Impacts of Coastal Land Reclamation and Sand Mining Activities: Perspectives from Coastal Fishing Communities and Ecotourism Providers

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ABSTRACT

The objective of this study is to understand the impacts of land reclamation and sand mining activities on coastal fishermen and coastal tourism providers. Set on Penang Island, a total of 22 coastal fishermen and 11 coastal tourism operators were interviewed using semi-structured, in-depth interviews. The findings were analysed using thematic analysis. This study discovered that previously, fishing communities and coastal tourism operated as separate entities. With the rising environmental degradation, pollution, and limited space for fishing areas due to reclamation activities, the separation between these two entities is now diluted, and they are mostly reliant on one another to sustain their operations and businesses. Over the past decade, their relationship has grown stronger, to the extent that a few respondents have identified themselves as having dual identities, balancing both professions. The impacts are presented based on economic, social and environmental categories. The economic impacts include higher seafood and travel costs, social impacts involve fading fisherman identities and occupational inheritance, and environmental impacts are marine pollution, altered landscapes, and damaged spawning grounds from land reclamation and sand mining. The repercussions of these impacts often displace coastal fishing communities, leaving them with a sense of emptiness when not at sea and affecting their mental health. Other repercussions include lowering tourists' appreciation and emotional experience, and reducing their intention to revisit. The results emphasise the need for integrated, sustainable approaches to preserve coastal environments and livelihoods for the benefit of current and future generations. The findings can be used to enlighten policymakers, researchers, and industry players in facilitating the integration of a sustainable and blue economy into policy-making and development projects. This integration is crucial for ensuring the protection of the coastal environment, preventing the marginalization of local fishing communities, and providing an authentic experience of coastal ecotourism.

Keywords: coastal tourism, fishing communities, land reclamation, sustainable development

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INTRODUCTION

Coastal areas serve as a platform for a source of income for fishing communities and recreational tourism activities for the general population. Rapid population growth in coastal areas, coupled with increasing urbanization and economic development, intensifies the demand for land, often leading to extensive land reclamation projects (Bhunia et al., 2021). Land reclamation, in this case, coastal land reclamation, is a civil engineering activity that involves the process of creating new land from previously submerged or intertidal areas, such as oceans, seas, riverbeds, or lakebeds (Nadzir et al., 2014). New lands created through land reclamation are seen as a viable way to expand the land mass, boost economic growth, improve the transportation system and support blooming population needs (Chee et al, 2017; Neumann et al., 2015).

In the process, land reclamation projects require a large amount of sand to act as fill material, in addition to clay, rock, boulders, and gravel (Stauber et al., 2016). Sea sand, mostly used for land reclamation, is one of the most mined commodities with a high selling value (Rukmana et al., 2020). Despite providing employment opportunities, port expansion, accommodating population growth and advancing economic progress, land reclamation and sand mining activities can be detrimental to the environment (Sengupta et al., 2023). The process of obtaining sand from beaches, inland dunes, and dredging from ocean and river beds is found to be damaging the landscape, biodiversity, and fish spawning nursery, and altering the pattern of surface water and groundwater flow (Hwang et al., 2014; Ayyam et al., 2019). Furthermore, the transformation of wetlands into artificial islands has proved detrimental to coastal ecosystems, marine environment pollution, and geological disasters (Fang et al., 2017; Sandirasegaran & Manap, 2016; Yu et al., 2021). Apart from environmental concerns, coastal land reclamations usually involve community conflict, ranging from socio-economic to human rights issues. Al Jazeera (2021) reported that these conflicts often arise because such large-scale developments fundamentally alter the lives and livelihoods of existing coastal communities, particularly those dependent on marine resources. This approach, while touted as a solution for economic growth and infrastructure expansion, has generated significant debate and controversy, particularly concerning its alignment with sustainable development principles (Aljazeera, 2021; Nadzir et al., 2014).

Striking a balance between the favourable and unfavourable outcomes of coastal land reclamation and sand mining is inherently challenging, as it often involves navigating complex trade-offs and competing priorities. Coastal land reclamation and sand mining present a complex contest to achieving sustainable development, which at its core seeks to balance economic growth, social equity, and environmental protection for current and future generations (Kitazume, 2022). The term "sustainable development" has gained popularity in the development discourse in achieving continued growth without compromising the ability of future generations to meet their own needs (defined by the 1986 Brundtland Commission and multilaterally agreed by the UN Conference on Environment and Development – Rio 1992). Besides that, the notion of the Blue Economy originated from the United Nations Conference on Sustainable Development held in Rio de Janeiro in 2012. The World Bank defined the blue economy the "the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of the ocean ecosystem." In more recent times, the World Bank has characterized the "Blue Economy" as the sustainable exploitation of oceanic resources to promote economic progress, improve livelihoods, and generate employment opportunities, all while ensuring the preservation of ocean ecosystem health (Vierros and De Fontaubert, 2017). The definition provided by the World Bank is comprehensive, encompassing various aspects of oceanic sustainability, including sustainable fisheries management, ecosystem health preservation, and pollution prevention (Lee et al., 2020).

In relation to this, Penang Island, as one of the most highly urbanised and densely populated cities in Malaysia, has increasingly turned to coastal land reclamation as a strategy to address land scarcity and facilitate further development since the 19th century. Major projects on Penang Island include: (1) Seri Tanjung Pinang (404 hectares), (2) Wellness City of Dreams (24 hectares), (3) the Tun Dr. Lim Chong Eu Expressway (spanning 17.84 km), (4) Queens Waterfront (14.7 hectares) (SAM, 2020), and (5) Penang South Island. Figure 1 illustrates the sites where land reclamation projects are conducted on the island.

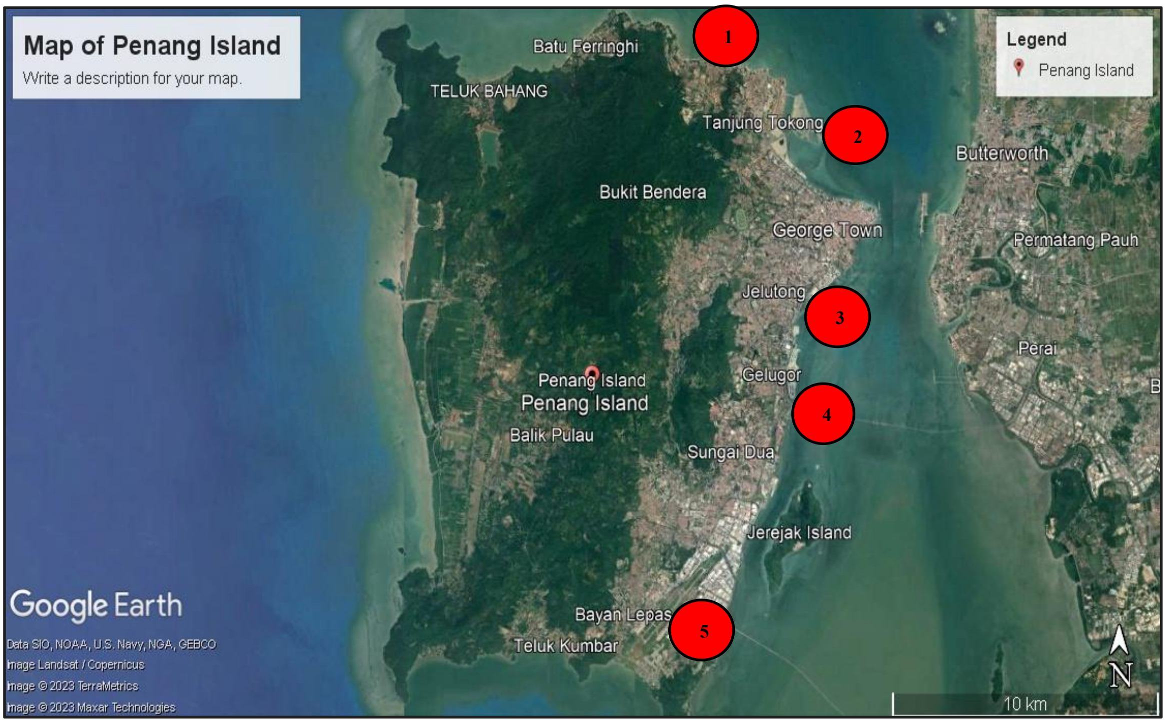

Figure 1. Major reclamation projects on Penang Island along sites 1,2,3,4 and 5

Furthermore, Penang Island is a popular holiday destination and hosts an increasing number of coastal tourists (Hanafiah et al., 2021). According to data from Tourism Malaysia (2022), the state recorded a total of 5.59 million visitors, an increase of 4.26 million tourists compared to the year 2021. There is also a rising demand for a more responsible and sustainable form of tourism, especially coastal ecotourism on this island (Hanafiah et al., 2021). It is noted that the past and ongoing reclamation works have received criticism among tourists, commenting on the destroyed landscape and natural beauty of the area (Nadzir et al., 2014). A Malaysian non-governmental organisation (NGO) called Friends of the Earth Malaysia or popularly known as *Sahabat Alam Malaysia* (SAM) has also reported that a staggering 11 million tonnes of sand were mined from offshore Lumut, Perak, a neighbouring state, to be utilised in the Seri Tanjung Pinang Phase Two project (SAM, 2013). The project was claimed to adversely affect the environment and the Tanjung Bungah fishermen community's income and catch despite benefitting urban development (Dermawan, 2019; Manjunath & Karthick, 2017).

Recent developments have seen fishermen engaging in tourism activities to gain additional income and compensate for the declining earnings from fishing activities (Wu & Tsai, 2016). Following past works, the decline in fisheries also affected coastal ecotourism given the fishing communities' inability to provide alternative activities such as fishing tourism, fishing village accommodation, fishery products and local restaurants (Lloret et al., 2018). Regardless many researches scrutinised the impacts of land reclamations and sand mining activities on fishermen (Tung et al., 2021; Dan Gavriletea, 2017; Mostafa, 2012; Nadzir et al., 2014), yet studies on the impacts of land reclamation and sand mining activities from the perspective of fishing community and coastal tourism providers remain lacking. With Penang's ongoing rapid development, significantly influenced by coastal land reclamation projects, this study focuses exclusively on Penang Island, excluding the broader geographical scope of the entire Penang State. This study tells the story from the perspective of fishermen and coastal tourism providers who have experienced land reclamation and sand mining activities since the early 1980s on Penang Island. This study also discovers the repercussions caused by the impacts of land reclamation and sand mining activities on the area.

METHOD

Semi-structured in-depth interview was used to elicit extended conversations from two target respondents: fishing communities and coastal tourism operators. For the first group, eight active fishermen's associations in Penang Island were selected, targeting three fishermen from each association. For the second group, the target respondents are hotel owners, nature guides, and boatmen who are conducting their businesses along Penang Island's coastline. Table 1 summarises the participants' information in this study.

Participants	Group 1	Group 2
	Fishing Community 3 members each from 8 fishing associations	Coastal Tourist Operators Hotel owners, Nature guides and Boatmen
Age Range	21- 68 years old	31-65 years old
Educational background	Mostly primary school education. Some have finished secondary school education	A mix of secondary school graduates, certificates, bachelor's degrees, and postgraduate diplomas.
Years of experience	5 to 53 years	6 – 45 years
Total	24	11

Table 1: Summary of Participants' Information in the Study

All fishermen and coastal tourism operators were approached using purposive and snowball sampling, targeting only Malaysians with a minimum of 5 years of experience in their industry. This set time frame allows them to witness the changes in the area and enables them to provide more relevant information based on their experience for this study. Interviews were conducted at different locations on Penang Island and were arranged in advance before conducting face-to-face sessions.

The interview questions encompass three main topics: (1) personal experience of the respondents with the changes in their area, (2) impacts observed, experienced and felt during and after land reclamation and sand mining works, and, (3) how they are affected by these activities. Interview questions are designed to be both open-ended and semi-structured, following a logical progression based on the objectives of the research. Prior to interviews, the prepared interview questions were sent to the ethical committee board for checking. The interview questions were also translated into Bahasa Malaysia and Mandarin. Translated questions were checked by language experts to ensure accuracy. Upon written consent from the respondent, the audio was recorded using an audio recorder. At the same time, two trained enumerators (member checking) were at the interview session to record field notes and verify the collected data against the original recordings to ensure accuracy and credibility of results. The interview took approximately 20-50 minutes for each respondent. Thematic analysis was applied in this study.

RESULTS

A total of 33 respondents were interviewed, comprising 22 fishermen and 11 coastal tourism operators. They are of two ethnicities: Malay and Chinese. While the aim was to secure a minimum of three respondents from each association, two associations were only able to provide two respondents each. For fishermen, their ages range from 21 to 68, with a significant number in their late 50s and 60s. Most respondents have educational backgrounds that are predominantly limited to primary school or no formal education, although some have attained secondary school qualifications. Their experience in the industry varies widely, from a mere 5 years to an extensive 53 years, where most are highly seasoned individuals. The coastal tourism operators showed a broader distribution across age groups, with their ages spanning from 31 to 65 years. Their educational attainment is generally higher, with most having completed secondary school, and some possessing a certificate, bachelor's degree, or even a postgraduate diploma. Their industry experience ranges from 6 years to 45 years, suggesting a blend of relatively new businesses and long-standing operations.

The major findings of this study are divided into three sections. The first section explores the background of respondents and provides an overview of the connection between coastal ecotourism and fishing communities. The second section explores the impacts brought by land reclamation and sand mining activities on the scrutinised communities. The impacts are arranged according to sustainable development pillars: environment, economy and social. The last section uncovers the repercussions of the impacts on the targeted groups. The interview excerpts below are taken as representing the views of either Group 1 or Group 2 participants.

Section 1: Background of Respondents: Co-existence of coastal ecotourism and fishing communities

The first group (Group 1) is the fishermen. They rely entirely on the sea for income and sustenance. The majority of fishermen continue to employ conventional fishing methods such as lift net fishing and trawling to carry out their fishing activities. The second group (Group 2) is the coastal tourism operators who are directly or indirectly involved with fishing communities. A few of them consider themselves fishermen since they fish on occasion during the low tourist season. They usually bring tourists to fishing villages to appreciate the nature and culture of coastal fishing villages.

> *"… if the fishing industry does not exist, then the tourism industry will not be able to either. If the fishing industry does not exist, tourists will not be able to enjoy the activities along the beach and get to know the culture and heritage of the fishing village. So, I think tourism is very important to the fishing industry; there is a mutual relationship between tourism and the fishing industry. "* (Group 2)

Over the years, fishermen's income has been badly affected by the declining fish resources. They observed that the quality and size of fish have decreased as marine pollution increased. Alternately, some fishermen were drawn to tourism as an alternative source of income, but they cannot fully rely on it because visitor arrivals are seasonal, peaking only on weekends and public holidays. Additionally, some fishermen expressed a strong desire to obtain a boat operator's license. However, their educational background unfortunately posed a challenge in passing the examination. This limitation, in turn, curtails their ability to engage with tourists or increase their income by offering tours to fishing spots in Penang. They also expressed their concerns about potential legal repercussions, such as summonses from marine police if found operating illegally as tour boat operators.

Section 2: Impacts of coastal land reclamation and sand mining activities

The discussion on these impacts is based on environmental, economic and social factors.

2.1 Environmental

Marine pollution caused by land reclamation has affected the fishing communities and coastal tourism operators on Penang Island. The coastline has gradually turned into mud flats after the implementation of the land reclamation activities, altering the original topography and marine ecology of the coastal areas. Most of the time, the dredging activities would leave a pungent smell and would deter tourists from visiting the area. Land reclamation works, according to the fishermen, have destroyed the mangrove region that used to be the fish spawning ground, while sand mining activities draw sand from the seabed, disrupting the fish spawning grounds. Changes in coasts have an impact on turtles as well. They need sandy beaches to lay their eggs. However, the change of topography from beaches to residential areas and reclamation projects might lead them to relocate or not lay eggs.

> *"The turtle has not been seen in 10 to 20 years. From the time I was 25 until I was 40, we used to witness turtles come up to lay eggs. But that was before the reclamation works began. Now, I hardly see them anymore."* (Group 1)

The fishermen and coastal tour operators indicated that fish may not be able to adapt to the environmental changes caused by the land reclamation activities. Furthermore, the land reclamation efforts contaminated the ocean, decreasing fisheries resources as fish migrate out of the reclamation zones. According to one fisherman, some fish thrive and would like to drift with the sea current. Sea currents are an essential component of ocean processes, influencing the distribution of salinity and heat, delivering nutrients to the surface, and transporting oxygen supplies to deep levels (Dipper, 2022). However, due to reclamation works, sea currents become weaker to some extent, and the water becomes stagnant, depleting nutrients and oxygen essential for the survival of fish in the area. The fishermen also reported that they experienced a drop in the quality of the fish caught in the marine waters of Penang.

> *"The fish and prawns caught nowadays tend to lose their freshness faster than they used to in the past".* (Group 1)

They believed that this was due to the poor water quality caused by land reclamation activities, which decreased the quality of the fish. They used to keep fish fresh for two days just with ice and salt, but now, they have to immediately sell the fish to ensure freshness for their customers.

2.2 Economy

All the fishermen and the majority of coastal tour operators perceived the sea and coastal areas as their rice bowl. Catching fish and other fisheries resources are seen as indispensable for fishermen.

> *"We rely on the sea to make a living. The sea can be considered my office."* (Group1)

The depletion of fisheries resources would result in higher seafood prices. The price of fisheries and seafood resources is rising as a result of land reclamation activities that have reduced the amount of fish and seafood resources. Aside from the increase in the price of fish and prawns, the fishing equipment they purchase is also expensive. Contrarily, fish cultivated in fish farms are considerably cheaper, but the flavour and taste of the fish differ from that of the sea catch. Aside from that, the cost of petroleum continues to rise, and the daily harvest is inadequate to pay the expense of fuel. Land reclamation activities have also affected fishermen's traditional fishing routes. They would venture further out to sea to reach new fishing grounds, adding expense and time to their earnings.

> *"These days, fishermen's daily harvest income is insufficient to cover the cost of gasoline. It is also incredibly exhausting when you can't catch any fish."* (Group 1)

2. 3 Socio-cultural

The identity of the fishermen and their fishing villages would gradually fade when land was reclaimed from the sea. Many fishermen were relocated, and many now live in areas far from their original fishing villages. Some were now residing in low-cost flats, grieving the loss of their fishing grounds. Coastal tourism providers reported that the majority of visitors prefer visiting fishing communities with natural components, and that bringing them to these locations was part of their package. They are concerned that, to some extent, land reclamation may result in cultural failure for the surviving fishing communities, affecting the authenticity of experiencing fishing villages in the coastal ecotourism industry.

The majority of fishermen and coastal tour operators believe that working as a fisherman is not sustainable. After graduating from university, youngsters would prefer to work in an office rather than as a fisherman or a coastal tour operator. This is because being a fisherman is a difficult profession that requires them to labour in the blazing heat. For coastal ecotourism, tourists prefer to visit places with all-natural products rather than man-made ones. As a result, land reclamation may have an impact on the number of visitors arriving and the operations of coastal tour companies.

> *"Nowadays, no one, not even my son, wants to work as a fisherman. After they graduate from university, they would rather work in a factory or anywhere else; they are also unwilling to work as fishermen because they find working in a factory more comfortable, if not as hot, as working under the sun."* (Group 1)

Nevertheless, few respondents still believe that the job of a fisherman will never perish. They agreed that being a fisherman is not stressful and leads a relaxing life. They trust their sons will continue to inherit their jobs as being free, having more control and flexibility over work activities, which lures them into this industry.

> *"I believe so, because fishing is a low-stress job that fishermen enjoy." We obtain a substantial share of the daily catch on occasion, but the time we spend at sea capturing fish is restricted, and we only capture a few of them."* (Group 1)

The fishermen also feared that land reclamation would have an impact on national food security by reducing fishery resources. Respondents also showed that customers may opt for imported fisheries goods over local fisheries products, and that the prices of imported fisheries products will rise in the future. This circumstance will undoubtedly have an impact on the fishermen's earnings.

Section 3: Repercussions of land reclamation and sand mining impacts on fishing communities and coastal tourism providers

3. 1: Sense of emptiness when not at sea

Coastal areas are regarded as the life and soul of fishermen. Their lives feel incomplete if they do not go to the sea either for sustenance or relaxation. They indicated that the lives of the fishermen and the sea are connected and intertwined. They lamented that they felt empty, unhappy, and unsatisfied following the implementation of land reclamation along Penang's major coastal lines. The sea is not just his place to find sustenance, but a place he calls home, an attachment to which he seeks solace and peace. One fisherman explained that

> *"My life and the sea are connected. Sometimes I did not go out to catch fish, I would also come and sit in front of the sea to enjoy the sea view. I have to see anything, including those fishing vessels. I will feel very uneasy if I am not here every day."* (Group 1)

3.2: Degrade Mental Health

Fishing before reclamation works was fulfilling and the fishermen shared that they felt happier during those days. Going to the sea could promise them guaranteed earnings, where they could laugh and joke with each other after a day out at the sea. The good times seemed to change after reclamation projects took place. They often feel depressed and unhappy, as most days they cannot get fish as much as they used to after putting in long hours of hard labour in the middle of the sea. One respondent bemoaned*;*

> *"The fishermen here are not as pleased as they were the last time. When all the fishermen returned from the sea, we would chit-chat and rest here, but now all the fishermen went straight home as if there was nothing to do."* (Group 1)

3.4: Displacement and loss of identity

The majority of fishermen who were directly affected by the reclamation areas were displaced. They further deplored that the compensation provided by the government was insufficient for them and were concerned that the government might consider compensating them with a low-cost flat. For them, staying on the land near the sea and staying on a high rise would never be the same. They fear they will lose their identity as fishermen, cease practising their culture (mending fishing nets), and no longer live in fishing villages. One of the tour operators disclosed the following:

> "Reclamation *projects destroy the identity of fishing communities. They are more relaxed because they used to live in the kampung, but now they want them to move to the low-cost flat. They are unable to move much, and their expenses will be higher…"* (Group 2)

3. 5: Lower Tourists' Appreciation and Emotional Experience

According to the coastal tourism operators, the majority of tourists were surprised by the changes in the coastal zone after they revisited the area. The tourists expressed disappointment with the loss of the natural scenery and the polluted environment caused by land reclamation activities. One nature guide shared his experience:

> *"Last time, a lot of tourists came for the Avatar Secret Garden. Do you know how pretty the sea was, you know? All gone now. That spot was very nice the last time, even fishermen will be sitting there and enjoying the scenery. Now it's all gone. The seawater is rising and murky. Sometimes smelly too."* (Group 2)

He further exposed that most of his customers would prefer to experience natural beaches instead of manmade beaches. They seek places that retain natural beauty for them to appreciate and adore.

3. 6: Lower the Tourist's Revisit Intention

The environmental contamination and loss of natural scenery caused by land reclamation operations influenced tourists' plans to revisit. Tourists would share their own opinions and impressions of the tourist attraction with their friends and family via social media. As a result, their friends and family's plans were also influenced. Another nature guide lamented:

> *"Visitors come and post about their experience on their social media. They will surely comment negatively about the place. So, nobody will be visiting this area next time. This will have a long-term impact on us."* (Group 2)

DISCUSSION

Based on the empirical findings from this study, Figure 2 visualizes the impacts of land reclamation and sand mining activities on fishing community and coastal ecotourism operators. It can be seen that fishing communities and coastal tourism operators in coastal areas often coexist in a mutually beneficial relationship. However, land reclamation and sand mining activities have demonstrably brought negative impacts across the pillars of sustainable development, specifically affecting environmental, economic, and socio-cultural aspects. These impacts consequently induced a sense of emptiness when fishermen were not at sea, adversely affecting fishermen's and coastal tourism operators' mental health, causing the displacement of fishermen, lowering tourists' appreciation and emotional experience, and reducing their revisit intention.

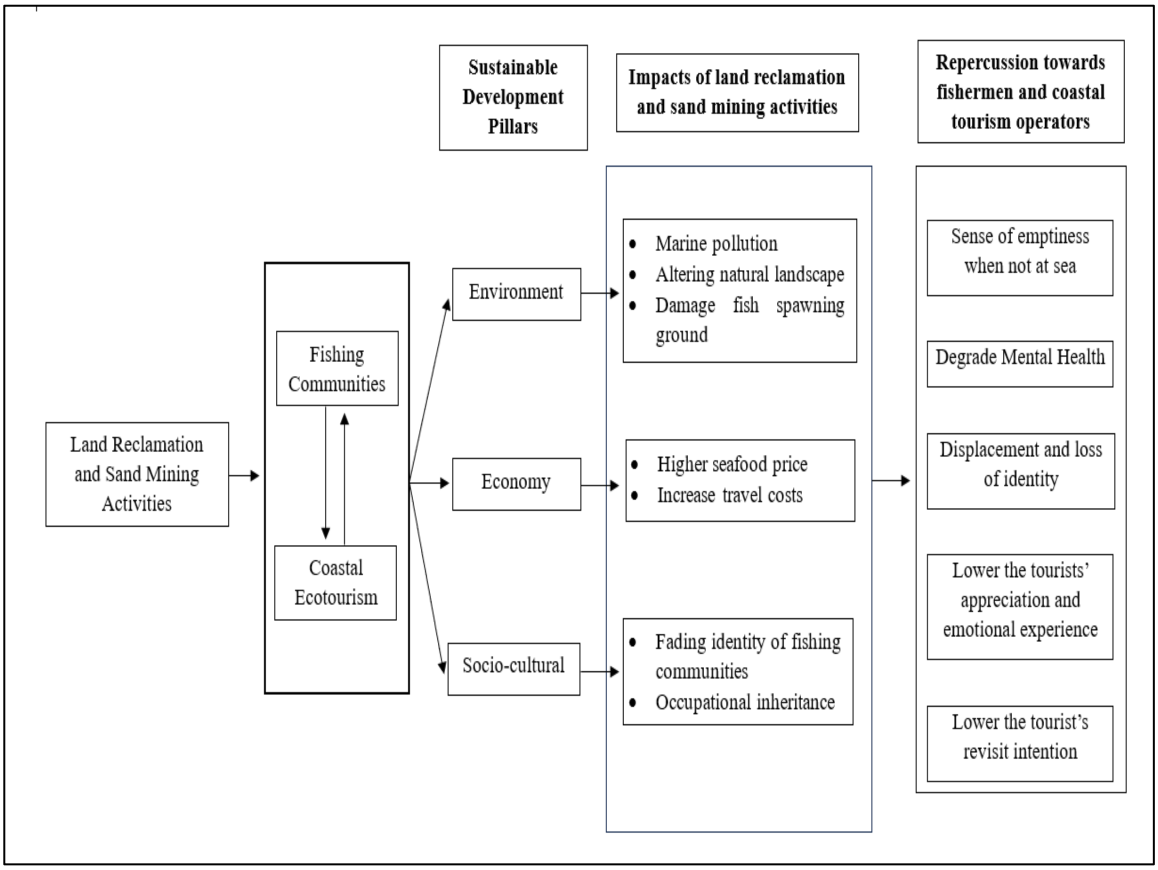

Figure 2: The impacts of land reclamation and sand mining activities on fishing communities and coastal ecotourism providers

The study findings discovered that in coastal areas of Penang, the fishing communities and coastal ecotourism operators mutually live despite being distinctive entities. This demarcation is blurred during weekends or public holidays when some fishermen work as boat operators to bring tourists sightseeing or fishing for additional income. Meanwhile, coastal tourism operators engaged with fishing communities by bringing tourists to experience local fishing villages and fishing activities for additional income. Fishermen could temporarily become tourist boat operators during peak tourism periods (Muslem Uddin et al., 2021) and take tourists “beach hopping” (Fabinyi, 2010). Perceivably, fishermen who continue to fish and engage in tourism would earn a substantial income (Pham, 2020). The advent of “yujiale” tourism in China depicts tourists residing with fishing families, participating in fishing activities, and attending cultural events within fishing communities (Su et al., 2016; Su et al., 2017). Such opportunities enable tourists to learn about traditional fishing methods and local cooking recipes with fresh-caught fish.

Regardless, boat operators in Malaysia must hold a Certificate of Competency issued by the Marine Department Malaysia, in which the boat is piloted by an experienced local master or captain with a Limited Domestic Mate Competency Certificate (Marine Department Malaysia, 2020). As the average age of fishermen in this study was 40 years or older, with primary schooling as their highest education level, it was deemed challenging to engage in tourism boat operations and obtain the authorisation letter. They perceived themselves to be incapable of having appropriate insurance policies and safety equipment (Marine Department Malaysia, 2020). A fisherman’s average monthly income of RM 1,600, the lowest in Malaysia (Hirschmann, 2022), deterred him from investing in the equipment or insurance policies required to obtain the authorisation letter as a tourism operator. Additionally, land reclamation and sand mining activities affected the occupational inheritance of fishermen. Occupational inheritance refers to the nature that sons and daughters follow in their parents' work footsteps (Roller & Lee, 2008). However, young Malaysians generally view agriculture as impoverished, unclean, and tedious, leading them to prefer urban employment over working in rural areas (Lee & Baharuddin, 2018). In this vein, a fisherman’s high-risk and tough job was perceived as unsustainable to support their livelihood.

The viability of fisheries livelihoods, as well as the well-being of fish harvesters and coastal fishing communities, are dependent on the availability and accessibility of fisheries resources (Bennett et al., 2018). It is found that the consequences of land reclamation activities are one of the factors that cause the poverty of fishermen (Harmain et al., 2020). Land reclamation activities would directly affect fish habitat and profoundly alter ecological connections, leading to the extinction of the original habitat (Bian et al., 2018; Jin et al., 2015; Xu et al., 2018) and eventually affecting the income of the fishermen and causing poverty. Alterations in the landscape force the fishermen to move their fishing village further from their usual area. The reclaimed land, which expanded from 0.4 km^2 (0.1%) in 1960 to 9.5 km^2 (3.2%) in 2015, could increase to 32.3 km^2 upon the completion of the ongoing and proposed reclamation projects (Chee et al., 2017). This situation compelled fishermen to travel further out to alternative fishing grounds to continue fishing, which increased petrol usage (Department of Environmental Malaysia, 2017). Shifts in the original topography would diminish fishing communities’ identity and impose economic burdens on fishing villages due to the disappearance of fish (Cipriani, 2022). They are also inadequately compensated due to their fragility in terms of their low academic background.

Fishermen often experience a profound sense of emptiness when they are not at sea. Land reclamation has modified the landscape and fishermen have to adapt their way of life to the new environment, in a process known as adaptation (Tain, 2018). However, this acclimatization is not straightforward, and some fishermen have reported experiencing mental health issues as a consequence (Zytoon & Basahel, 2017). It is explained that when persons living in poverty are asked about their lived realities, it appears that some speak of despair, suffering, being driven insane, and losing the desire to live as they are upset about their living situations (Mills, 2015). The sea floor transformed the area into mudland, emitting a pungent smell in the neighborhood (Guiraldo, 2019). Smelly neighbourhoods pose a psychological impact on human health, including stress-related headaches and sleep disruption (Hirasawa et al., 2019; Schiffman et al., 2005; Shusterman et al., 1991; Berkers et al., 2021; Blanes-Vidal et al., 2012; Nordin et al., 2017; Schiffman et al., 1995). These impacts could occur in addition to the more direct physiological impairments caused by air pollution, such as cancer, heart disease, and respiratory disease (Fuller et al., 2022). Although Environmental Impact Assessment (EIA) reports were done concerning coastal land reclamation projects in Penang, their findings frequently appear to fall on "deaf ears," failing to translate into meaningful protective measures for vulnerable populations. Usually, this disconnection is largely attributable to a pervasive lack of two-way communication between policymakers and researchers (Lai et al., 2020).

The Strait’s Quay fishing village in Penang Island is the last remaining example of a composite coastal community that successfully integrated coastal village life with ecotourism (Jahan Karim, 2022). Regardless, land reclamation and sand mining activities on the island have disrupted the relationship between fishing communities and coastal ecotourism. Cipriani (2022) defined the term ‘reclaim’ as the process by which locations lose their identity. The local elements representing the fishing village identity would boost coastal ecotourism in terms of boat moorings, places to catch fish, places to sell or auction fish, fishermen community settlements (Sulistyo & Widjajanti, 2018), fishing gears, and knowledge and mastery of crafts in traditional and artisanal fishing techniques (de Madariaga

& del Hoyo, 2018). Nonetheless, these elements diminished post-land reclamation. The lack of novelty in fishing villages may disappoint tourists and cause them to lose interest. Similarly, Zheng and Liu (2021) discovered that marine pollution disrupted the marine ecosystem balance and severely limited sustainable industrial development. Several studies highlighted the negative effect of environmental pollution on tourists’ motivation to travel to or revisit a region (Becken et al., 2017; Zhang et al., 2015), which reduced their enjoyment (Krelling et al., 2017), visiting duration, and return visits. This aversion to polluted environments directly undermines the principles of a thriving blue economy, as the economic prosperity derived from marine and coastal ecotourism is heavily dependent on pristine and healthy ocean ecosystems. Thus, environmental degradation poses a substantial threat to the sustainable development and economic potential of ocean-based industries, including coastal ecotourism.

LIMITATION OF STUDY

When interpreting stories, researchers must acknowledge that data is always shaped by its specific place, time, and location (Pervin & Mokhtar, 2023). Despite this, the researcher strives to remain unbiased in their interpretation of the narrators' experiences. In this case, the fishermen interviewed for this study, representing eight active fishermen's associations in Penang Island are predominantly fall within the older age bracket (45–68 years). This demographic skew may be attributed to fading interest in this traditional occupation among younger generations and potentially influenced by the respondents' long-term observations of environmental degradation over several decades. Consequently, their extensive experience and deep connection to the marine environment could disproportionately shape the overall findings, potentially overshadowing neutral or even positive perspectives. Thus, the research findings may not fully reflect the perceptions of the entire fishing population in Penang Island.

CONCLUSION AND RECOMMENDATIONS

In conclusion, this study revealed a complex, often interdependent relationship between fishing communities and coastal ecotourism operators. Moreover, the disruptions caused by land reclamation and sand mining activities were found to significantly affect all three pillars of sustainable development: environmental, economic, and socio-cultural, and concurrently strain the intricate relationship between fishing communities and coastal ecotourism operators. Furthermore, these impacts resulted in repercussions for the well-being of fishermen and the viability of the tourism industry. Although reclamations may optimise land use on the Penang Island, participation of marginalized communities, particularly fishermen, in planning and implementation processes is vital for social equity. The cumulative impact of reduced fish stocks, altered marine ecosystems, and compromised fishing capacities poses a direct and serious threat to regional food security, jeopardizing the sustainable availability of fresh seafood for the broader population of Penang Island. Stronger commitment to socio-ecological well-being by the government may ensure that development benefits all stakeholders. Apart from that, protecting existing and establishing new mangrove patches along Penang's coastal areas can serve as vital natural fish nurseries, foster essential green lungs for the environment, and concurrently benefit fishermen, the tourism industry, and future generations.

Future studies could be conducted by including more stakeholders and expanding the geographical coverage to encompass all of Malaysia, rather than just focusing on Penang Island. By doing this, investigations could critically assess and try to eliminate the negative impacts, help marginalised groups including fishing communities and ecotourism stakeholders to benefit sustainably from land reclamation projects.

AUTHOR DECLARATION

YFH contributed to the initial writing of the paper, data collection, and analysis. ARA contributed to overseeing the research procedure, reviewing and finalizing the article for journal publication.

DECLARATION OF STATEMENT

The lead author confirms the manuscript's integrity, stating that it provides an honest, accurate, and transparent account of the reported study. No crucial aspects of the study have been omitted, and any discrepancies from the planned (and, if applicable, registered) study have been appropriately explained.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare. All co-authors have seen and agree with the manuscript's contents and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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