ISSN: 3067-8366
Research Article
Journal of Environmental Science, Sustainability, and Green Innovation

Analyzing the Impacts of Eco-Tourism and Climate Change on the Hundred Island National Park

Marwin S Del Rosario[1]*, Liao Cheng-Hsin[1, 2], & Tseng Hsiao-Chun[1, 3]

1Doctoral Degree Program in Ocean Resource and Environmental Changes, National Taiwan Ocean University, Taiwan
2Department of Environmental Biology and Fisheries Science, National Taiwan Ocean University, Taiwan
3Institute of Marine Environment and Ecology, National Taiwan Ocean University, Taiwan

***Corresponding author:** Marwin S Del Rosario, Doctoral Degree Program in Ocean Resource and Environmental Changes, National Taiwan Ocean University, Taiwan.

Submitted: 01 November 2025 **Accepted:** 21 November 2025 **Published:** 27 December 2025

https://doi.org/10.63620/MKJESSGI.2025.1026

Citation: *Rosario, M.S. D., Hsin, L. C., & Chun, T. H. (2025). Analyzing the Impacts of Eco-Tourism and Climate Change on the Hundred Island National Park. J of Environ Sci & Sustain & Green Innov, 1(4), 01-16.*

Abstract

The study investigates the connection between coastal areas and the ocean, focusing on the Hundred Islands National Park (HINP) in the Philippines. It explores how marine communities rely on, engage with and respond to changes in their ocean environments, mainly when faced with environmental and climate issues. The research draws on qualitative approaches and involves interviews with fisherfolk, indigenous groups, tourism operators and local government oficials. By following the Social-Ecological Framework and the DPSIR (Drivers, Pressures, State, Impact, Response) model, the analysis explored the interaction between social and environmental factors. Findings show that fishing, tourism, and cultural practices form the foundation of coastal livelihoods and identity. However, communities are increasingly affected primarily by increasing tourism and climate change, which resulted to declining fish stocks, extreme weather, and coastal degradation. Although government agencies aim for long-term conservation, many local people believe they are not involved in key decisions and planning. In spite of these problems, communities are finding ways to adapt by using sustainable methods, diversifying their income and relying on traditional ecological knowledge. The study underscores the need for more inclusive, participatory governance that bridges scientific and local perspectives. Strengthening community-based approaches and aligning them with national policies can support both environmental sustainability and social resilience. The findings underscore the importance of empowering coastal communities as key partners in marine conservation and climate adaptation. The study also highlights and provides valuable guidance for MSP practitioners. Furthermore, the study highlights and identified that community/stakeholders' engagement is crucial for which is one of the key components or enabling conditions for the MSP framework to be effective through structured evaluation based on the DPSIR model, this approach addresses the challenges associated with ambiguous objectives and evaluation criteria, ultimately leading to more effective governance of marine resources.

Keywords: Marine Spatial Planning (MSP), DPSIR, Climate Change, Coastal Community, Eco-Tourism.

Introduction

Coastal societies globally have traditionally depended on the sea as a source of livelihood, food, and cultural identity. A typical example is the coastal communities of the Philippines which are integral part of the country's identity, reflecting its rich cultur- al heritage and natural beauty. The Philippines, an archipelagic country composed of over 7,641 islands, boasts some of the most stunning coastlines in the world, characterized by pristine beaches, coral reefs, and naturally formed tropical landscapes. These communities are not only known for their scenic views but also for their vibrant local cultures, economic practices, and resilience in the face of environmental challenges. Being close to the ocean means they have easy access to fish, seaweed and shellfish, so fishing and aquaculture become main sources of income.

Besides drawing from ocean life, the societies have formed unique cultures, ways of living and economies influenced by the natural patterns of the sea. Nevertheless, the constant changes in coastal areas can bring about big problems, especially during the threats of climate change, over exploitation of marine resources and different government policies. It is necessary to understand how coastal communities use the ocean, what they think about governance and how they react to changes in nature to preserve these vital regions.

Coastal communities require attention because they are easily disturbed by environmental and socio-economic changes. Global warming is affecting sea levels, acidifying oceans, causing coral bleaching and causing severe weather which puts both infrastructure and livelihoods at risk. One of the key points of this study is learning how coastal communities are tied to the ocean. Besides providing food, the ocean supports economic activi- ties such as eco-tourism, trading and transportation. Numerous small-scale fishers and indigenous communities rely on the marine resources for their livelihood, transferring traditional fishing skills and sustainable practices from one generation to anoth- er. The sea also sustains industries like local shipbuilding and coastal farming, hence forming a key part of local economies. Yet, over-exploitation, pollution, and destruction of habitats have undermined these economic pillars, and new approaches to reconcile conservation and economic development are needed.

The Hundred Islands National Park in Alaminos, Pangasinan., Philippines has showed significant economic contributions, primarily due to increasing influx of tourist's, in 2023, right af- ter covid-19 pandemic outbreak of which people across nations desire to live as normally as before without fear of harm from covid virus. The natural park recorded approximately 438,000 tourist arrivals, both local and foreign that resulted in tourism receipts of around Forty-Four (44) million Php, which marked an increased from 33.3 million Php in 2023. (pna.gov.ph/articles/1216227)

The economic impact is not just limited to direct revenues; it also includes various auxiliary benefits to the local community, the sustainable eco-tourism practices employed in the park had led to a substantial economic advantage for the surrounding community, enhancing local livelihoods and supported local related businesses. in addition, the presence of National Park stimulates job creation and enhance infrastructure development through Local government units (LGUs) and other funding sources, further embedding the park as a critical economic driver for the municipality of Alaminos, Pangasinan [1].

One of central concern within coastal management is the variation of vision between governments and coastal society. Most coastal dwellers focus on the sustainable use of marine resources for their day-to-day survival, using traditional knowledge and practices to inform their actions. Government institutions, on the other hand, apply general conservation policies aimed at long-term environmental sustainability without regard to the so- cio-economic circumstances of local people. Coastal societies are important to marine conservation and resource management from the government's perspective. Policies and regulations are usually crafted to prevent overfishing, avoid pollution, and conserve biodiversity. When local communities sense that decisions are made without their input, they might resist enforcement of policy. Governments have to juggle delicate political and social circumstances that involve finding a balance between economic development and care for the environment. In other instances, economic incentives and the launch of relevant job creation projects, have been attempted to back up sustainable use, but the results have depended on how they are executed and how equipped the local communities are to be informed.

Climate change is the biggest challenge that coastal communities face today. Low lying coastal areas are susceptible to losing land, having to relocate and being hit by more natural hazards because of higher sea levels. Fish stocks are affected by acidification and warming of the oceans that alter normal fishing habits and result in reduced catches. There are a few coastal areas that have been at the forefront of applying solutions including mangrove replenishments, reef structures and better aquaculture to face climate change. Others face environmental changes by relying on their own ecological practices and customs.

This case study sheds light on these points by examining how coastal communities rely on and interact with the ocean, how they see governance and how they are adapting to climate change. Understanding this dynamics help policymakers, researchers and stakeholders move towards more sustainable and equitable approaches to coastal development.

Objective

Hundred Islands National Park (HINP) in Alaminos, Pangasinan, was the very first National Park created in the Philippines, on 14 January 1940, during the presidency of Manuel L. Quezon. The park is one of the main coastal and marine environments in the Philippines, providing income, tourist destinations and ecological benefits to people living nearby. The ocean is the main source of fishery, tourism and religious activities for the people living in Alaminos, Pangasinan. Still, increasing problems like climate change, the over-exploitation of ocean resources and disagreements about policies between government and communities make it hard for coastal areas to remain sustainable.

Although management of HINP's marine resources has been attempted, there is still a knowledge gap on how coastal communities in Alaminos engage with, and rely on the ocean and how their views correspond or contrast with government policies. This detached issue has the potential to cause ineffective conservation policies, indecorous use of resources, and financial burdens on communities. In addition, climate change remains a constant threat to biodiversity and a disturbance of tradition- al living practices, such that it becomes crucial to analyze how both communities and government entities adjust to change within the region.

This study explored the environmental and socio-economic dependence of Alaminos' coastal communities on the sea, how they interact with marine ecosystems, and their view of governance. It explored the impact of climate change on these communities and the adaptive responses that are being put in place to sustain coastal development.

Specifically, the study answered the following questions:

1. How do the Coastal Communities rely on the ocean?
2. How do Coastal Communities interact with the ocean?

3. Are coastal societies' perspectives different from the governments?
4. How does the government view coastal societies?
5. How does climate--change affect Coastal Communities and societies?
6. How do the Coastal Communities, societies, and government adapt to climate change?

Literature Review

A coastal community is a population that resides near the ocean, generally with distinct practices based on their seashore surroundings. Coastal communities have a crucial role in the promotion of ocean sustainability. Today, more than 40% of the entire world's population resides within 100 kilometers from the shore. Since these communities are most directly affected by the state of the ocean, they are more likely than other communities to be concerned with ocean sustainability [2].

For the over Three (3) billion people living by the sea, coast- al ecosystems host employment, industries and commerce, and supply food and storm shielding and other harsh natural occurrences. However, these important places are threatened as growing populations and expanding urbanization create the massive destruction and loss of coastal habitats — such as saltmarshes, mangroves, coral reefs and shellfish reefs [3].

Viana et al. (2023) highlighted that coastal communities rely considerably on marine resources for their daily sustenance, notably through fishing, aquaculture, and tourism. Fisheries contribute both subsistence and commercial means in most small island states, ensuring food security and economic livelihood. Their research on Southeast Asian fishing villages revealed that more than 60% of households depended on small-scale fisheries as their main income source, and seasonal fluctuations influenced their economic well-being. Additionally, the research also emphasized that reliance on the ocean is not only economic but also cultural since several indigenous communities integrate aspects of the sea into their cultures and societal institutions [4].

According to Sunkur et al. (2023), coastal populations are dependent on the ocean for direct economic reasons and also for the services it provides such as safeguarding the coast, supporting many species and controlling climate change. It was found that mangroves, coral reefs and seagrass beds play a key role in protecting fisheries and preventing coastal erosion. In the case study of Sunkur et al. in the Caribbean, the degradation of coral reefs caused a drop in fish populations and communities struggling to get new jobs. The research revealed that knowing about these ecological connections is very important for creating sustainable coastal management policies [5].

Frazão Santos, Tundi Agardy, & Elena Gissi (2020) also pointed out that Marine spatial planning (MSP) can help lessen the effects of climate change on nearby communities by focusing on sustainable marine resource use. Using the ocean space wisely can keep ecological, economic and social priorities balanced, so that communities can retain their traditional ways of life and handle changes in the environment. It encourages stakeholders to collaborate, helps communities recover from disasters and ensures that cultural heritage is maintained by including traditional wisdom in development [6].

Raquel et al. (2022) studied the various ways people living along the coast connect with the ocean, by fishing, traveling and taking part in cultural rites. The study found that most rural communities along the coast still use traditional ways to fish, like handline fishing and fish traps. Research also showed that boats and maritime transport remain essential for trading and communicating among islands in archipelagic countries. They pointed out that oceanic gods are regular themes in community celebrations which shows that coastal societies honor the ocean greatly [7].

Coller (2020) looked at how people in coastal communities take part in the conservation and management of marine resources, sometimes officially through government programs and sometimes unofficially through community efforts. There are accounts in the Philippines where local fishers teamed up with non-governmental groups to establish marine protected areas (MPAs). Such actions resulted in more fish available and a rise in species diversity. Coller discovered that involving communities locally in conservation efforts leads to more sustainable management of resources from the ocean [8].

Haenssgen et al. (2021) studied how government policies for managing marine resources differ from the opinions of coastal communities. It was found that governments are mostly concerned with economic growth and big-scale fisheries, whereas the local communities focus more on sustainable fishing and the future availability of resources. Fishers in Indonesia expressed dissatisfaction with the government because its policies advantage industrial fishing and regularly lead to overfishing and the depletion of local fish stocks. It was concluded from the study that the differences are caused by different priorities, with governments focusing on national income and local fishers focused on their immediate needs for food [9].

In their study Pennino, et al. (2021) regarding the effectiveness of Marine Spatial Planning (MSP) they accentuated the importance of socio-cultural values, which often overlooked in favor of economic interests, they suggested that the integration of socio-cultural aspect can help reduce governance rigidity and promote adaptability in decision-making process. Further, in order to promote environmental justice, they asserted that government must create an inclusive negotiations space that values cultur- al aspects alongside economic considerations--they argued and reasoned that all stakeholders, especially marginalized coastal communities' perspective should be acknowledged and valued [10].

According to Peer et al. (2022), issues arise when coastal communities and government agencies do not agree on policies. It reviewed times when conservation efforts by the government in the marine area met resistance from local communities whose traditional fishing spots were affected. While the government was working to save biodiversity, the people living in those areas viewed these actions as a direct threat to their survival. They argued that letting communities be involved in decision-making would close this gap and lead to improved policies [11].

Andrews et al. (2021) looked into how governments see coastal populations, focusing on areas such as economic growth and rules. These communities were mainly seen by governments as economic resources and areas that needed to follow regulations.

Because of its high income from coastal tourism, port activities and fishing, the coast is very important to a nation's economy. Sometimes, informal and small-scale fisheries are seen as a barrier to big development projects which can lead to disputes between policymakers and local citizens [12].

Marilena Papageorgiou (2016) discusses how Marine Spatial Planning (MSP) helps in managing coastal and marine tourism, especially by promoting tourism that does not harm the environment and helps resolve clashes among different marine activities. MSP supports a strategy that links environmental care with economic and social development in zones subject to various marine activities [13].

Recent reports (Duarte et al., 2020; IPCC, 2019, 2022) suggest that MSP is especially valuable for coping with climate change by overseeing ecosystem-based management, protecting at-risk habitats and promoting renewable energy projects. The emphasis is also placed on including local communities, fishermen and tourism operators in the decisions that direct marine activ- ity [14]. In the Philippines, with a rich marine life and many people depending on the ocean for their livelihoods, MSP can support fair use of resources, protect fishing and prevent conser- vation from harming communities. If applied in places such as the Hundred Islands National Park, where fishing, tourism and nature protection are important, MSP can bring together what the community wants with the national agenda and help resolve conflicts among different sectors, as well as build structures that can withstand climate change [15].

Paxton et al. (2023) looked into how governments have tried to include coastal communities in their national development plans. The study looked at projects where Latin American governments improved coastal areas, set up eco-tourism and made their communities more resistant to disasters. They noticed that even though the interventions were intended to help, they did not involve the local community, so the policies were often ineffective or did not last. The study found that governments should use a strategy that gives coastal communities direct involvement in policy-making [16].

According to Griggs & Reguero (2021), sea level rise causes coastal communities to experience more flooding, saltwater getting into freshwater areas and displacement. Authorities used both satellite pictures and direct observations to watch for coastal erosion in Bangladesh which has caused many villages to relocate because of flooding. Experts found that poor coastal communities, who generally lack resources, are more strongly affected by climate change [17].

Venegas et al. (2023) looked into how warming seas and coral bleaching affect communities living along coastal areas. It was shown that rising ocean temperatures caused mass coral death which affected the number of fish and income of fishing communities in Southeast Asia. They pointed out that along with the harm to the ocean, climate change also threatens the financial health of people living by the coast, sometimes making them switch to unhealthy ways of earning a living [18].

Parveen et al. (2024) studied how communities in coastal ar- eas are using mangrove restoration to adapt to climate change. Successful cases in Indonesia and the Philippines were shown, where local people planted mangroves to act as natural barriers against flooding and land erosion. They pointed out that these measures help both the coastline and the variety of species and products from the sea [19].

Eriksen et al. (2021) studied government actions such as building infrastructure to resist climate change. Areas with urban coastal flooding were the main focus, with governments working on seawalls, roads and making houses resistant to floods. They noticed that these interventions protect for a short period but are pricey and often move people living in high-risk areas. The study advised governments to use nature-based plans, for instance, by protecting wetlands and planting more trees [20].

In their study, Engle & Senten (2022) explained that developments in technology support the strength of coastal communities against climate change. The research enumerated developments in early warning systems, satellite weather surveillance, and resilient aquaculture practices. Shrimp farming technologies with salt resistance, for instance, have been practiced by Vietnamese farmers, thereby ensuring livelihood opportunities even with escalating salinity within coastal waters. They concluded that technology-based alternatives, coupled with customary knowledge, provide a viable avenue to coastal resilience [21].

McNaught (2024) wrote about global partnerships in climate adaptation, with an emphasis on collaboration between coastal countries and international agencies. The research reported on projects supported by the United Nations and World Bank for climate-resilient development in small island developing states. They stressed that international finance is critical but that adaptation measures need to be context-specific to be effective [22].

Pilare (2024) explored how education and climate awareness campaigns drive climate resilience in coastal communities. The research showed that higher levels of environmental literacy were associated with more proactive and sustainable practice uptake. In Fiji, for instance, schooling campaigns have induced sustainable fishing activities by local fishermen, minimizing overfishing and the degradation of oceanic habitats. They advised expanding climate education campaigns as a sustained adaptation capacity strengthening strategy [23].

Methodology

In this research, a qualitative case study is applied to explore the link between coastal societies and the ocean, the differences in opinions among government and local communities and the results of climate change on adaptation measures [24]. The Hundred Islands National Park (HINP) in Alaminos, Pangasinan, is chosen as the case site since it is ecologically significant and stakeholders interact in managing and using it. The people living near the National Park depend on the sea for their jobs and also take part in tourism linked to its natural features. The study also works to discover what it is like for coastal communities, government agencies and maritime law enforcement to contribute to the park's conservation, economic and social aspects [25].

The participants of this research are a varied group of stakeholders engaged in the management and day-to-day activities within the coastal and marine environment of HINP. These are the De-

partment of Environment and Natural Resources (DENR) and the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) which look after environmental rules and marine resource management. Involving local government units (LGUs) and coastal barangay officials is necessary to understand the governance and community-based programs implemented in HINP. In addition, those who live nearby such as indigenous people and fisherfolk, share how much they depend on the ocean for their jobs, food and cultural traditions. Those working in maritime law at HINP's environmental protection also offer useful opinions on regulations, ways to conserve resources and disputes involving their use. With a variety of respondents, it is possible to see how different groups' view, use and react to ocean-related matters [26].

The main method of data collection for the research is semi-structured interviews with an interview guide that will be used to investigate major themes around the research questions. The issues at hand pertain to (1) coastal communities' dependency and engagement with the ocean, (2) dissimilarities of views among the local populace and the government, (3) government perspectives and policies on coastal societies, (4) climate change impacts on HINP and inhabitants, and (5) adaptive measures adopted by various stakeholders. Semi-structured interviews provide opportunities for respondents to describe their experiences clearly and to keep the conversation aligned with the research's main goals. With participants' consent, interviews will take place face-to-face, be recorded and then transcribed for analysis [27].

A thematic design is used during data analysis, where all interview answers are organized by theme to identify common and new patterns. The process of thematic analysis involves studying the data, developing initial codes, spotting themes, assessing and defining themes and interpreting the results. The process makes sure the study can provide important insights into coastal dependence, governance and climate adaptation in HINP. Looking at the data can highlight areas where agreement exists among stakeholders and where there are differences which can show possible gaps in policies and opportunities to cooperate more effectively [28].

The research will be carried out according to all the ethical principles it follows. Before participants take part in any interviews, they will be told about the purpose of the interview, that they can withdraw anytime and that it is their decision to join. Confidentiality will be guaranteed and people's names will be replaced with codes or pseudonyms when any findings are shared. In the same way, the research will adhere to ethical rules set by different academic and government organizations [29].

Case Description

In Alaminos, Pangasinan, the Hundred Islands National Park (HINP) plays a vital role as a marine and coastal ecosystem, giving economic, environmental and cultural benefits to the surrounding communities. The HINP, made up of 124 islands in the Lingayen Gulf, supports most of the coastal communities by giving them food, ways to earn a living and cultural traditions. The regional economy relies on fishing and tourism which are both connected to the ocean. Despite this, regional fishers are affected by environmental damage, climate change and new regulations which can lead to disagreements with the government. This research examines how people from coastal communities use and connect with the ocean, how government rules influence their lives and how they react to climate change [30].

Fishing, aquaculture and tourism are the main activities that provide income to Barangay Lucap, the entry point to HINP. To harvest bangus (milkfish), lapu-lapu (grouper) and squid, fisherfolk who work on small boats often rely on techniques such as net fishing, handline fishing and fish traps. A number of residents also earn money through seaweed farming and gathering shellfish. Since these fishing activities have existed for many generations, the ocean is closely tied to who they are and what they do [31].

Other than fishing, the community relies heavily on eco-tourism. Locals there operate boat rentals, island tours, snorkeling sites and souvenir shops, using the beauty of the park's beaches, colorful reefs and sea life to their benefit. Many families in the area depend on seasonal tourism, by guiding visitors, renting out boats and working at resorts, especially in the summer. At the same time, depending heavily on the oceans puts the environment at risk, since overfishing, water pollution and damaging tourism can harm the sea and the people who work there [32].

People living near the ocean depend on it economically, but their connection is also cultural and social. The community celebrates important events, performs religious rites and holds festivals centered on the ocean. With time, fisherfolks have learned a lot about the environment by noticing changes in tides, fish movements and the weather. It shapes their fishing plans, guides their way on the water and informs their harvest methods [33].

In addition, the communities living near the ocean for generations have their own customs and beliefs about the sea. Some ceremonies and rituals are done by communities to get good catches or protect from storms which shows their strong spiritual relationship with the sea. At the same time, improvements in modernization, tourism and government rules have changed the usual ways people earn their living in these regions, pushing local communities to adapt. While some have found different ways to earn money, others find it tough to work within the regulations of marine conservation [34].

A big issue in managing coastal resources is the disagreement between coastal residents and government officials. Those living along the coast believe that rules about fishing, marine protected areas and seasonal closures limit their independence and threaten their livelihoods. For instance, there are fishermen who feel that marine conservation policies prioritize tourism which makes them unhappy and unwilling to follow the rules [35].

Alternatively, the Department of Environment and Natural Resources (DENR) and the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) argue that strict conservation efforts are required to preserve marine diversity and ensure sustainability. They claim that marine ecosystems have already been damaged a lot by overfishing, coral reef deterioration and coastal pollution and this means that tighter rules for maritime laws should be put in place [36].

It is up to the local government units (LGUs) to help ensure

that economic development, the environment and the welfare of the community are all considered. Coastal barangay officials employ local sea guards (Bantay-Dagat) often serve as liaisons between the community and national agencies, implementing policies while addressing local concerns. However, ineffective enforcement, limited resources, floating assets and lack of community participation hinder the effectiveness of government initiatives [37].

The Philippine state sees coastal communities as both beneficiaries and custodians of the seas. There are several laws and programs, including the Fisheries Code of 1998 and the Expanded National Integrated Protected Areas System (E-NIPAS) Act, designed to manage fishing, fight against illegalities, and encourage sustainable marine management [38]. For the government, coastal residents have a duty to play a central role in conservation. Coastal communities are aided in adopting more sustainable sources of livelihood through training on alternative livelihood and programs such as community-based coastal management and marine sanctuaries. Low finances, reluctance towards change, and insufficient education cause limitations to the participation rate.

Illegal fishing executed by the local fisherfolks is one of the largest issues facing the government. Blast fishing, cyanide fishing, and fishing in excess are done by some fisherfolk, which lead to the destruction of marine habitats. Regular patrols and arrests are carried out by law enforcement bodies such as Philippine Coast Guard in tandem with HINP rangers and local authorities, but issues like a shortage of staff, and jurisdictional disputes hin- der enforcement [39].

Climate change increasingly threatens HINP and its coastal communities. Sea level rise, warming of the ocean, more intense typhoons, and coral bleaching already impact marine biodiversity and fish catch. Most fisherfolk complain about decreasing stocks that push them to travel further from the shore, raising operating expense and risk of accidents [40].

Severe weather conditions like Typhoon Yolanda in 2013 (Haiyan) and Typhoon Odette in 2021 (Rai) have ruined coastal communities, destroying boats, houses, and tourism facilities respectively. Storm damages make it difficult for many families to recover, showing their exposure to climate-related disasters. In addition, ocean acidification and coral reef degradation can endanger the diving and snorkeling business, potentially lowering tourism income. The unpredictable weather has pushed the communities to rethink their survival mechanisms, necessitating robust disaster preparedness strategies and flexibility measures [41].

Faced with climate change and environmental risks, coastal communities, local government units, and national government agencies have instituted different adaptation measures. Fisherfolk are moving towards sustainable fishing practices, such as fish farming, seaweed farming, and eco-tourism activities. Some boat operators and tour guides have initiated the promotion of responsive tourism practices, such as reef-safe snorkeling and waste management initiatives [42].

The municipal government of Alaminos has collaborated with NGOs and research centers to restore coral reefs, implement mangrove reforestation programs, and improve disaster risk reduction measures. Coastal zoning laws have also been implemented to discourage illegal settlements and infrastructure construction in high-risk zones [43].

Education and information campaigns are essential in filling the gap between policy and practice. Environmental groups run seminars and training for residents to educate them about living in a climate-friendly manner, responsible fishing and the possibilities of ecotourism. Challenges like funding shortages, bureaucratic delay, and local opposition are still hurdles to efficient implementation [44].

Despite these challenges, cooperation between government agencies, local communities, and private organizations offers hope for sustainable coastal development. By integrating traditional ecological knowledge with modern conservation strategies, HINP can become a model for balancing marine resource use and environmental protection [45].

Data Analysis

The data analysis for this study was qualitative since the research questions focused on gaining insight into coastal communities' and the government's lived experiences, interactions, and views. The major method was thematic analysis, where interview transcripts, focus group discussions, or observational data were systematically coded to reveal repeating patterns and themes [46]. For questions 1 and 2, answers were examined to uncover the various ways coastal communities depended on and engaged with the ocean, classifying their dependency under economic, cultural, and environmental categories [47].

For questions 3 and 4, a comparative analysis was undertaken to examine the views of the government and coastal societies. This included identifying areas of convergence and divergence in policy, priorities, and perceptions of coastal resource management and community well-being. For questions 5 and 6, con- tent analysis was used to investigate how the effects of climate change were understood and experienced, what adaptation strategies communities and the government implemented, and what common coping mechanisms, policy measures, and barriers to adaptation emerged from these findings [48].

Results

Table 1: The Way Coastal Communities Rely on the Ocean

Themes	Actual Responses from Respondents

Primary Source of Livelihood	Barangay Official 1: "Fishing has always been the main source of in-come for our community. Most families here rely on the sea, whether di-rectly through fishing or indirectly through selling seafood, running small eateries, or operating boat services for tourists." Fisherfolk 1: "Without the ocean, we have no livelihood. Every day, we go out to fish, hoping for a good catch. It's not just work for us—it's a way of life that has been passed down from our ancestors."

Food Security and Daily Sustenance	Barangay Official 2: "Many families here depend on the ocean for their daily meals. Even if they don't sell their catch, they at least have some-thing to eat. It's not just about money, it's about survival." Indigenous Person 1: "Our ancestors taught us how to gather shellfish and seaweed from the shoreline. Even when times are tough, the ocean always provides something for us to eat."
Tourism-Related Income Opportunities	Barangay Official 3: "The Hundred Islands National Park attracts visi-tors, and many of our residents earn from boat rentals, tour guiding, and selling handicrafts. The ocean is not just for fishing—it also gives us jobs in tourism." Indigenous Person 2: "We use our traditional knowledge of the islands to guide tourists. Some of us have small businesses renting out snorkel-ing gear or selling local products to visitors."
Cultural and Spiritual Connection	Indigenous Person 3: "For us, the ocean is sacred. Indeed, before fish-ing venture, we have rituals and traditions passed down from our ances-tors to ask for protection and a good harvest. We believe that if we re-spect the sea, it will take care of us in return." Fisherfolk 2: "Before we go out to sea, we say a prayer. The ocean is more than just a source of food and income—it's a part of our identity and culture."
Source of Alternative Re-sources	Fisherfolk 1: "When fishing is not good, we collect seaweed and shells, which we can sell or use. Some families make crafts out of seashells to earn extra income." Barangay Official 1: "Our community has learned to make use of what the ocean provides, not just fish but also things like seaweed farming and eco-tourism activities."
Climate and Environmen-tal Dependence	Barangay Official 2: "Our daily activities, from fishing to tourism, de-pend on the weather and ocean conditions. When storms come, our in-come suffers. The changing climate makes our reliance on the ocean more unpredictable." Indigenous Person 1: "We have noticed that the sea is changing. The fish we catch is fewer now, and the corals are not as vibrant as before. We are worried about what this means for our future."

Table 2: Interaction of Coastal Communities with the Ocean

Themes	Responses
Fishing as a Primary Livelihood	Barangay Official 1: "Many residents here depend on fishing as their main source of food and income. We work with BFAR to ensure sustainable fishing practices." Barangay Official 2: "Our barangay supports small-scale fishers by coordinating with local authorities for fair market prices." Fisherfolk 1: "I have been fishing since I was a child. The ocean is not just my workplace but my life. Without it, we have nothing." Fisherfolk 2: "Sometimes, we have to go farther to catch fish because the nearby waters are becoming less abundant." Indigenous Person 1: "Our ancestors taught us how to fish using traditional methods. We respect the ocean by only taking what we need." Indigenous Person 2: "We follow customary fishing seasons to let the fish population replenish, just as our elders did."
Tourism and Livelihood Diversification	Barangay Official 1: "Many community members also work in tour-ism, serving as boat guides or renting out cottages to visitors." Barangay Official 3: "Some fisherfolk now run small businesses like selling seafood to tourists or offering boat rides." Fisherfolk 1: "Sometimes, when fish catch is low, I take tourists on island-hopping tours to earn extra income." Fisherfolk 2: "Tourists buy fresh fish from us, so even if we don't catch much, we still have a way to earn." Indigenous Person 1: "We share our traditions with tourists, teach-ing them about our cultural practices related to the sea." Indigenous Person 3: "Local festivals and celebrations often include ocean-related activities, strengthening our connection with the wa-ter."

Cultural and Spiritual Significance	Barangay Official 2: "There are local rituals before major fishing seasons to ask for a good catch and safe journeys." Barangay Official 3: "We believe the ocean has spirits, so we practice traditional ceremonies to show respect." Fisherfolk 1: "I always say a prayer before heading out to sea because the waters can be unpredictable." Fisherfolk 2: "Our fishing practices include following lunar cycles, which we believe influence fish movements." Indigenous Person 2: "Our ancestors passed down stories of how the ocean provides but must be respected, or it will take back what it gives." Indigenous Person 3: "We perform rituals and chants before large fishing expeditions, honoring the sea as our provider."

Table 3: Difference in the Perspective of Coastal Societies and the Government

Themes	Actual Responses
Resource Utilization and Conservation	Coastal Barangay Official 1: "For us, the ocean is our livelihood. Fishing and tourism are our main sources of income, so we need to use marine resources to survive. However, we also know that we must protect it to ensure its sustainability." DENR Personnel 1: "From the government's perspective, strict conservation is necessary. Many coastal communities overfish or engage in illegal activities like dynamite fishing, which threatens marine ecosystems. That is why we impose regulations."
Policy Implementation and Local Compliance	Fisherfolk 1: "The government makes policies without consulting us. Some fishing bans and marine protected areas limit our access to traditional fishing grounds, making it harder for us to earn a living." LGU Representative 1: "Policies are designed to balance environmental protection and economic activity, but many coastal communities resist them because they feel it threatens their livelihood."
Climate Change Response and Adaptation	Indigenous Person 1: "We have lived with nature for generations, and we know how to adapt to the ocean's changes. But the government rarely acknowledges our traditional ways of predicting the weather or conserving resources." BFAR Personnel 1: "The government relies on scientific research and data-driven policies to address climate change. While traditional knowledge is important, it needs to be integrated with modern strategies for a more effective response."
Disaster Preparedness and Response	Coastal Barangay Official 2: "We feel that government assistance during disasters is slow. After typhoons, we struggle to rebuild our homes and livelihoods with minimal aid." HINP Law Enforcer 1: "Disaster response is challenging due to limited resources and logistical issues. We try our best to help, but we also need coastal communities to follow early warning systems and evacuation protocols to reduce risks."

Table 4: Government's View on Coastal Societies

Themes	Actual Responses
Role of Coastal Communities in Marine Conservation	DENR Personnel 1: "Coastal communities are key partners in marine conservation efforts. They are the frontliners in protecting marine resources, and their involvement is crucial in enforcing sustainable fishing and tourism practices." BFAR Personnel: "These communities have valuable local knowledge about marine biodiversity, but sometimes they lack awareness of legal policies, which is why we conduct educational campaigns."
Challenges in Compliance with Environmental Regulations	LGU Representative 1: "Some fisherfolk and business operators violate environmental laws, either due to economic necessity or lack of information. This is a challenge because it leads to habitat destruction." HINP Law Enforcer: "Illegal fishing practices and overharvesting are still concerns despite regulations. Strengthening enforcement and collaboration with local leaders is necessary."
Socioeconomic Struggles of Coastal Residents	LGU Representative 2: "Many of these communities rely heavily on the ocean for their livelihood, but they are also among the most vulnerable to environmental changes. We need to balance conservation and economic opportunities." DENR Personnel 2: "Government assistance programs exist, but the challenge is ensuring that these resources reach the right people and are used effectively for sustainable livelihood projects."
Collaboration Between Government and Coastal Communities	LGU Representative 3: "We are working to bridge the gap between policymakers and fisherfolk by conducting dialogues and capacity-building programs to ensure that government regulations align with local needs." BFAR Personnel: "There is still a disconnect between national policies and local implementation. Strengthening coordination with barangay officials and community leaders will help create more effective governance."

Table 5: Climate Change Affecting Coastal Communities and Societies

Themes	Actual Responses
Rising Sea Levels and Coastal Erosion	Coastal Barangay Official 1: "We've noticed that our shorelines are slowly eroding. Houses near the coast now experience frequent flood-ing, and some families have been forced to relocate." Indigenous Person 1: "Our ancestral lands near the coast are being swallowed by the rising sea. What used to be our sacred spaces are now at risk of disappearing."
Changing Fish Populations and Declining Catch	Fisherfolk 1: "We used to catch plenty of fish near the shore, but now we have to go farther out to sea. It's more expensive and dangerous for us." Fisherfolk 2: "The seasons are unpredictable. Fish don't migrate the way they used to, and our income has been greatly affected."
Unpredictable and Extreme Weather Patterns	Coastal Barangay Official 2: "Storms have become stronger and more frequent. Every year, typhoons destroy homes and boats, leaving our community vulnerable." Indigenous Person 2: "We rely on natural signs to predict the weather, but climate change has made it difficult. We experience longer droughts and unexpected storms that harm our crops and livelihood."
Health and Liveli-hood Impacts	Coastal Barangay Official 3: "Rising temperatures and saltwater intrusion are making it harder to grow crops, affecting both food supply and income for our people." Indigenous Person 3: "We are seeing more cases of heat-related illnesses, especially among the elderly and children. The changing climate is making survival more difficult for our community."

Table 6: Adaptation of Coastal Communities, Societies, and Government to Climate Change Coastal Communities, Societies, and Government Adapt to Climate Change?

Themes	Actual Responses
Sustainable Fish-ing Practices	Fisherfolk 1: "We have adapted by using traditional and eco-friendly fishing gear, avoiding overfishing to ensure marine life remains abundant for future generations." BFAR Personnel: "We promote responsible fishing practices and impose stricter regulations to prevent illegal fishing methods that harm marine biodiversity."
Mangrove Re-forestation and Coastal Protection	Coastal Barangay Official 1: "To mitigate the impact of storm surges and coastal erosion, we actively par-ticipate in mangrove planting projects in partnership with environmental organizations." DENR Personnel 1: "Mangrove reforestation has been a priority, as these trees act as natural buffers against rising sea levels and extreme weather conditions."
Diversification of Livelihoods	Indigenous Person 1: "Many of us have shifted to alternative livelihoods like shellfish farming and eco-tourism to reduce dependence on fishing." LGU Representative 1: "We provide training and financial assistance to help coastal communities explore new income sources, such as handicrafts and community-based tourism."
Government Cli-mate Policies and Disaster Prepared-ness	HINP Law Enforcer: "We strictly enforce zoning laws to prevent illegal settlements in high-risk areas and conduct regular patrols to ensure environmental laws are followed." LGU Representative 2: "Our disaster response teams conduct early warning system drills and provide climate adaptation training for vulnerable coastal communities."
Community-Based Climate Education	DENR Personnel 2: "We educate communities on climate change effects and train them in disaster pre-paredness to minimize the impact of typhoons and rising sea levels." Indigenous Person 2: "We share traditional knowledge about reading weather patterns and ocean conditions to help our communities prepare for natural disasters."

Discussion

The Way Coastal Communities Rely on the Ocean

The dependence of coastal communities on the ocean is multi-dimensional and involves ecological, economic, social, and cultural aspects. The results of this research indicate that the ocean is a major source of living for fisherfolk, coastal peoples, and local barangay officials engaged in tourism-related endeavors. This is consistent with research conducted by Aldasoro-Said & Ortiz-Lozano (2021), which insists that coastal communities have a strong reliance on marine resources for livelihood and food, especially where other forms of employment are scarce. The respondents pointed out that fishing is not only employment but a way of life, reinforcing earlier research conducted by Castello et., al. (2023), which testified to the generational character of small-scale fisheries and their important contribution to food security [49].

Aside from economic dependence, the research further discovered that coastal societies interact with the ocean through cultural and religious practices, validating the work of Parsons et al. (2021), who explained how deep spiritual bonds exist between indigenous peoples and marine ecosystems. Respondents were that respect and traditional rituals to the sea form a critical aspect of their affiliation with the sea, about the paper by Poto et., al. (2021), whereby it was discussed that most societies along the coastline believe in nature's reciprocal relation—where maintenance of the natural environment guarantees continued sustainability [50].

Tourism has also been a major consideration in ocean dependence, with indigenous respondents and barangay officials commenting that the Hundred Islands National Park (HINP) offers jobs aside from fishing. This is by the study of Zafra (2021), who

explained that marine-based tourism has been an important economic engine for coastal communities in the Philippines. Yet, as noted by the respondents, tourism is still seasonal and highly environmentally dependent, a problem that resonates with the research of Scott (2021), who cautioned that climate change and coastal degradation imperil the sustainability of marine tourism economies [51].

Environmental dependence and climate were also reflected in the feedback, as communities reported changes in fish stocks and coral health, which showed increasing ecological issues. This matches Scott's (2021) conclusion that overfishing and climate change have led to a decrease in marine biodiversity which affects livelihoods near the ocean. Moreover, respondents accepted the fact that weather patterns are unpredictable and it affects their daily lives, according to Martinez et., al. (2020) who noted the influence of climate-related surprises on coastal communities.

Interaction of Coastal Communities with the Ocean

People living by the sea deeply connect their daily lives, traditions and sources of income to the ocean. As evident in the answers, fishing is still the main source of livelihood for most people near in the Hundred Islands National Park (HINP) area. This is in line with Pauly and Zeller (2016), who stressed that small-scale fisheries are the mainstay of coastal economies, especially in developing countries. The use of conventional fishing practices, as noted by indigenous interviewees, concurs with De Sousa et al.'s (2022) study, which discovered that indigenous and artisanal fishermen employ traditional harvesting methods with long-term sustainability. Nonetheless, some of the fisherfolks complained about depleting fish stocks, which is also cited by Pham et al. (2023) as posing a threat to the sustainability of marine resources globally due to overfishing and environmental degradation [52].

Aside from fishing, coastal populations in HINP also engage with the ocean through tourism-related activities. The diversification of livelihoods for many locals involves providing boat tours, selling fish, and operating hospitality services. This transformation is comparable to the work of Fabinyi et al. (2022), who elaborated on the way tourism in marine ecosystems has created alternative sources of income for most fishing-dependent families. Nonetheless, although tourism is a factor in econom- ic stability, it comes with challenges. As Baloch et al. (2022) state, growing tourism can come with environmental demands like coral bleaching and degradation, as well as pollution, and thus it should be properly managed for a balance of economic gains against ecological preservation. The barangay officials' comments reflect attempts to manage tourism and ensure that no over-exploitation of marine life occurs.

Other cultural and religious affiliations of people with the sea also contribute to community patterns. Prayers, rituals, and customary beliefs regarding marine resources depict a strong sense of respect for nature, just like conclusions drawn by Recio & Hestad (2022), who believed that indigenous ecological knowledge is very important in the management of sustainable resources. In HINP, the indigenous people still hold ceremonies that revere the ocean, which continues to affirm their desire to uphold ecological balance. This cultural element is usually neglected in government policies, which favor scientific methods over customary knowledge [4]. Closing this gap is important in developing integral marine conservation measures that combine modern and indigenous thought.

Difference in the Perspective of Coastal Societies and the Government

The variation in opinion between coastal nations and the state arises from the latter's conflicting priorities for utilizing, conserving, implementing policy, and adapting to climate, in contrast to coastal communities. The fisherfolk and local populations of the coast consider the ocean a basic component of their economy, underscoring continuity but sustainable usage. Yet, the government, through agencies such as the Department of Environment and Natural Resources (DENR) and the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR), prioritizes long-term ecological sustainability and conservation, usually at the cost of restrictions perceived by some locals as constraining their economic potential. Effective management of marine resources, as argued by Jones & Long (2020), needs to strike a balance between government controls and community participation so that conservation doesn't adversely affect poor and vulnerable coastal communities. In addition, community engagement promotes transparency in the planning process, it allows for open communication about evaluation results and the condition affecting MSP outcome, which can enhance trust and collaboration among all parties involved [5].

Implementation of policy is also the biggest area of controversy. Local governments claim that sturdy regulations are need- ed to safeguard marine biodiversity, but fisherfolk and coastal barangay officials feel left out of the decision-making process. As observed by Farmonaut (2025), top-down governance styles of marine management create tension with local communities because they might exclude traditional knowledge and cultural fishing techniques. This incompatibility causes non-compliance with policy, which makes it even more challenging to conserve marine ecosystems. Connecting the two sides through participatory governance, whereby policymakers and the local communities both work together on decision-making, has been posited as an effective solution [5].

A further important area of divergence is climate change adaptation and response. Indigenous peoples and fisherfolk depend on traditional ecological knowledge to anticipate weather patterns and regulate natural resources, but government agencies prefer science-based, data-driven methods. Dorji et al. (2024) point to the need for combining indigenous ecological knowledge with contemporary climate adaptation methods to develop more comprehensive and effective solutions. Failing this, communities will reject externally driven strategies, leading to ineffective climate resilience measures.

Preparation for disasters also demonstrates the disparity between governmental authorities and community citizens. Residents in coastal communities feel that assistance is delayed and lacking from government officials after calamities, hampering relief. By comparison, authorities within the local forces and state administrations believe the scant resources available, coupled with logistical challenges, inhibit relief efforts after calamities. Sufri (2024) highlights in a study that the resilience to climate-relat-

ed hazards can be greatly improved by enhancing communi- ty-based disaster preparedness programs along with improved coordination between government and local actors.

Government's View on Coastal Societies

Coastal communities are important actors in marine conservation, but their interaction with the government is also characterized by both cooperation and conflict. Government agencies like the Department of Environment and Natural Resources (DENR) and the Department of Agriculture-Bureau of Fisheries and Aquatic Resources (DA-BFAR) acknowledge coastal communities as vital stakeholders in marine biodiversity protection. The DENR and DA-BFAR respondents shared the same view and said that fisherfolk and locals have meaningful ecological knowledge but are not knowledgeable about environmental policy. This agrees with Nuno et., al. (2021), who emphasized that although coastal societies possess intrinsic conservation ethics, limited policy awareness reduces their capability for compliance with sustainable practices.

Still, compliance with environmental policy remains a high-profile issue. LGU representatives cited that economic necessity compels some of the population to practice unsustainable fishing and tourism. Notwithstanding government regulations in place, the HINP enforcer highlighted that illegal fishing and habitat loss are still transgressions that point to stricter enforcement and enhanced local involvement in conservation. This aligns with Jentoft and Chuenpagdee's (2015) argument that there must be a balance between regulation and empowering the community so that long-term sustainability is achievable.

The socio-economic weakness of people who live along the coast is also a major concern. LGU members said that since these communities depend on the ocean for their jobs, they are also highly vulnerable to climate change and harm to the environment. This is proven by Correia's (2019) study, showing that rising sea levels and extreme weather events hit coastal areas harder, making their economic conditions much worse. Also, the DENR noted that even if government aid programs exist, getting them to people evenly and enforcing them is a big challenge. This finding is in line with what Mudge (2018) observed which suggests that coastal resource strategies often collapse since bottom-up management and local group representation are usually missing.

Climate Change Affecting Coastal Communities and Societies

Coastal communities and societies have suffered from climate change with the rise in sea level, less fish, more severe weath- er incidents and various health problems. Respondents said that more instances of coastal erosion and flooding are making people move to new places. According to Mardikian & Gala- ni (2023), increased sea levels threaten living areas, buildings and economic ventures near the coast, especially in lowlands. Indigenous people were also afraid that erosion might take away their ancestral lands which was also confirmed by Human Rights Watch's (2020) observations that climate change negatively impacts Indigenous people by disrupting their customary ways of life.

Respondents said it is now harder to expect where fish will appear, forcing fishers to sail in unpredictable areas which has raised both operational risk and expenses. According to Venegas et al. (2023), warmer and more acidic oceans affect the natural migration of fish, resulting in fewer catches and a loss of income for people who depend on coastal fisheries. Additionally, Tai et al. (2021) remarked that changes in fish populations because of climate can greatly affect both marine biodiversity and food security. This shows that coastal people often face economic difficulties when their primary earnings are disrupted.

Many respondents pointed out that extreme weather problems meant they faced stronger typhoons and more unpredictable storms that ruined their homes and boats. As found by Ortiz et al. (2023), climate change causes stronger tropical cyclones, making it harder for coastal residents who may end up displaced. Indigenous communities had trouble making weather predictions which they used to do based on local customs.

Environmental Challenges

Despite being beautiful and rich in culture, the coastal community near in the HINP are dealing with more and more serious environmental problems. As they are situated near the sea, these islands are especially at risk from climate change, with sea level rise causing coastal erosion, people to be displaced and water sources to become tainted. Because of the regular occurrence and strength of typhoons along the coasts, Filipinos in these ar- eas always face great danger to their lives, occupation and essen- tial infrastructure. Such environmental pressures make it neces- sary to take strong and inclusive steps that enhance resilience and promote good sustainability practices to save both habitats and communities. Examples of such efforts are to boost disaster preparedness, act on projects like regenerating mangroves and coral reefs and ensure sustainable fishing.

Adaptation of Coastal Communities, Societies, and Government to Climate Change

Coastal communities, societies and government tackle climate change through a range of actions involving traditional practices, new policies and protecting the environment. One of the main ways in which fisherfolk adapt is practicing sustainable fishing which prevents overfishing and protects the marine environment. The Department of Agriculture – Bureau of Fisheries and Aquatic Resources (DA-BFAR) also employs strict fishing regulations to ensure the maintenance of healthy marine resources which is in line with Pauly & Zeller (2017), who argued that good fishery policies are vital in combating the consequences of climate changes on those living near the coast.

Many of the coastal barangay authorities and the Department of Environment and Natural Resources (DENR) stress reforesting mangroves and protecting the shoreline is the key to adapting. The mangroves provide a shield against storm surges and help to preserve shorelines which are important in solving problems relating to rising sea levels. This is continued by another study by this Alongi (2020) which states that mangroves 'take up carbon, slow erosion along the coast and build up the region's resilience in the face of climate change'. These findings agree with the government's actions to restore mangroves which demonstrate the important role that nature-based solutions will play in climate adaptation.

Adapting to climate change usually involves diversifying how people make a living. By shifting to shellfish farming and ecotourism, indigenous people are no longer dependent only on fishing and so have more capacity to deal with changes in the ocean. Salgueiro-Otero et al. (2022) also state this idea and think that diversifying livelihoods buffer coastal communities' livelihoods from economic shocks that stem from climate change. LGUs also provide training and financial support to local businesses so these areas can contend with economic obstacles.

In addition, climate policies and disaster readiness actions strengthen communities. Better land use planning and early warning systems help counteract the risks incurred from climate change, according to the study by Dhar et al. (2023) who reported that HINP appointed officials to enforce zoning rules and prohibit building settlements on risky areas. Training and practice of climate adaptation is also being done by LGUs.

Ultimately, climate education through the community employs both science and tradition to seek out the means by which to adapt. The DENR provides funding for climate consciousness efforts to inform coastal communities on the risks of climate change as well as traditional ocean patterns that are vital in predicting weather and help in management of disasters. This is in support of the findings from Amador & Naldoza (2023) that combining traditional knowledge with modern science helps increase resilience to climate change.

Applying the Social-Ecological Framework to Address Challenges in Philippine Coastal Communities

The social-ecological framework looks at Philippine coastal communities by focusing on the complex ways social and ecological systems are connected. At an individual level, helping people learn about the environment and giving them alternative ways to make money can help them avoid using harmful practices. Moving to the interpersonal level, building strong relationships, encouraging teams and using both community wisdom and science can enable people to manage their resources and work through disagreements as a group. At the organizational level, improving environmental management in local government, using incentives and CSR to support local businesses and creating partnerships with NGOs, research institutions and local organizations are all important for successful conservation. The community level necessitates building resilience to climate change impacts and natural disasters through preparedness plans, revitalizing traditional ecological knowledge for sustainable practices, implementing community-led ecosystem restoration initiatives, and preserving cultural heritage linked to the coastal environment to strengthen community identity. Finally, at the policy level, advocating for stronger environmental laws and their effective enforcement, mainstreaming environmental sustainability into development planning, securing adequate funding for coastal conservation, and ensuring policy coherence across different sectors are essential for creating an enabling environment for long-term sustainability. By addressing these interconnected levels, the social-ecological framework facilitates a holistic and participatory approach that empowers local communities, strengthens governance, fosters collaboration, and ultimately promotes more resilient, equitable, and environmentally sustainable coastal futures for the Philippines.

Table 7: Application of the DPSIR Framework to Address Challenges in Philippine Coastal Communities

DRIVERS (D) These are the underlying causes of change	ENVIRONMENTAL CHANGES DUE TO CLIMATE CHANGE: such as rising sea temperatures, rising sea level, and extreme weather events (e.g. Typhoons)
	TOURISM GROWTH: Increased visitors' numbers, infra-structure development, economic dependence of tourism
	URBANIZATION AND ECONOMIC ACTIVITIES: fishing, industrial activities, expansion of coastal cities
PRESSURES (P) These are the direct effects of the drivers	COASTAL EROSION: land degradation due to rising sea lev-els and human activities
	POLLUTION: waste from tourism, industries and urban areas affecting the ecosystems
	EXPLOITATION AND HABITAT DESTRUCTION: unsus-tainable fishing practices (e.g. cyanide fishing) and destruction of coral reefs
	RESOURCE OVERUSE: increased demand for fresh water, food and energy—resulted to higher cost of basic commodities for local communities
STATES (S) It refers to the current condition of the coastal communities	INFRASTRUCTURE VULNERABLITY: Coastal cities and tourism facilities are at risk from flooding and storm surge.
	DECLINING BIODIVERSITY: Coral bleaching, loss of ma-rine species, ecosystems degradation
	SOCIAL AND ECONOMIC STRUGGLES: displacement of local communities—loss of traditional livelihoods
IMPACT (I) these are the consequences of these changes	ECONOMIC LOSSES: declination of fish population, decline of tourism revenue and increased disaster recovery costs
	HEALTH RISKS: water contamination, food insecurity, and increased disease outbreak

	CULTURAL DISRUPTION: Traditional lifestyles and the heritage that they represent are declining

RESPONSES (R) it pertains to the course of actions taken by the Government to address these issues	SUSTAINABLE TOURISM POLICES: Regulations to limit environmental damage and promote responsible eco-tourism.
	COASTAL PROTECTION MEASURES: building seawalls, restoring mangroves and implementing erosion control strate-gies
	CLIMATE ADAPTATION PLANS: relocation programs, dis-aster preparedness and infrastructure resilience projects
	MARINE CONSERVATION EFFORTS: establishing more protected areas, regulating fishing and reducing marine pollu-tions
	STAKEHOLDERS /COMMUNITY ENGAGEMENT: rein-force the involvement of local populations in decision-making and encourage sustainable practices

The DPSIR (Drivers, Pressures, State change, Impact, Responses) model provides a structured and systematic approach to understanding and addressing the complex challenges faced by the HINP coastal community. Indeed, Sobsahani et al, (2023) demonstrated that this model is effective and supports this research. By providing a structured framework, it provides a way to identify vulnerable areas and propose a sound solution for eco-tourism management that are sustainable. The Drivers, such as population growth, economic activities like tourism and fishing, and the overarching influence of climate change, are the fundamental forces initiating environmental changes. These drivers exert Pressures on the coastal environment, manifesting in direct effects like overfishing, which led to depleting fish stocks, pollution from various sources degrading water quality, deforestation of vital mangrove ecosystems, and unsustainable coastal development altering natural habitats. Consequently, these pressures lead to observable State changes in the environment, including habitat degradation and loss, declining biodiversity and fish populations, rising sea levels inundating coastal areas, and an increased vulnerability of communities to the impacts of typhoons and other extreme weather events. These environmental state changes, in turn, result in significant impacts on human communities, such as the loss of traditional livelihoods dependent on fishing and coastal resources, displacement of populations due to coastal soil erosion and sea-level rise, increasing food insecurity as marine resources dwindle, and heightened disaster risks threatening lives and infrastructure. Finally, the Response component encompasses the various actions undertaken to mitigate or adapt to these challenges, ranging from the implementation of sustainable fishing regulations and the active restoration of mangrove ecosystems to the development and execution of comprehensive disaster preparedness programs and the formulation of climate change adaptation policies. By systematically dissecting the cause-and-effect relationships through the DPSIR framework, policymakers and local communities gain a clearer understanding of the root causes of environmental degradation and can therefore develop and implement more targeted and effective solutions, such as mangrove restoration directly addressing coastal erosion (state change) and the loss of natural storm barriers (impact), or sustainable fishing practices directly reducing the pressures on fragile marine ecosystems.

Conclusion

The coastal communities of the HINP represent a vibrant and diverse tapestry of cultures, lifestyles, and traditions, all deeply and intimately connected to the rhythm and resources of the sea. Their economic activities, ranging from traditional fishing to burgeoning tourism, their unique local customs and celebrations, and their ongoing efforts to confront significant environmental challenges underscore the profound importance of these communities within the national consciousness and their increasing prominence in the global tourism landscape.

Coastal communities depend upon the ocean in three dimensions, economic, cultural and environmental. To this day, fishing is the main way that fisherfolk and indigenous people support themselves and it is a huge part of what they are or who they are. Tourism now makes a larger contribution but is mostly dependent on the weather and seasonal changes. Aside from being economically valuable, the ocean holds value to people culturally and spiritually, therefore making it important in traditional customs and worship. Climate change and environmental problems are altering marine environments that affect communities and biodiversity. The findings underscore the requirement for science and traditional knowledge to be combined in marine resource management and climate adaption policies that promote sustainable use of resources.

In addition to trade, the ocean is involved with coastal communities for culture and tourism purposes. But these relationships are under threat from declining fish stocks and environmental issues for which more conservation effort is needed. Although tourism jobs may continue to be threatened by climate change, the local economy is also growing in its variety. This validates the importance of considering social needs, economic progress and environmental preservation for sustainable long-term results.

One huge obstacle is that the coastal communities and the government don't always see things through the same lens. Coastal residents utilize sustainable activities while government departments work towards long term conservation at times introducing rules that are considered restrictive by the locals. Moreover, most climate adaptation approaches tend to be top down and little community involvement makes for less successful approaches. In order for marine care and disaster readiness to be successful, stakeholders must be brought together and traditional ecological knowledge must be linked with science.

By providing a structured and participatory approach for managing marine resources, Marine Spatial Planning (MSP) is able to address these governance challenges in a tangible manner. Clear delineation of areas for use: e.g. fishing, tourism, renewable energy and conservation, MSP prevents conflict and ensures fair distribution of resources among sectors. It acknowledges the overlapping interests of fisherfolk, tour operators and government regulators, and therefore calls for collaboration rather than

competition. It enables both traditional and modern industries to grow in a strategic spatial organization that also protects ecological integrity which is the more important because of the pressures on marine ecosystems from climate change and economic growth.

MSP also encourages adaptation to climate change through ecosystem-based practices and adaptive management in marine planning. Through its analysis it finds places especially vulnerable to climate change, helps conserve vital coastal habitats such as mangroves and coral reefs and incentivizes the use of renewable energy from the oceans to reduce carbon emissions. By gathering information from both science and the community, MSP helps both how responsive its policies are and how it understands cultural values. It secures coastal areas against the threats of the environment and ensures that they are able to participate in decisions on ocean management. The MSP adds to national and local plans and can promote economic growth as well as ecological and cultural protection.

Although the government acknowledges the role that coastal communities play in protecting the ocean, trying to make sure policies are followed is still a struggle. Unsustainable levels of fishing and tourism that occur during difficult economic times make it even harder to protect the environment. Socioeconomic factors and climate change worsen challenges and lead to worries like sea-level rise and severe weather. To better build sustainability and resilience in coastal governance, coastal areas need to make better local governance, raise awareness of policies and the fair management of natural resources.

A rise in sea levels, fewer fish in the water and increased dangers from disasters are all ways climate change threatens coastal society. Because of coastal erosion and inundation, coastal residents must migrate and indigenous peoples lose their historical lands. Unpredictable weather patterns add more challenges for fisherfolks and increase economic problems. To address climate change, it is important to adapt, become more disaster ready and protect both human livelihoods and ecosystems.

It is shown in the conclusions that there are strong links among coastal society, the marine environment and governance. Economic stability, the preservation of cultural values and the care for the environment should be given equal attention in sustainable development policy. For long-term prosperity, coastal societies should promote engagement with their communities, use traditional knowledge and strengthen their resistance to climate change.

References

1. Escaño Cabotaje, C. (2010). Assessing the feasibility of adopting payments for environmental services (PES) framework in protected area conservation: The case of Hundred Islands National Park, Philippines (Master's thesis, University of Twente). https://purl.utwente.nl/essays/92387
2. Saravia, C. (2024, November 25). The role of coastal communities in ocean sustainability. Seaside. https://www.seasidesustainability.org/post/the-role-of-coastal-communities-in-ocean-sustainability
3. PreventionWeb. (2020). The world's coastlines and communities are under threat – Here are 4 ways to protect them. https://www.preventionweb.net/news/worlds-coastlines-and-communities-are-under-threat-heres-4-ways-protect-them
4. Safford, T. G., & Whitmore, E. H. (2024). How should scientists act? Assessing public perceptions of scientists and scientific practices and their implications for science communication. Journal of Science Communication, 23(08). https://doi.org/10.22323/2.23080205
5. Zuercher, R., Ban, N. C., Flannery, W., Guerry, A. D., Halpern, B. S., Magris, R. A., ... & Kramer, J. G. (2022). Enabling conditions for effective marine spatial planning. Marine Policy, 143, Article 105141. https://doi.org/10.1016/j.marpol.2022.105141
6. Ison, S., Cvitanovic, C., Pecl, G., Hobday, A. J., & van Putten, I. (2024). Participatory research in complex marine conservation settings: A review of recent trends and lessons for the future. Ocean & Coastal Management, 253, Article 107053. https://doi.org/10.1016/j.ocecoaman.2024.107053
7. Aldasoro-Said, G., & Ortiz-Lozano, L. (2021). Marine resource dependence in rural coastal communities south of the Reef Corridor of the Southwest Gulf of Mexico. Ocean & Coastal Management, 211, Article 105778. https://doi.org/10.1016/j.ocecoaman.2021.105778
8. Alongi, D. M. (2020). Global significance of mangrove blue carbon in climate change mitigation. Sci, 2(3), 67. https://doi.org/10.3390/sci2030067
9. Amador, M. M. A., & Naldoza, C. V. (2023). Integrating the local and indigenous knowledge (LiNK) of Barangays Dolo and Manzana in local disaster risk reduction and climate change adaptation planning. Open Access Library Journal, 10(12), 1–13. https://doi.org/10.4236/oalib.1109598
10. Andrews, N., Bennett, N. J., Le Billon, P., Green, S. J., Cisneros-Montemayor, A. M., Amongin, S., Gray, N. J., & Sumaila, U. R. (2021). Oil, fisheries and coastal communities: A review of impacts on the environment, livelihoods, space and governance. Energy Research & Social Science, 75, Article 102009. https://doi.org/10.1016/j.erss.2021.102009
11. Baloch, Q. B., Shah, S. N., Iqbal, N., Sheeraz, M., Asadullah, M., Mahar, S., & Khan, A. U. (2022). Impact of tourism development upon environmental sustainability: A suggested framework for sustainable ecotourism. Environmental Science and Pollution Research, 30(3), 5917–5930. https://doi.org/10.1007/s11356-022-22496-w
12. Castello, L., Carvalho, F., Ornelle, N., Busanga, A. K., Ickowitz, A., & Frimpong, E. A. (2023). An approach to assess data-less small-scale fisheries: Examples from Congo rivers. Reviews in Fish Biology and Fisheries, 33(3), 593–610. https://doi.org/10.1007/s11160-023-09770-x
13. Collier, C. E. (2020). Enabling conditions for communi- ty-based co-management of marine protected areas in the United States. Marine Policy, Article 104244. https://doi.org/10.1016/j.marpol.2020.104244
14. Correia, M. S. (2019). Sustainability: An overview of the triple bottom line and sustainability implementa- tion. IGI Global. https://www.researchgate.net/publication/330057873_Sustainability_An_Overview_of_the_Triple_Bottom_Line_and_Sustainability_Implementation
15. de Sousa, W. L., Zacardi, D. M., & Vieira, T. A. (2022). Traditional ecological knowledge of fishermen: People contributing towards environmental preservation. Sustainability, 14(9), 4899. https://doi.org/10.3390/su14094899

16. Dhar, T., Bornstein, L., Lizarralde, G., & Nazimuddin, S. M. (2023). Risk perception—A lens for understanding adaptive behaviour in the age of climate change? Narratives from the Global South. International Journal of Disaster Risk Reduction, 95, Article 103886. https://doi.org/10.1016/j.ijdrr.2023.103886
17. Dorji, K. R., Morrison-Saunders, A., Blake, D., Banham, V., & Pelden, S. (2024). Understanding how indigenous knowledge contributes to climate change adaptation and resilience: A systematic literature review. Environmental Management. https://doi.org/10.1007/s00267-024-02032-x
18. Engle, C. R., & van Senten, J. (2022). Resilience of communities and sustainable aquaculture: Governance and regulatory effects. Fishes, 7(5), 268. https://doi.org/10.3390/fishes7050268
19. Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., Harding, B., Khatri, D., Lenaerts, L., Liverman, D., Mills-Novoa, M., Mosberg, M., Movik, S., Muok, B., Nightingale, A., Ojha, H., Sygna, L., Taylor, M., Vogel, C., & West, J. J. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance? World Development, 141, Article 105383. https://doi.org/10.1016/j.worlddev.2020.105383
20. Fabinyi, M., Belton, B., Dressler, W. H., Knudsen, M., Adhuri, D. S., Abdul Aziz, A., Akber, M. A., Kittitornkool, J., Kongkaew, C., Marschke, M., Pido, M., Stacey, N., Steenbergen, D. J., & Vandergeest, P. (2022). Coastal transitions: Small-scale fisheries, livelihoods, and maritime zone developments in Southeast Asia. Journal of Rural Studies, 91, 184–194. https://doi.org/10.1016/j.jrurstud.2022.02.006
21. Farmonaut. (2025, January 4). Protecting small-scale fishers: The battle for municipal waters in the Philippines. https://farmonaut.com/asia/protecting-small-scale-fishers-the-battle-for-municipal-waters-in-the-philippines/
22. Frazão Santos, C., Agardy, T., Andrade, F., Calado, H., Crowder, L. B., Ehler, C. N., ... & Rosa, R. (2020). Integrating climate change in ocean planning. Nature Sustainability, 3(7), 505–516. https://doi.org/10.1038/s41893-020-0513-x
23. Griggs, G., & Reguero, B. G. (2021). Coastal adaptation to climate change and sea-level rise. Water, 13(16), 2151. https://doi.org/10.3390/w13162151
24. Haenssgen, M. J., Savage, J., Yeboah, G., Charoenboon, N., & Srenh, S. (2021). In a network of lines that intersect: The socio-economic development impact of marine resource management and conservation in Southeast Asia. World Development, 146, Article 105576. https://doi.org/10.1016/j.worlddev.2021.105576
25. Human Rights Watch. (2020, October 21). "My fear is losing everything": Climate crisis and First Nations' right to food in Canada. https://www.hrw.org/report/2020/10/21/my-fear-losing-everything/climate-crisis-and-first-nations-right-food-canada
26. Jones, P. J. S., & Long, S. D. (2020). Analysis and discussion of 28 recent marine protected area governance (MPAG) case studies: Challenges of decentralisation in the shadow of hierarchy. Marine Policy, Article 104362. https://doi.org/10.1016/j.marpol.2020.104362
27. Mardikian, L., & Galani, S. (2023). Protecting the Arctic Indigenous peoples' livelihoods in the face of climate change: The potential of regional human rights law and the law of the sea. Human Rights Law Review, 23(3). https://doi.org/10.1093/hrlr/ngad020
28. Martinez, G., Costas, S., & Ferreira, Ó. (2020). The role of culture for coastal disaster risk reduction measures: Empirical evidence from northern and southern Europe. Advances in Climate Change Research, 11(4), 297–309. https://doi.org/10.1016/j.accre.2020.11.001
29. McNaught, R. (2024). The application of collaborative governance in local level climate and disaster resilient development: A global review. Environmental Science & Policy, 151, 103627. https://doi.org/10.1016/j.envsci.2023.103627
30. Mudge, L. (2018). Use of community perceptions to evaluate and adapt coastal resource management practices in the Philippines. Ocean & Coastal Management, 163, 304–322. https://doi.org/10.1016/j.ocecoaman.2018.07.008
31. Nuno, A., Matos, L., Metcalfe, K., Godley, B. J., & Broderick, A. C. (2021). Perceived influence over marine conservation: Determinants and implications of empowerment. Conservation Letters. https://doi.org/10.1111/conl.12790
32. Ortiz, A. M., Chua, P., Salvador, D., Jr., Dyngeland, C., Albao, J. D., Jr., & Abesamis, R. (2023). Impact of tropical cyclones on food security, health and biodiversity. Bulletin of the World Health Organization, 101(2), 152–154. https://doi.org/10.2471/blt.22.288838
33. Papageorgiou, M. (2016). Coastal and marine tourism: A challenging factor in marine spatial planning. Ocean & Coastal Management, 129, 44–48. https://doi.org/10.1016/j.ocecoaman.2016.05.006
34. Parsons, M., Taylor, L., & Crease, R. (2021). Indigenous environmental justice within marine ecosystems: A systematic review of the literature on Indigenous peoples' involvement in marine governance and management. Sustainability, 13(8), 4217. https://doi.org/10.3390/su13084217
35. Parveen, K. H., V. K., S., P., B., Muhammed, J., & Augustine, A. (2024). Mangroves in environmental engineer- ing: Harnessing the multifunctional potential of nature's coastal architects for sustainable ecosystem management. Results in Engineering, 101765. https://doi.org/10.1016/j.rineng.2024.101765
36. Paxton, A. B., Riley, T. N., Steenrod, C. L., Smith, C. S., Zhang, Y. Z., Gittman, R. K., Silliman, B. R., Buckel, C. A., Viehman, T. S., Puckett, B. J., & Davis, J. (2023). What evidence exists on the performance of nature-based solutions interventions for coastal protection in biogenic, shallow ecosystems? A systematic map protocol. Environmental Evidence, 12(1). https://doi.org/10.1186/s13750-023-00303-4
37. Pennino, M. G., Brodie, S., Frainer, A., Lopes, P. F., Lopez, J., Ortega-Cisneros, K., … & Vaidianu, N. (2021). The missing layers: Integrating sociocultural values into marine spatial planning. Frontiers in Marine Science, 8, 633198. https://doi.org/10.3389/fmars.2021.633198
38. Peer, N., Muhl, E.-K., Janna, J., Brown, M., Zukulu, S., & Mbatha, P. (2022). Community and marine conservation in South Africa: Are we still missing the mark? Frontiers in Marine Science, 9. https://doi.org/10.3389/fmars.2022.884442
39. Pham, C.-V., Wang, H.-C., Chen, S.-H., & Lee, J.-M. (2023). The threshold effect of overfishing on global fishery outputs: International evidence from a sustainable fishery perspective. Fishes, 8(2), 71. https://doi.org/10.3390/fishes8020071
40. Pilare, & Acledan, M. Y. (2024). Environmental literacy and

pro-environmental behavior of pre-service science educators: The mediating effect of their climate change awareness. International Journal for Multidisciplinary Research, 6(5). https://doi.org/10.36948/ijfmr.2024.v06i05.29810
41. Poto, M. P., Kuhn, A., Tsiouvalas, A., Hodgson, K. K., Treffenfeldt, M. V., & Beitl, C. M. (2021). Knowledge integration and good marine governance: A multidisciplinary analysis and critical synopsis. Human Ecology. https://doi.org/10.1007/s10745-021-00289-y
42. Raquel, Piñeiro-Corbeira, C., Gutiérrez-Barroso, J. J., González-Cruz, C., Barreiro, R., Batista-Medina, J. A., Pascual-Fernández, J. J., González, J. A., Santana Talavera, A., & Aswani, S. (2022). Small but strong: Socioeconomic and ecological resilience of a small European fishing community affected by a submarine volcanic eruption. Ocean & Coastal Management, 223, 106124. https://doi.org/10.1016/j.ocecoaman.2022.106124
43. Recio, E., & Hestad, D. (2022, April 22). Indigenous peoples: Defending an environment for all. International Institute for Sustainable Development. https://www.iisd.org/articles/deep-dive/indigenous-peoples-defending-environment-all
44. Sobhani, P., Esmaeilzadeh, H., Wolf, I. D., Deljouei, A., Marcu, M. V., & Sadeghi, S. M. M. (2023). Evaluating the ecological security of ecotourism in protected areas based on the DPSIR model. Ecological Indicators, 155, 110957. https://doi.org/10.1016/j.ecolind.2023.110957
45. Salgueiro-Otero, D., Barnes, M. L., & Ojea, E. (2022). Transformation in times of climate change: What makes a fisher diversify livelihoods? Frontiers in Marine Science, 9. https://doi.org/10.3389/fmars.2022.888288
46. Scott, D. (2021). Sustainable tourism and the grand challenge of climate change. Sustainability, 13(4), 1966. https://doi.org/10.3390/su13041966
47. Sufri, & Lassa, J. A. (2024). Integration of disaster risk reduction (DRR) and climate change adaptation (CCA) in Aceh province: Progress and challenges after 20 years of Indian Ocean tsunamis. International Journal of Disas- ter Risk Reduction, 104894. https://doi.org/10.1016/j.ijdrr.2024.104894
48. Sunkur, R., Kantamaneni, K., Bokhoree, C., & Ravan, S. (2023). Mangroves' role in supporting ecosystem-based techniques to reduce disaster risk and adapt to climate change: A review. Journal of Sea Research, 196, 102449. https://doi.org/10.1016/j.seares.2023.102449
49. Tai, T. C., Sumaila, U. R., & Cheung, W. W. L. (2021). Ocean acidification amplifies multi-stressor impacts on global marine invertebrate fisheries. Frontiers in Marine Science, 8. https://doi.org/10.3389/fmars.2021.596644
50. Venegas, R. M., Acevedo, J., & Treml, E. A. (2023). Three decades of ocean warming impacts on marine ecosystems: A review and perspective. Deep-Sea Research Part II: Topical Studies in Oceanography, 212, 105318. https://doi.org/10.1016/j.dsr2.2023.105318
51. Viana, D. F., Zamborain-Mason, J., Gaines, S. D., Schmidhuber, J., & Golden, C. D. (2023). Nutrient supply from marine small-scale fisheries. Scientific Reports, 13(1). https://doi.org/10.1038/s41598-023-37338-z
52. Zafra, M. (2021). Developing the Philippine blue economy: Opportunities and challenges in the ocean tourism sector. Asian Development Bank Institute. https://www.econstor.eu/bitstream/10419/249470/1/adbi-wp1291.pdf