Phenomenological Analysis of The Economic Impacts of a Coastal Disaster on The Tourism Sector of Pola, Oriental Mindoro

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Abstract. In February 2023, the MT Princess Empress oil tanker sank off the coast of Mindoro, causing severe damage to ecosystems and disrupting economic activities. This study aimed to explore the economic impacts of the oil spill on the tourism sector in a coastal community in Pola, Oriental Mindoro. Semi-structured interviews and audio recordings were conducted with seven tourism stakeholders using purposive sampling. A phenomenological research design was employed to understand the lived experiences of the community during the oil spill and its effects on the tourism industry. Participants shared how the spill led to negative health and economic consequences, significantly altering their lives and family dynamics. Key economic impacts included a decline in tourism activities and revenue, loss of livelihoods, damage to conservation areas, and reduced fish catches. In response, some community members sought alternative livelihoods, temporarily migrated to other areas for better opportunities, and resort owners introduced new amenities to compensate for reduced access to aquatic activities. The findings highlighted the need for government interventions, inter-agency collaborations, and community involvement to mitigate the impacts of oil spills and future disasters, aiming to create safer and more resilient and sustainable communities.

1 Introduction

Tourism activities in coastal areas play a crucial role in the local and national economy by providing a vital source of tax revenues, income, employment, and community development. This is particularly important in countries abundant in natural resources, including picturesque beaches with clean waters, rich marine ecosystems, and vibrant cultural heritage. As millions of travelers flock to coastal destinations each year, the economic contributions of this sector are increasingly recognized not only for their immediate financial impact but also for their long-term benefits to local and national economies. Yet, a huge tourist influx poses harm to the well-being of local communities through overcrowding and overuse due to physical, ecological, social, economic, psychological, and/or political pressures of tourism.

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The tourism industry can have detrimental effects on the environment, contributing to climate change, depleting natural resources, and polluting water, air, and land with plastic, light, and noise pollution, which can harm wildlife and lead to species extinction.

Maritime disasters such as oil spills are another challenge to the environment, the vulnerable communities of fisherfolk, and the tourism sector. It poses a significant threat to the environment and natural resources, especially in sheltered areas like estuaries, deltas, and wetlands that are vulnerable to oil contamination. These areas often contain sensitive habitats such as coral reefs, mangroves, and salt marshes [1]. On the other hand, coastal communities whose livelihoods depend solely on fishing have their subsistence, food security, and human well-being highly compromised [2].

In the tourism sector, maritime disasters limit tourism activities, reduce the number of tourist arrivals, damage local economies, and affect public perception. For instance, a survey of households in Northwest Florida indicated a cancellation of 1.88 million planned visitor trips to the region a year after the Deepwater Horizon Oil Spill in 2010, resulting in a loss of US$1.30 billion in visitor spending and a total regional economic losses at US$2.04 billion in industry output, US$1.37 billion in value-added, and an employment loss of 20,486 job-years [3]. Another study reported that the Don Pedro accident in 2007 is one of the most expensive in recent history in terms of the tonnes of oil spilled affecting one-third (4.6 km) of 55 sandy beaches (13.5 km), 107 hotels and apartment blocks costing €900,000 for the 30 km of barriers used, €360,000 compensation paid to the owners of oiled vessels in the port of Ibiza, €289,889 for the use of Balearic government's boats and cleaning staff, €6 million for decontaminating the wreck, and €1,504,423 for the 32 claims of tourism firms [4].

While quantitative methods provide essential data and broad trends regarding economic impacts, a deeper understanding of how oil spills affect coastal communities on a personal and communal level is equally important for providing comprehensive assessments and effective recovery strategies. Phenomenology plays an important role in understanding these impacts by emphasizing the lived experiences and subjective perceptions of coastal communities affected by oil spills. Yet, there are limited studies utilizing this qualitative method to analyze the economic impacts of maritime disasters. For instance, Abereton et al. [5] explored the lived experiences of under-five children living in areas affected by oil spills and found that they were more likely to experience respiratory problems such as cough, catarrh, chest pain, and other health emergencies like difficulty/fast breathing, pneumonia, hemoptysis, exacerbation of previously existing conditions, asthma development, etc. which led to frequent hospital visits. The study also added that the oil spills had damaged the livelihoods of these communities, further contributing to the health problems of the children. In another phenomenological analysis, Crayton & Naher [6] identified the impact of neglected infrastructure on communities in the Niger Delta and found that corruption, poor governance, lack of accountability, laws, finances, resources, and education contributed to the decline of infrastructure in the region.

Currently, there are no studies applying phenomenological analysis on the economic impacts of maritime disasters on the tourism sector from the perspective of a coastal community. By investigating the lived experiences of various stakeholders, this study aims to contribute to a deeper understanding of the economic impacts of oil spills on the tourism sector. Specifically, this study aims to (1) explore the lived experiences of a coastal community during the 2023 Mindoro Oil Spill, (2) identify the impacts of the oil spill on the economy of the community, and (3) characterize the coping strategies of the tourism sector. The findings will further inform policy recommendations and strategic responses to mitigate future maritime disasters and other economic disruptions while enhancing the resilience of vulnerable tourism sectors and coastal communities.

2 Methodology

2.1 Study area

Pola, a coastal municipality in the Province of Oriental Mindoro. It is the second smallest municipality in the province, with a land area of 159.34 square kilometers, which constitutes 3.76% of the total land area of Oriental Mindoro. Fishing is the main livelihood in the coastal areas using motorized and paddled boats, gill nets, hook line and sinker, payao, and beach seine. Its municipal waters account for 303.74 square kilometers, which is 9.79% of the total provincial waters. As shown in Figure 1, there are seven (7) Marine Protected Areas (MPAs) or fish sanctuaries with a combined total area of 248.32 hectares located at Barangays Bacawan (Bacawan Fish Sanctuary), Puting Cacao (St. John the Baptist Fish Sanctuary), Tagumpay (Saint Peter the Rock Fish Sanctuary), Misong (Song of the Sea Fish Sanctuary), Calima (Stella Mariz Fish Sanctuary), Tiguihan (Kingfisher Fishery Reserve), and Buhay na Tubig (San Isidro Labrador Fish Sanctuary).

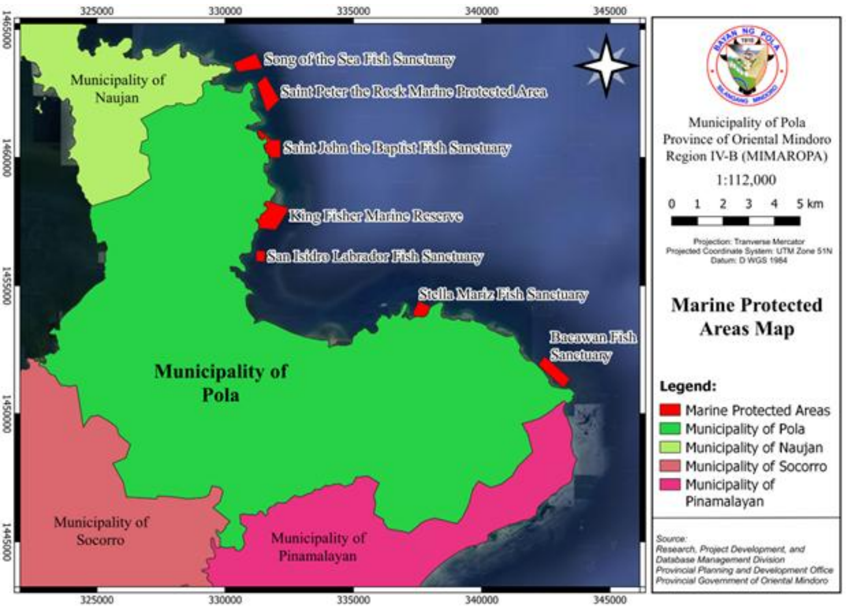

Fig. 1. Marine Protected Areas Map of the Municipality of Pola, Province of Oriental Mindoro.

Various fish species caught are round herring, mackerel, tuna, siganid, and surgeon fish, while other marine products are squid, cuttlefish, shells, and shrimps. During peak season (February-September), the average fish catch of motorized boats is 3-5 kilos per day, and 1-2 kilos per day for paddled boats for 20 fishing days a month, while 10 fishing days during the off-season (October-January). The tourism sector is another major contributor to the economy of the municipality. Every summer, around 25,000 people visit the town for its famous tourist sites, including waterfalls, lagoons, heritage houses, pilgrim churches, mangrove reserves, and (white) beaches with pristine waters, such as Bihiya, Tagumpay, Lambanog, and Kabilang Ibayo beaches.

However, a coastal disaster happened on 23 February 2023 when MT Princess Empress, carrying 800,000 liters of industrial fuel oil, sank off Naujan, Oriental Mindoro. As shown in Figure 2, this disaster resulted in oil spillage in multiple areas and on the coastal areas of Oriental Mindoro and nearby provinces. The Mindoro Oil Spill disaster affected coastal communities, MPAs, and ecological sanctuaries located in the Verde Island Passage – often referred to as the "center of the center" of marine shore fish biodiversity. As of 12 October 2024, the National Disaster Risk Reduction and Management Council (NDRRMC) reported a total of 43,699 families or 200,244 persons affected by the oil spill with 211 injured and a total loss of 928.64 MT of agricultural production equivalent to PHP 4.929 billion (US$ 98.584 million) all over the country.

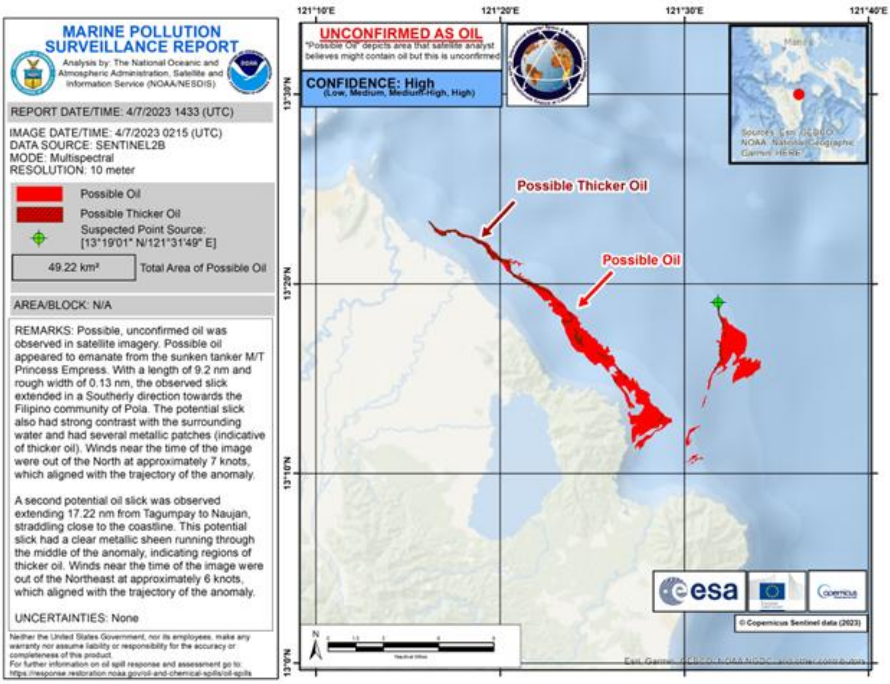

Fig. 2. Possible unconfirmed oil from MT Princess Empress off the northeast coast of Mindoro in the Philippines as of 7 April 2023. Source: U.S. National Oceanic and Atmospheric Administration (NOAA) and National Environmental Satellite, Data, and Information Service (NESDIS).

Immediately after the disaster, several municipalities prohibited all aquatic activities, including fishing, swimming, and bathing, among other activities, in the affected areas. This resulted in losses of income and livelihood of households from coastal communities whose subsistence depended on these activities [2]. Four months after the disaster, it was found that King Fisheries Reserve had the highest concentration of oil and grease with a value of 3.7 mg/L followed by St. John the Baptist Reserve (1.9 mg/L), St. Peter the Rock (1.5 mg/L), and lastly Bacawan Fish Sanctuary with <1.0 mg/L of oil and grease [7].

Compared to other municipalities in the province, Pola and two other municipalities also experienced an extended fishing ban due to its proximity to the sunken tanker. Besides MPAs, the tourism sector of Pola was greatly hit by the disaster, particularly Bihiya Beach, 3 Cottage, Long Beach K. I, Aguada Beach Resort, Oloroso Beach Resort, Munting Buhangin Tagumpay Beach Resort, and Buhay na Tubig White Beach Resort. The Municipal Mayor reported that none of the 25,000 tourists visited last Summer of 2023 due to the fishing ban, which greatly affected the municipality's tourism sector and the economy as a whole.

2.2 Research design

A phenomenological study design was used in this study to describe the lived experiences of residents in Bihiya Beach, Barangay Misong in Pola, Oriental Mindoro. Phenomenology is a research method that focuses on understanding how people perceive and interpret their lived and shared experiences on certain events or objects. This qualitative approach prioritizes the subjective perceptions and interpretations of individuals, allowing researchers to capture the complexities of their experiences in the aftermath of environmental crises. By focusing on the perceptions of local business owners, tourists, and community members, this study aims to uncover how oil spills reshape economic realities and social dynamics within affected areas.

2.3 Data collection

This research limited the participants to individuals living in the coastal community to provide insight into the unique perspectives of this specific population. Purposive sampling was utilized with the following inclusion criteria: (1) living in the coastal area, (2) livelihood depends on tourism, (3) experienced the Mindoro Oil Spill, and (4) voluntary participation in the study. To determine the sample size, thematic saturation, the point wherein no new additional data/ information was acquired while conducting the data collection process, was employed. A total of seven (7) participants went through individual face-to-face interviews held on 15-16 September 2024 in Sitio Lambanog, Barangay Misong, Pola, Oriental Mindoro. A semi-structured in-depth interview was utilized for this study. The questionnaires include demographic information (age, sex, marital status, household members, income), lived experiences during the disaster, impacts on their livelihood, coping strategies, and recommendations. Questions were asked in Filipino, the vernacular language of the participants. This was done to express better the participants' insights on the phenomenon and the social, economic, and environmental impacts; their coping strategies; and the environmental efforts to recover from the coastal disaster. Voice recordings and photo documentation were taken, but consents were asked beforehand during the entire data-gathering process. To maintain the anonymity and confidentiality of all participants, all participants were referred to as P1, and so on.

2.4 Data analysis

This study applied a Phenomenological analysis consisting of four steps. These include (1) Bracketing – identifying the preconceived beliefs and opinions concerning the phenomenon by bracketing the surroundings and any presuppositions contained in a bid to confront the data in a very pure form; (2) Intuiting – focusing on the attributed meaning of the phenomenon by providing a variance of the data until a common and shared understanding of the phenomenon is met; (3) Analyzing – coding, categorizing, and making sense of the significant meanings of the phenomenon through immersion for as long as possible for attaining pure and thorough description of the phenomenon; and (4) Describing – communicating the meaning and significance of the experience through comprehension and definition of the phenomenon.

In this study, interview notes and voice recordings from participants were transcribed and thoroughly reviewed. Researchers discussed the variance of the data and arrived at a common understanding of the oil spill experiences. Initial codes were created upon the review, followed by the identification, examination, and subsequent definition and labeling of themes and sub-themes. In the last step, researchers synthesized the findings into a rich description of the core experiences of the coastal disaster, highlighting both commonalities and unique variations among the different participants from the community.

3 Results and discussion

The descriptive statistics for the socio-demographic characteristics of the participants are shown in Table 1. Participants were predominantly middle-aged and older individuals. The ages of the participants range from 35 to 67 years old, with the majority being 51 years old (28.57%), followed by equal representation across other age groups at 14.29%. The respondents are also predominantly female, accounting for 57.14%, while males make up 42.86%. Household sizes vary, with most participants having either four (4) or nine (9) members (28.57% each).

Table 1. Socio-Demographic Characteristics of the Participants

Characteristics	Frequency	Percentage
Age		
35 years old	1	14.29%
51 years old	2	28.57%
56 years old	1	14.29%
63 years old	1	14.29%
65 years old	1	14.29%
67 years old	1	14.29%
Sex		
Female	4	57.14
Male	3	42.86%
Number of Household Members		
1	1	14.29%
3	1	14.29%
4	2	28.57%
5	1	14.29%
9	2	28.57%
Source of Income		
Resort Owner	1	11.12%
Caretaker	1	11.12%
Housewife	1	11.12%
Food Vendor	2	22.24%
Livestock and Poultry Raiser	1	11.12%
Retail Store Owner	1	11.12%
Sea Patrol “Bantay Dagat”	1	11.12%
Fisherman	1	11.12%
Marital Status		
Single	1	14.29%
Married	5	71.43%
Separated	1	14.29%

In terms of livelihood, the participants engage in various income-generating activities. Food vending is the most common occupation (22.23%), while others work as resort owners, caretakers, livestock and poultry raisers, retail store owners, sea patrol officers (*Bantay Dagat*), and fishermen, each representing 11.12%. In terms of marital status, the majority are married (71.43%), with the remaining being either single or separated (14.29% each).

The participants' responses were organized into key themes and sub-themes, with four major themes and fifteen sub-themes emerging from the data. The main themes identified were: Oil Spill Experiences, Economic Impacts, Coping Strategies, and recommendations. Each of these had corresponding sub-themes. Under Oil Spill Experiences included are the implications for health, the banning of fishing and other aquatic activities, disaster response, and changes in family dynamics. The Economic Impact theme had sub-themes related to tourism activities, loss of livelihood, damages to conservation and protected areas, and a decline in fish catch. For coping strategies, the sub-themes focused on alternative livelihood options, temporary migration, additional resort amenities, and environmental restoration initiatives. Lastly, the recommendations theme included suggestions for maritime transport safety, disaster response, and disaster recovery. Each theme and sub-theme were supported by descriptive quotes reflecting the perspective of the participants.

3.1 Oil spill experiences

During the interview, the participants recounted their experiences with the 2023 Mindoro Oil Spill, discussing the negative impacts it had on them. The responses revealed that the community endured negative health and economic-related events that significantly affected their lives and changed their family dynamics. The responses gathered, though from distinct individuals, were comparable and similar as they live on the same island and depend mainly on coastal resources within the area.

3.1.1 Health

Oil spills not only devastate the environment but can also pose significant health risks to humans and wildlife. The repercussions of these incidents can be immediate and severe, affecting air quality, water safety, and the well-being of entire communities. Participants shared their experiences on the impacts of oil spills related to their health.

> "... The bad odor of the oil coming from the ocean affected my child... it increased the asthma symptoms... almost every day." P3

> "... It causes us chest pain... and headache." P3

> "I was there every day (since they are a *bantay dagat* officer)... at the moment, well, I am still coughing a bit." P7

> "... Yes. My family also had coughs... We just stayed at home. We did not have any other options... Sometimes, we bought medicine for the coughs." P7

> "We always wear face masks. Because when we... breathe in the air, it feels like... it hurts our chest." P4

These experiences support previous studies revealing how toxic substances in oil can pose health risks to both those involved in oil spill cleanup and those who live near the coast. The health impacts include lung diseases, cancers, skin disorders, which can vary across populations, and exposure to chemicals from oil spills [2].

3.1.2 Fishing and aquatic activities ban

Fishing bans promote the recovery of fishery resources, resulting in higher fish production. Yet, fishing bans are also imposed in response to oil spills to protect marine life and habitats while preventing the consumption of contaminated seafood and allowing affected areas time to recover. Participants in this study shared their experiences in the fishing ban and other aquatic activities.

> "Of course, first thing we thought when the oil spill occurred. . . we do not have any other source of income. . . none at all!" P3

> "My husband was forced to stop fishing. . . so we do not have another source of income." P4

> "... we do not have any source of income." P6

In other countries, oil spills in the oceans including those that occurred during the Gulf War, Exxon Valdez, Deepwater Horizon, and more recently, in Brazil and Mauritius, have resulted in significant contamination of marine ecosystems with Polycyclic Aromatic Hydrocarbons (PAH), prompting bans on fishing and seafood trade in affected areas [8]. Fishing and other aquatic activities are also being halted in areas with oil spills if there is a substantial risk of contamination of fishing equipment or catches.

3.1.3 Disaster response

Timely and efficient government response to maritime disasters is crucial to coastal communities, whose livelihoods solely depend on fishing or tourism activities. Participants shared their positive and negative experiences in the coastal disaster in terms of the responses from both local and national governments.

> "... We were only able to survive every day because of relief goods. . . even our drinking water, we wait and depend on the government. . . They give us almost every week. . . enough for our family composed of three members. . . but they give sardines for weeks so we were fed-up because we ate the same food every day and our kid did not like it." P3

> "Sardines, noodles, and rice ... other essentials, we did not have them because of accessibility issues... They were stricter during the oil spill compared to COVID-19. Although we can travel during the oil spill, we cannot do fishing activities. Compared to COVID-19, although we were not allowed to go outside the island, we can still do fishing activities." P3

> "Well, I am a sea patrol officer (*bantay dagat*) here. We were the first to find out about the oil spill. . . When it occurred, of course, we reported it to the town telling them what had happened... But here, our area was not really affected. It was only on the other side, Brgy. Misong." P7

> "... We received aid after that... No, it really was not enough. In fact, some of us end up in debt. And we could not cover the expenses for our children." P7

> "... In total, I received around US$ 1200 in financial support from various government agencies, politicians, and private donors. These should have been higher if local government officials did not take around 10-20% of the cash aids... " P2

> "... during the fishing ban, I collected around 500 cans of sardines from the

> family food pack. However, some of them were not edible due to the foul smell of the fish... some of us just washed them and recooked them with eggs as omelets... " P1

> "...Since eating fish is not allowed... We only relied on relief goods such as sardines because we do not have a choice... " P4

> "... The food packs are frequently distributed, but the financial assistance takes a long time. We only received US$ 244 and haven't received the next one yet... I collected around 150 kilos of rice, but I also gave it to other people because we couldn't eat it either due to rice weevils" P4

> '... We used all the food packages we received and ... my husband also has a small income... Sometimes they give us 5 kilos of rice for a week... We were also able to receive one sack of rice... " P6

These experiences support previous findings that the coastal communities affected by the Mindoro oil spill received financial and material support from different government agencies, political personalities, and non-governmental organizations, yet, they expected a quicker response from the government and better management of the oil spill as it affected both their current livelihood and their future catch both in the quantity and quality of the fish [2]. These results are also comparable with the emergency responses of governments between developed and developing countries. For instance, the United States has a well-established and technologically advanced approach to containing and mitigating spills. On the other hand, Nigeria suffers from regulatory loopholes, insufficient resources, weak enforcement, and a lack of preparedness that exacerbates the environmental and social impacts of oil spills [9]. Yet, the gap between the vulnerability of local communities and the inadequacy of current policies and remediation mechanisms might also serve as a tipping point to change governments' behavior in the future in addressing maritime disasters such as oil spills.

3.1.4 Changes in Family Dynamics

Emergencies like oil spills can significantly affect family dynamics, altering roles, responsibilities, relationships, and overall family functioning. Participants from the coastal community shared the changes in family dynamics.

> "...Only I managed the house and took care of our child... my husband gave us Gcash (mobile wallet application) to buy our essentials." P3

> "...Fortunately, I have a child who supported and helped our family during the oil spill." P4

> "My two children worked. They are the ones who... supported us." P6

These responses supported previous studies on different disruptions experienced by families based on social position and community social structure. The loss of income or livelihood due to the coastal disaster may be especially difficult for men who are the main providers of their families, and the flexibility in beliefs around gender norms and family roles enhanced the capacity of the families to cope with job loss in prosocial ways [2]. Hence, it is noteworthy to understand the role of families' beliefs about and adaptive behaviors around gender norms, especially in emergencies like the coastal disaster.

3.2 Economic impacts

Accounts of the participants revealed severe economic impacts caused by the Mindoro Oil

Spill, including a decline in tourism activities and revenue, loss of livelihoods, damage to conservation and protected areas, and a significant decrease in fish catch. A more thorough explanation of these economic impacts is provided below.

3.2.1 Decline in tourism activities

Coastal zones host a wide range of activities including human settlement, industry, ports, harbors, navigation, fishing, and tourism. Tourism is one of the sectors that is highly vulnerable to the impacts of crises and disasters such as oil spills. Participants shared their experiences with decreased tourist arrivals and limited tourism activities caused by the oil spill, negatively affecting their livelihoods.

> "... before the disaster, tourists can do different activities here including swimming, snorkeling, kayaking, boating, sand bathing, and beach volleyball. Due to the ban, tourists were not allowed to swim nor even touch the ocean, otherwise, the coast guard and sea patrols arrive to reprimand them" P2

> "... before, we used to sell food here, but everything stopped because of the spill. There were no more people coming. There is a huge difference. B efore the oil spill, even if the sea was a bit rough, many people came here. . . P7

> "Tourists rarely come now, unlike before when there were no places for people to stay. Some would even just go to the beach." P4

These responses support previous findings on the tourism crisis due to an oil spill. For instance, Câmara et al. [10] identified that sectors related to food, accommodation, and tourism & leisure experienced the most significant negative impacts. For instance, the Don Pedro Oil Spill near the island of Ibiza prevented the tourists in affected areas from using the beach adjacent to their accommodation or accessing even the nearest beach [4].

3.2.2 Loss of Revenue in the Tourism Sector

The oil spill caused a significant decline in tourist arrivals, negatively affecting the livelihoods of residents who depend on the tourism industry. Participants discussed how their income was affected by this incident.

> "... during peak seasons like summer and the holy week, there were a lot of tourists here. . . all accommodations were fully booked, beach fronts were crowded with tourists, and open spaces were occupied with camping. . . since the ban was imposed, tourist bookings significantly declined... " P1

> "... before the oil spill, tourists from Naujan (neighboring municipality) alone could occupy the place... then tourists from farther municipalities stayed for a night or two. . . when the disaster happened, only a few people from other municipalities visited. . . maybe they opted to go to rivers as activities here are limited... " P2

> "... my boss told me that we may have low revenues from the resort, but we still need to continue the business so that people may still have a place to go... we can still recover the costs from my boss' other types of businesses" P2

> "... only a few people bought fish after the oil spill." P3

> "... before, we used to sell food here, but everything stopped because of the spill. There were no more people coming. . . There is a huge difference. Because, first

> of all, before the oil spill, even if the sea was a bit rough, many people came here... We used to earn money then because we would transport tourists. We earned from that and also from selling. But when the oil spill happened, for several months, we did not earn anything." P7

These statements supported previous studies on loss of revenue in the tourism sector, given that the nature of offshore oil spills makes the effects particularly relevant along the coast, where many tourism and recreational activities take place. According to Cheong [11], maritime disasters such as oil spills can have negative impacts on the economy, affecting tourism revenue, the oil and gas industry, recreational and commercial fishing, and other local businesses.

3.2.3 Loss of livelihood

The Municipality of Pola has the second-highest number of registered fisherfolks and is the last municipality to lift the fishing ban throughout the province. Participants shared their experiences with the coastal disaster in terms of losing their livelihoods.

> "... of course, our livelihood is the most important thing; my husband lost our livelihood." P3

> "... just fishing ... since we don't have any farmland... spouse had any sources of income... we lost our livelihood." P7

> "... I was selling food back then. When the oil spill happened, I couldn't anymore." P4

> "When the oil spill occurred... we lost our livelihood." P6

These responses supported another study that reported that fisherfolk in the nearby municipality have lost income ranging between US$ 10 and US$ 1,300 per week, depending on the type of fishing, frequency per day or week, and season (peak from February to November or off-peak from November to January) [2].

3.2.4 Damages to Conservation and Protected Areas

Located in the Verde Island Passage, the coastal area of the Pola has several MPAs and fish sanctuaries that are designated for conserving marine biodiversity, protecting ecosystems, and ensuring sustainable use of marine resources. Yet, the oil spill posed significant threats to these vital areas. Participants shared their concerns about the impacts of the Mindoro Oil Spill on these resources.

> "... the corals there suffered during the oil spill and died." P3

> "Our municipality has several marine protected areas... there are traces of oil and grease in mangroves and corals." P1

These were also found by a study showing that the MPAs tested (including 5 from Pola) for oil and grease, ammonia, and sulfate were above the water quality standards [7], causing long-term damage to the economy, human health, and the environment.

3.2.5 Decline in fish catch and income

Oil spills can damage fisheries, leading to significant decreases in fish catch. From direct toxicity, habitat degradation, water quality deterioration, and subsequent economic consequences, oil spills can severely impact fish populations and the coastal communities that depend on them. Participants mentioned a significant decrease in fish catch and income due to the oil spill.

> "... When the fishing ban was lifted, my husband experienced a decline in fish catch. . . the ocean still has marks of oil spill... only a few people buy fish because they were still afraid of the oil spill." P3

> "Before the oil spill occurred, it was easy to catch fish. But after the oil spill, it became hard to catch any." P4

> "Before the oil spill, tourists could eat fresh catch as fish were delivered here in the resort morning... fisherfolks earned a lot if there were many tourists. . . during the oil spill ban, eating fish from the ocean was prohibited. . . however, after the ban, there was limited fish catch. . . but also few tourists who buy them." P1

A similar study found that the biomass of large reef fish decreased by 25% to 50% in areas most affected by the spill, and the biomass of large demersal fish decreased even more by 40% to 70% [12].

3.3 Coping strategies

According to the participants, they employed various coping strategies in response to the 2023 Mindoro Oil Spill. Some mentioned shifting to alternative livelihoods, while others resorted to temporary migration in search of better economic opportunities. Furthermore, resort owners adapted by adding new amenities to compensate for the reduced access to sea activities. All of these strategies were done mainly for economic purposes to compensate for their losses and continue having income or a source of livelihood to afford essential goods and services.

3.3.1 Alternative livelihood

As a coastal municipality heavily reliant on fishing and tourism, the oil spill severely affected the livelihoods of the local residents. In response to this, residents sought alternative ways to earn a living and sustain the needs of their families. A participant shared that the local government offered an alternative livelihood that would provide them with essential goods in return.

> "When you help in cleaning up the oil spill, the local government will give you food packs in return." P6

> "... also, the government provided financial support through a 'cash-for-work' program when we joined creating improvised spill booms made from Indigenous materials" P1

Correspondingly, the displaced fishers from the 2006 Guimaras Oil Spill were hired for cleanup work under a "cash for work" program after the fishing, considering that it was the most effective economic intervention to help them cope with their financial losses [13].

3.3.2 Migration

As a result of the oil spill and the loss of income, some residents shared that family members had to migrate in search of better economic opportunities to support their families financially.

> "My husband worked in Marinduque for a month... he did the same, fishing." P3

> "... When the oil spill happened, he (referring to his son) didn't stay here for long. He was supposed to live here. But he went abroad again." P4

In another study, Crayton & Naher [6] also found that oil spills in Niger Delta have led many residents to either actively participate in local efforts to manage and maintain infrastructure and facilities or migrated in search of better living conditions. The lack of support for livelihoods also somewhat influenced restlessness and migration.

3.3.3 Additional resort amenities

Immediately after the oil spill, the government prohibited all aquatic activities. Beach resorts located in affected areas need to adapt their amenities and services to address environmental concerns, restore visitor confidence, and enhance recovery efforts. Participants from the beach resorts narrated their efforts to provide alternative amenities.

> "... Since all activities were banned, we constructed a modular swimming pool so that tourists have other activities to do other than picnic and camping..." P1

> "... We improved the resort's lawn by planting Bermuda grass and installing a volleyball net. . . " P2

> "... since there were only a few tourists, we constructed more rooms so that the resort can accommodate more tourists when the ban would be lifted... " P1

These experiences highlight the perspectives of local communities from less-developed tourist destinations. For instance, because of the closure of the beaches in more famous destinations, booking companies provide alternative options for tourists at a reasonable cost to avoid being inundated with angry demands for refunds [4]. In the case of Pola, local resort owners improved their facilities by providing alternative activities for tourists other than fishing and swimming in the ocean.

3.4 Stakeholders recommendations

All the participants agreed that the 2023 Mindoro Oil Spill was a very dangerous event that polluted the sea, disrupted their livelihoods, and affected their physical and mental health. They discussed recommendations to prevent oil spill incidences along with proposed efforts to better manage this disaster in case it happens again in the locality.

3.4.1 Maritime transport safety

Maritime regulations are crucial in establishing a framework that promotes safety, accountability, and environmental protection in maritime transport. By preventing potential disasters, regulations provide safeguards to protect our marine ecosystems, local economies, and vulnerable communities while enhancing overall maritime safety. With the experiences from the Mindoro Oil Spill, participants shared insights related to maritime transport safety.

> "Take more precautions... be more prepared for all hazards in the sea." P3

> "The government must impose strict regulations on maritime navigation. . . dilapidated ships should not be allowed to sail, especially during typhoons and bad weather." P2

> "... ships carrying huge amounts of [industrial] oil must be continuously monitored and evaluated if they are still safe and 'qualified' to navigate... especially in critical areas for marine biodiversity" P1

These responses are also discussed within the International Convention for the Prevention of Pollution from Ships (MARPOL) of 1973, which provides strict regulations in design, certification, and inspection systems for operating ships as well as provisions to safeguard environmentally sensitive areas from activities that pose a high risk to the ecosystem [14]. Furthermore, this also provides a suitable instrument for largely preventing discharges of harmful substances from ship operations and, in the event of accidents, for limiting the least quantity. However, limited offshore monitoring and enforcement capabilities often hinder the ability to successfully prosecute marine pollution crimes, ineffectively contributing to the effective management of maritime disasters such as oil spills.

3.4.2 Disaster response and recovery

Oil spill response efforts aim to protect the environment by minimizing the impact of oil spills, which includes redirecting the oil to less sensitive environmental components and removing an appropriate portion of it for responsible disposal. Yet, another aspect of the coastal disaster response and recovery pertains to the communities that were greatly affected by the oil spill. Participants shared recommendations that could be useful in addressing the immediate concerns of the coastal communities.

> "... Prioritize the needs of fishermen and their families... consider all needs for relief operations... " P3

> "... Well, we cannot really say what should be done because the ships are the ones passing through here... But to prevent it from getting worse, of course, immediate action is really necessary. To prevent things from getting as bad as they did before... Because it took a long time before action was taken." P7

> "... they were cleaning rocks where the oil spill stuck." P7

> "...there were efforts to maintain our coastal sanctuary but halted during the oil spill. The corals died. There should be coastal restoration efforts." P3

Small-scale fisherfolks and tourism-dependent community stakeholders are among the marginalized and socially vulnerable groups that are at the greatest risk of long-term damages and impacts from oil spills. Given the unpredictability of oil spill disasters, institutions, as well as coastal communities, must be prepared for any potential spill through participatory, multistakeholder, and inter-agency planning and management to protect ecosystems and communities and to address the critical environmental justice issues related to public health, loss of livelihoods, and food security emanating from such disasters [15].

4 Conclusion and recommendations

This study explored a coastal community's lived experiences and insights on the economic impacts of the 2023 Mindoro Oil Spill in the tourism sector. The participants revealed how negative health and economic impacts significantly affected their lives and family dynamics. Economic losses were incurred from the decline in tourist arrivals due to the total ban on aquatic activities and health concerns from the oil spill. The damaged coral reefs and mangroves, along with the death of marine species, reduced fish catch even after the fishing ban was lifted. Participants described their coping strategies, including alternative livelihoods or sources of income to survive the negative social, economic, and environmental impacts of the oil spill. They proposed stricter implementation of maritime regulations to prevent potential oil spill disasters in the future. Environmental efforts are needed to restore the natural resources and services that people obtain from damaged marine ecosystems.

The findings of the study provided bases for recommendations as follows:

1. *Tourism Recovery Programs*. Develop programs aimed at revitalizing the tourism sector post-spill, including marketing campaigns to restore the destination's image and attract visitors back. Social media and the Internet of Things may be utilized for this initiative.
2. *Diversification of Tourism Activities*. Encourage the development of alternative tourism activities and amenities (e.g., eco-tourism, cultural tourism) to reduce dependency on vulnerable sectors and enhance overall resilience.
   Stakeholder Engagement. The local communities should be involved in tourism planning and recovery efforts, ensuring that the local ecological knowledge is shared and their needs are addressed in policy formulations.
3. *Capacity Building*. Provide training for local residents and businesses on cri- sis management and environmental safety to enhance resilience against future maritime disasters or other emergencies.
4. *Collaborations with Non-Government Organizations (NGOs) and the Private Sector*. Partner with NGOs and the private sector to promote sustainable tourism initiatives and environmental restoration projects.
5. *Monitoring and Assessment Framework*. Establish a framework for ongoing monitoring of environmental health and its economic impacts on tourism, enabling prompt response to future spills.

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