPA rules, and they comply with them. However, despite the fishing ban within the MPAs, evidence clearly shows that some small-scale fishing still take place in the NTZs (Shuib, et al., 2018; Islam, et al., 2017). This is especially true during the monsoon months, when tourism activities come to a halt, and when strong winds and heavy rain make it dangerous for fishers to fish outside the MPAs waters. Many of the inhabitants are of the opinion that fishing rules in the MPA are too restrictive; they believe that the authorities should extend more flexibility and permit non-destructive small-scale

fishing. This matter is of importance to the local community as many of them still rely on fishing for subsistence (Islam, 2011).

3.3.4 Unclear demarcation of NTZ in the marine protected area

The areas that are restricted from fishing and tourism activities that damage coral reefs are not clearly demarcated in the MPA sites, and this has led to confusion and difficulty to comply. It is generally acknowledged that the local community was not consulted when the MPA rules and regulations were formulated (Islam, et al., 2017; Islam, et al, 2014). The people in the MPAs feel that the authorities should take into consideration the impact of MPA rulings and decisions on the community. Moreover, enforcement of the rules and regulations has been ineffective and inconsistent, particularly in relation to littering, pollution, and encroachment by commercial trawlers (Islam, 2011). There is a need to have a clear zoning for tourism and fisheries activities.

3.3.5 Overlapping jurisdiction of marine protected areas

Federal, state, and district institutions are responsible to manage activities on the marine park islands. Some of the federal and state agencies have overlapping administration roles (Nasir et al. ,2017). The management procedures involve several stakeholders such as federal and state governments, tourism industry, and local villagers. Out of these stakeholders, the local villagers had minimal say in policy and management decision-making processes (Islam et al., 2013). There are problems of communication, coordination, overlapping roles, and policy synchronicity in the levels of government (Islam et al., 2013). This top-down management puts the fishers in a vulnerable position and forces them to change the customary lifestyle which was followed by the previous generations (Islam et al., 2016).

3.3.6 Social and cultural change

The tourism sector attracts the local villagers to change lifestyles from fishing to being a business owner or an employee in the tourism industry. Tourism creates many employment opportunities for men and women alike. Women choosing a career in the tourism sector is an ongoing observed social change (Salmond, 2010). The tourism related activities can be considered as social driving factors in the marine islands. Tourism is the main source of income, and thus holds a powerful influence over social life in the Islands. It is observed that many women in the marine parks have moved away from their traditional role of housewives to work in the tourism sector. With the resultant increase in household income, many families can now afford to send their children to school (Maidar, 2018). Previously, fishers used to live on the islands all year round, now many of them have residences in the mainland Kuala Besut district in Terengganu. Education and health care facilities have increased in the marine parks (Maidar, 2018). The ecotourism business practices on the islands pay little attention to the ecological and social concerns. Businessmen with government connections invest on the land to build more tourism infrastructure. Consequently, the price of the land has significantly increased, local landowners are losing their land ownership, and local residents are marginalized.

3.3.7 Climate change

The climate change effect on the degradation of coral reef habitat has been documented with significant reduction of coral cover. Pivotal in the degradation of corals in Peninsular Malaysia is the increase of sedimentation (Yasin et al., 1998). The sedimentation occurred in the coral reefs due to several factors such

as tidal current and wave action. Huge amounts of sediment changes the biological, physical and chemical conditions of coral reefs, which restricts coral growth. Climate change in Malaysia, which is evident as extreme weather conditions (storms and heavy rain), big waves, floods and heat have had a serious impact on the marine ecosystem. Water run-off from storms and heavy rain reduces salinity along the coast leading to coral bleaching; run-off water from land will lead to excessive nutrient levels in water bodies contributing to algae blooms which can harm corals. Acidification of sea water due to excessive absorption of carbon dioxide will increase the pH level of the ocean and raise sea temperature, causing coral bleaching (Muhammad et al., 2016). Finally, as mentioned, tourism is one of the main drivers for the decrease of live coral coverage in Peninsular Malaysia. A mass coral bleaching event affected coral reefs in the Coral Triangle region including Malaysia, Indonesia and Thailand due to global climate change.

4. Emerging issues and challenges

In this section, we address the key emerging issues and challenges facing small scale fisheries in the east coast of Peninsular Malaysia.

4.1 Loss of income from the establishment of no-take marine protected areas

Fishing has been the only source of income and food for the artisanal fishers in the offshore islands of Peninsular Malaysia for generations. Their traditional fishing grounds were the waters surrounding islands, where coral reefs provide sheltered habitats for fish and other marine resources to feed, breed and grow. Following the 1994 establishment of no take MPAs, fishing is banned for a distance of up to 2 nautical miles from the shore of the MPA islands (Islam et al., 2013). The Department of Marine Park has imposed a set of rules and regulations to protect and conserve marine biodiversity. However, the fishing restrictions in the MPAs has made a serious adverse effect on the livelihoods of fishing households. The traditional fishers are not capable of fishing beyond 2 nautical miles with the small fishing boats and traditional gears. The local fishers are among the poorest and most marginalized groups in the country. There are about 11,000 fishers directly involved in fishing in Terengganu, which represent 13% of the total number of fishers in Peninsular Malaysia (Islam et al., 2014b). The growth of tourism in the MPAs during the last 2 decades has brought much economic benefits and opportunities to the local people. Nevertheless, many still rely on fishing as a means of subsistence. Fishers fish during the northeast monsoon months from October to February, when nearly all tourism activities stop and income from tourism ceases (Islam, 2016; Dulguun, 2018).

4.2 Degradation of coral reefs

No-take MPAs, such as the Perhentian Islands, were established in Malaysia to enable overexploited marine resources to recover and to conserve coral reef ecosystems. However, marine parks have also been promoted towards mass tourism, and the increasing influx of tourists to the MPAs over the past 2 decades has put severe pressure on the coral reefs and fish habitats. Recent studies conducted suggest that Malaysian coral reefs are under serious threat due to human activities (Islam et al., 2014; Islam et al., 2016). Common environmental stresses to coral reefs include physical damage to corals from divers and snorkelers and overcrowding at dive sites (Haddock-Fraser & Hampton, 2010; Reef Check Malaysia, 2011). In Perhentian, discarded fishing equipment by illegal fishers, and boats anchoring on the coral reefs, are among the factors that have compounded the degradation of the reefs (Islam et al., 2014; MNRE, 2009).

The objectives of establishing MPAs in Malaysia may not have been achieved due to various threats that have degraded the coral resources – increased tourism activities, siltation and pollution from land-based activities such as construction of tourism infrastructure, improper waste disposal, littering and run-offs from agricultural activities as well as illegal fishing (Tai et al., 2014). Enforcement of fishing rules is noticeably poor, particularly during the monsoon. (Islam et al., 2013). The design and implementation of marine policies in Malaysia failed to address the environmental consequences of tourism in marine parks. There was no environmental impact assessment done to evaluate the possible risk and threats from human activities on the marine resources in the MPA. (Islam et al., 2014).

Due to the rapid development of nature tourism and growth of unregulated tourist operators over the last few decades, arrival of visitors to the Perhentian Islands has increased yearly, intensifying pressure on the natural ecosystems' carrying capacity and wildlife (Harborne et al., 2000; Islam et al., 2016). A major constraint to the conservation of coral reef resource is the overlapping jurisdictions of the federal and state governments, and their lack of coordination (Islam et al., 2016). While terrestrial ecosystems are under the jurisdiction of the state governments, the Marine Park Department of Malaysia is responsible for the management of MPA waters area up to two nautical miles surrounding the island. Furthermore, the conservation of fisheries resources is under the control of the Department of Fisheries Malaysia (Islam et al., 2013).

4.3 Pollution

A massive physical infrastructure has been developed in Pulau Perhentian over the last two decades to meet the demand of the swiftly expanding tourism industry (Islam et al., 2013). Excessive tourism activities and the establishment of hotels and other land-based infrastructures have led to a serious problem with pollution (Islam et al., 2016). The causes of pollution on the islands are waste discharges from chalets, littering on the beach, dumping of discarded fishing equipment, rubbish from restaurants, wastewater from households, and oil leakage from boats anchoring on the coral reefs. Inadequate water treatment and sanitation facilities also cause severe environmental problems on the beaches and in the waters surrounding the Perhentian MPA. The consequences of tourism activities on pollution are not adequately addressed in the planning and current management of the Perhentian Island MPA (Islam et al., 2014a; Reef Check Malaysia, 2011).

Marine pollution is one of the main reasons for the unhealthy state of the coral reefs of the Perhentian Islands. The corals register a high presence of Nutrient Indicator Algae (NIA). NIA kills corals through intense competition for space and sunlight, and it also reduces the available surface for coral growth. One of the causes for the increase in NIA is influx of nutrients into the water due to marine pollution. The possible sources of sea water pollution originate from untreated waste discharged by chalets and resorts, restaurants, and community households directly into the sea, littering on the beach, sedimentation and nutrient runoff from unplanned construction activities (Tai et al., 2014).

The issue of pollution, and the negative effect on the marine environment and terrestrial landscape, is of great concern to all stakeholders in Perhentian, and this is mainly related to sewage and solid waste disposal. The community cites government lack of accountability as part of the reason why garbage remains a consistent threat to the health of the environment. In addition, the problem of rubbish is a major turn off for tourists to the islands (Haddock-Fraser & Hampton, 2010).

The Perhentian MPA consists of small islands that simply lack the capacity to support the amount of infrastructure that has been built. Shortages of land forced developers into direct conflict with conservation initiatives e.g., illegal development on turtle beaches. Development resulted in dredging of channels, destabilization of slopes, deforestation, soil erosion, and releasing of sediment onto coral gardens. The

development activities on Perhentian had gone beyond the carrying capacity of the islands. Excessive demands on water and problems of waste disposal are all too evident on the islands. A long-term management strategy and an ecosystem approach are called for, encompassing all aspects of the marine park (Harborne et al., 2000).

4.4 Weak marine protected area governance

Reasons behind the unsuccessful management of the MPAs include the lack of proper planning at the design stage; lack of coordination among the responsible agencies (Department of Marine Park and Department of Fisheries), the failure of the authorities to enforce the rules and regulations; and a failure to appropriately respond and adapt to emerging situations e.g., the inability of the government agencies to deal with rubbish and wastewater disposal. Furthermore, the local community is not consulted on decision-making on MPA matters, resulting in sub-optimal decisions and poor implementation. Members of the local community want MPA rules to be fair and participatory (Shuib et al., 2018). Fishers are unhappy about the lack of action by the authorities against commercial trawlers who enter in the near shore areas to encroach and catch fish illegally surrounding the MPA waters. The top-down approach to the management of the MPAs leaves stakeholders feeling powerless and frustrated regarding matters that concern their daily lives and well-being (Islam, 2011; Islam et al., 2016).

4.5 Inequities in access to benefits

The local people are dissatisfied with the inequitable distribution of benefits from the MPAs, in view of the unsuccessful management of the marine parks. Furthermore, the majority of tourism establishments in Perhentian are owned and managed by expatriates or people from the mainland, rather than locals (Islam et al., 2016). The benefit of the MPA in fisheries stock enhancement has not been perceived by the local fishers.

4.6 Covid-19 pandemic

Due to the government's movement control order during the Covid-19 pandemic, local fishers have been unable to fish, which resulted in income loss and food insecurity. The situation has improved slightly, as fishing has been recently allowed to resume -- subjected to certain measures such as receiving permission from the police (The Edge Markets, Feb 9, 2021). The pandemic has brought the entire tourism industry in Malaysia to a halt as the government closed its borders and imposed travel bans (The Edge Malaysia Weekly, Jan 11, 2021). The number of visitors to Terengganu was reduced significantly. Small-scale fishers have faced vulnerability during the pandemic. In Perhentian, local fishers and tourism workers were engaged in fishing activities during the pandemic due to lack of tourism activities and less strict movement control order in the island. There is no recent study available to understand the impact of lockdown and related new regulations on fisheries and tourism.

5. Policy and governance

5.1 Governance of marine protected areas in Peninsular Malaysia

Marine protected areas (MPAs) were first initiated by the Department of Fisheries Malaysia (DoFM) in 1983. The principal goal of establishing marine parks in the country was to protect, conserve marine

ecosystems of significance, particularly coral reefs and their associated flora and fauna. In addition, the aim was to encourage public understanding, appreciation and enjoyment of Malaysia's natural marine heritage. In 1994, 38 islands in Malaysia were declared as marine parks, which cover waters up to 2 nautical miles from the shore to the surrounding islands (except for Pulau Kapas where marine park waters cover 1 nautical mile seaward from the outermost points of the island). In 2004, The Malaysian government created the Marine Park Department Malaysia (MPDM) under the Ministry of Natural Resources and Environment, to take over the administrative and management responsibilities of MPAs from the DoFM (Islam et al., 2016). The main goal of creating the MPDM was to improve the management of MPAs through effective enforcement of MPA regulations. The MPDM is the main agency responsible for management of MPAs, but other agencies from the federal government and state governments have been involved in the MPAs management. In declared MPAs, fishing is prohibited, while a variety of non-extractive uses are permitted, e.g., snorkeling, diving, boating, and beach use (Islam et al., 2016). Malaysia has established a total of 53 coral reef MPAs, and they include 42 coral reef MPAs in Peninsular Malaysia by the MPDM. In East Malaysia, eight coral reef MPAs were established in Sabah by the Sabah Wildlife Department and three in Sarawak by the Forest Department of Sarawak. The regulations governing the MPAs are provided under the Malaysia Fisheries Act 1985 (Islam et al., 2016).

5.2 Effectiveness of marine protected areas management

Studies have shown that MPA management not successful, as evidenced by the overexploitation of fisheries and degradation of coral reefs (Islam et al., 2016). Although fishing is prohibited in MPAs, there was clear evidence that the majority of the local fishers depended on these areas, particularly in the monsoon season (Islam et al., 2013). Also, MPA rules failed to protect fisheries and coral reefs from trawl fishing, and the encroachment of commercial fishers is still a major problem in the MPAs. Further, enforcement activities are not effective in controlling pollution in the coastal marine environment in the MPA areas. Better governance could include increased monitoring of fishing activities and regulations to curb against the negative impacts of tourism (Islam et al., 2016).

Tourism infrastructure has been developed rapidly in Malaysian Islands, the ecological and social impacts have been overlooked. There is a need for sustainable development of these areas in which economic gain is not achieved at the expense of the environment (Harborne et al., 2000). A number of key factors have been identified as the cause for ineffective management of the MPAs and are presented below.

5.2.1 Lack of jurisdictional coordination and integration among government agencies

Due to Malaysia's policies and institutional frameworks, there is a separation of jurisdiction between Federal and State Government. Furthermore, natural resources and areas are under different sectoral management (Harborne et al., 2000). The lack of coordination between the federal and state governments has been a major setback to the successful management of MPAs (Islam et al., 2016).

The Department of Marine Park, which works under the jurisdictions of the Federal government oversees all the activities related to coral reefs and tourism activities in the MPAs. The department has established a set of rules to protect marine biodiversity especially fisheries and coral reefs in MPAs. Meanwhile, the Department of Fisheries Malaysia governs all activities related to fisheries beyond the MPAs, whereas the Department of Land, under the respective state governments, is responsible for land-based infrastructure and other tourism development activities in the marine parks (Islam et al., 2016). It has been observed that the jurisdiction between federal and state governments in Malaysia is overlapping and complex. The poor coordination between government agencies has been highlighted as the main constraint for successful

marine resource management in Malaysia. The lack of jurisdictional coordination and integration among the agencies is a major challenge to MPA governance (Islam et al., 2016).

5.2.2 Lack of public involvement in planning and management

Several studies have highlighted that successful implementation of MPA management is difficult without consultation with the local community. Existing regulations have negatively affected the livelihood of the fishing community in the MPAs. This suggests that the implications of MPA regulations on fishers' socioeconomic conditions need to be understood in order to properly plan and implement regulations for the protection of marine resources. Local communities are concerned that their views be included in the decision-making process for the management of MPAs.

MPA governance could be improved significantly with locals' participation. The current top-down approach in MPA governance in Malaysia provides few incentives to fishers to participate in management. Serious effort is called for to increase MPA effectiveness by promoting awareness and raising compliance, transparency and equity in the MPA management (Islam et al., 2016). Furthermore, the area restricted from fishing and tourism activities that damage coral reefs is not clearly demarcated in the MPA sites. A clear zoning for tourism and fisheries activities that is understood and accepted by the community could be adopted for improving governance and management of MPA in Malaysia (Islam, 2011).

5.2.3 Lack of effective monitoring, evaluation and adaptation

It is argued that despite the many potential benefits of MPAs, the majority of MPAs failed to meet their objectives due to the lack of effective monitoring, evaluation and adaptation (Islam et al., 2014). The rapid growth of nature tourism and the unregulated proliferation of tourist operators over the last few decades have resulted in an increasing traffic of visitors to the MPAs, thus exerting great pressure on the natural ecosystems' carrying capacity (Coral Cay Conservations, MTFCP – Report 2005).

The existing policy on tourism management does not effectively protect coral reefs in the marine parks. The beach and coral reefs are excessively used by the visitors undertaking various tourism activities. The current use of coral reefs should be reduced, and the number of tourists should be regulated based on the carrying capacity of the coral reef habitat (Islam et al., 2013).

The growing number of chalets and jetties in the MPAs negatively affects coral reef ecosystems by contributing to pollution of the sea water and increased boat activities. Development agencies should assess the environmental impact of infrastructures and the consequences of tourism on the environment of the MPAs in the design and implementation of marine policies. There is a need to conduct Environmental Impact Assessment to assess the possible risk and threats from these activities on the resources in the MPA. The government should restrict land development activities, particularly in small islands such as Perhentian (Islam et al., 2013).

The non-government organizations, volunteer associations, universities and research institutes have been working with the department of fisheries and local people to prepare local management plans for MPA. Local people are interested in activities to protect fisheries and coral reefs. There is a need for better coordination with the local communities to develop a holistic partnership approach for sustainable management of marine resources in the MPAs.

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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**