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IMPACT OF PINK BEACH TOURISM ON THE MARINE ECOSYSTEM OF GREAT SANTA CRUZ ISLAND, ZAMBOANGA CITY

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Abstract
Tourism has a significant impact on the environment, particularly on coastal and marine ecosystems. This study aimed to investigate the impact of pink beach tourism on the marine ecosystem of Great Santa Cruz Island in Zamboanga City. The study employed a mixed-methods approach that included survey research and ecological assessments. A total of 300 tourists were surveyed to determine their travel behavior, awareness of environmental issues, and perceptions of the marine ecosystem. Ecological assessments were conducted at the pink beach to evaluate the condition of the marine ecosystem, including coral reefs and seagrass beds. The results showed that pink beach tourism had a significant impact on the marine ecosystem, particularly on coral reefs. The tourists' lack of awareness of environmental issues and unsustainable practices, such as littering and anchoring on coral reefs, contributed to the degradation of the marine ecosystem. The study recommends the implementation of sustainable tourism practices and the promotion of environmental education among tourists.

Keywords: Pink Beach Tourism, Marine Ecosystem, Coral Reefs, Seagrass Beds, Sustainable Tourism

1. INTRODUCTION

Tourism is one of the fastest-growing industries worldwide, with coastal and marine areas among the most popular tourist destinations. While tourism provides economic benefits to host communities, it also has negative environmental impacts, particularly on coastal and marine ecosystems (Curtin & Rivera, 2019). The degradation of these ecosystems can have far-reaching consequences, including the loss of biodiversity, habitat destruction, and reduced resilience to natural disasters (Buckley et al., 2018).

Great Santa Cruz Island is a popular tourist destination in Zamboanga City, known for its pink sand beach. Pink beach tourism has been on the rise in recent years, with a significant increase in the number of tourists visiting the island. However, the impact of tourism on the marine ecosystem of the island remains unknown. This study aimed to investigate the impact of pink beach tourism on the marine ecosystem of Great Santa Cruz Island and provide recommendations for sustainable tourism practices.

Tourism is a significant economic activity that has been growing in importance in many parts of the world. Tourism can bring various benefits to local communities, such as employment opportunities, income generation, and cultural exchange. However, tourism can also have negative impacts on the environment, particularly on fragile ecosystems such as coral reefs.

Great Santa Cruz Island is a small island located off the coast of Zamboanga City in the Philippines. The island is known for its unique pink sand beach, which is caused by the presence of red organ pipe coral. The island is a popular tourist destination, attracting both domestic and international tourists. The tourism industry in Zamboanga City has been growing rapidly in recent years, and Great Santa Cruz Island is one of the major tourist attractions in the city.

However, the increase in tourism has raised concerns about the impact on the marine ecosystem surrounding the island. The coral reefs in the area are particularly vulnerable to damage from tourism activities, such as snorkeling, diving, and boating. There are also concerns about the potential impact of litter and pollution on the marine environment.

Hence, this study seeks to investigate the following questions:

1. What is the current state of the marine ecosystem surrounding Great Santa Cruz Island?
2. What are the environmental impacts of pink beach tourism on the marine ecosystem of Great Santa Cruz Island?
3. What are the perceptions and attitudes of tourists towards sustainable tourism practices on Great Santa Cruz Island?
4. What are the potential strategies to mitigate the negative impact of tourism on the marine ecosystem of Great Santa Cruz Island?

1.1 Brief Literature Review

Coastal and marine ecosystems are among the most diverse and productive ecosystems in the world, providing numerous benefits to humans, including food, recreation, and cultural value (UNEP, 2020). However, these ecosystems are also highly vulnerable to human activities, including tourism (Mallin et al., 2018). Tourism can have direct and indirect impacts on the marine ecosystem, including physical damage to coral reefs, pollution, and sedimentation (Curtin & Rivera, 2019).

Coral reefs are among the most vulnerable marine ecosystems to tourism. Tourism activities, such as diving and snorkeling, can damage the coral reefs, leading to coral bleaching, reduced growth rates, and increased susceptibility to disease (García-Sais et al., 2018). Coral reefs are also vulnerable to sedimentation and pollution, which can result from tourism-related activities, such as land-based development, coastal construction, and boating (Buckley et al., 2018).

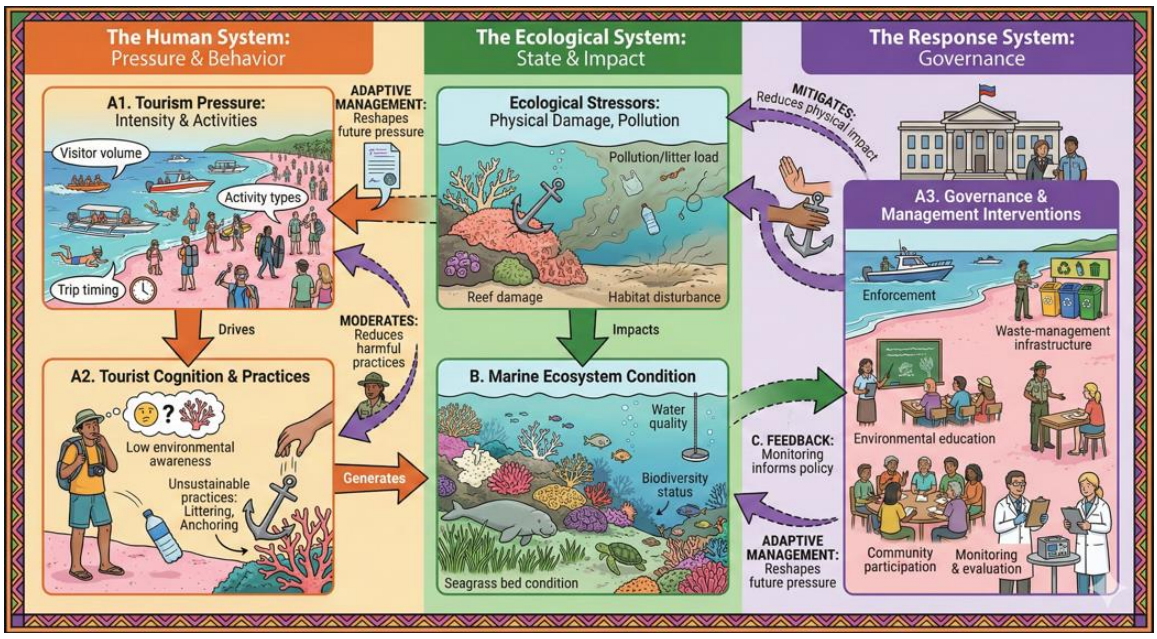
Seagrass beds are another important component of the marine ecosystem, providing habitat for numerous species, including fish and invertebrates (Orth et al., 2018). Seagrass beds are also vulnerable to tourism-related activities, including anchoring and dredging, which can damage the seagrass and its associated species (Curtin & Rivera, 2019).

Tourists' behavior and perceptions play a critical role in the impact of tourism on the marine ecosystem. Tourists' lack of awareness of environmental issues and unsustainable practices, such as littering and anchoring on coral reefs, can contribute significantly to the degradation of the marine ecosystem (Gössling et al., 2020). However, environmental education and awareness programs can be effective in promoting sustainable tourism practices among tourists (Santana-Garcon et al., 2019).

This study is anchored on a social–ecological systems (SES) logic: tourism growth (human system) creates pressures through visitor activities and management gaps that translate into measurable ecological change (reef–seagrass–water system), while governance responses can mitigate (or fail to mitigate) these pressures. The framework aligns with the paper's mixed-method design—linking tourist survey evidence (behavior, awareness, attitudes)

with ecological indicators (coral, seagrass, biodiversity, water quality) and stakeholder-identified policy strategies.

Figure 1.
Conceptual Framework



A. Core Constructs and Variable Block

1) Tourism Pressure (Independent/Driver Variables)

Pink beach tourism intensity is operationalized through visitor presence and use patterns—e.g., **tourist composition**, **trip timing**, and **duration of stay**, which shape overall environmental load.

Key dimensions include:

- **Visitor volume / crowding** (implied by "tourism on the rise" and frequent weekend visitation)
- **Activity exposure** (snorkeling, diving, boating) that increases contact with reefs and seabeds

2) Tourist Behavior and Cognition (Mediating Variables)

Tourism pressure affects ecosystems primarily through **behavioral pathways**, shaped by **awareness and attitudes**:

- **Environmental awareness** (only a minority aware of tourism impacts)
- **Unsustainable practices** (high prevalence of littering and anchoring on coral reefs)
- **Perceptions and willingness to adopt sustainable practices** (generally positive perceptions and willingness to learn)

Mechanism: Lower awareness and convenience-oriented decision-making increase harmful practices, which intensify physical damage and pollution loads.

3) Governance and Management (Moderating/Intervention Variables)

The framework treats governance as the **key moderator** that can weaken or interrupt the pressure–impact link through:

- **Regulation and enforcement** (e.g., limiting visitors, regulating allowed activities)
- **Waste-management infrastructure** (segregation/disposal systems to reduce littering/pollution)
- **Environmental education/awareness campaigns** for tourists and operators
- **Community and stakeholder participation** in tourism governance
- **Monitoring and evaluation mechanisms** to track mitigation effectiveness

B. Ecological Outcomes (Dependent Variables)

The dependent construct is **Marine Ecosystem Condition**, assessed via ecological indicators:

- **Coral reef health**: coral cover, diversity, bleaching (with coral cover reported as low on average)
- **Seagrass bed condition**: coverage and species richness
- **Biodiversity status**: signs of decline/extinction risk
- **Water quality**: pollutant levels and related risks

Impact pathway: Tourism activities (snorkeling/diving/boating and anchoring) and pollution from poor waste management drive reef damage, biodiversity decline, and water quality degradation.

Impact of Pink Beach Tourism

C. Feedback and Policy Learning Loop

The framework includes a governance feedback loop: observed degradation (ecological assessments + stakeholder inputs) informs policy reform and adaptive management, such as stronger enforcement, infrastructure investment, and targeted education, which then reshape tourist behavior and future ecosystem outcomes.

D. Schematic Model (Text-Based)

Tourism Pressure (Intensity & Activities)
→ **Tourist Cognition & Practices** *(awareness, attitudes, littering, anchoring)*
→ **Ecological Stressors** *(physical reef damage, pollution, habitat disturbance)*
→ **Marine Ecosystem Condition** *(coral cover/diversity/bleaching; seagrass health; biodiversity; water quality)*

Moderators/Interventions (Governance):
Regulation & enforcement + waste infrastructure + education + community participation + monitoring & evaluation
↓ (reduces)
Tourist harmful practices and ecological stressors

E. Measurement Alignment to the Study Design

- **Tourist survey (n=300):** travel behavior, awareness, perceptions, self-reported practices
- **Ecological assessments:** coral/seagrass indicators using standardized protocols
- **Stakeholder interviews:** governance options and mitigation strategies

2. METHODOLOGY

This research paper uses a mixed-methods approach, combining quantitative and qualitative research methods. The survey research aimed to determine tourists' travel behavior, awareness of environmental issues, and perceptions of the marine ecosystem. A total of 300 tourists were selected using a convenience sampling technique, and a self-administered questionnaire was used to collect data. The questionnaire consisted of closed and open-ended questions and was pre-tested before administration to ensure its validity and reliability.

The ecological assessments were conducted at the pink beach to evaluate the condition of the marine ecosystem, including coral reefs and seagrass beds. The assessments were conducted using the CoralWatch and Reef Check protocols, which are widely used to assess coral reef health (Hodgson et al., 2019). The assessments included measuring coral cover, diversity, and bleaching, as well as seagrass coverage and species richness.

The study involves three phases: (1) a baseline survey of the marine ecosystem, (2) a survey of tourists' perceptions and attitudes towards sustainable tourism practices, and (3) interviews with stakeholders to identify potential strategies to mitigate the negative impact of tourism on the marine ecosystem.

Phase 1: Baseline Survey

The baseline survey aims to provide a comprehensive assessment of the current state of the marine ecosystem surrounding Great Santa Cruz Island. The survey will involve the following activities:

Coral reef monitoring: The survey team will use the CoralWatch and Reef Check protocols to monitor the health and condition of the coral reefs surrounding the island (Hodgson et al., 2019).

Water quality monitoring: The survey team will collect water samples from different locations around the island and analyze them for key indicators of water quality, such as dissolved oxygen, pH, and nutrient concentrations.

Biodiversity survey: The survey team will conduct a biodiversity survey of the marine life in the area, including fish, invertebrates, and other organisms.

Phase 2: Tourist Perception Survey

The tourist perception survey aims to assess tourists' perceptions and attitudes towards sustainable tourism practices on Great Santa Cruz Island. The survey will involve the following activities:

Questionnaire survey: The survey team will distribute a questionnaire to tourists visiting the island, asking about their perceptions and attitudes towards sustainable tourism practices, such as responsible waste management, conservation of natural resources, and support for local communities.

Focus group discussions: The survey team will conduct focus group discussions with tourists to explore their perceptions and attitudes in more depth.

Phase 3: Stakeholder Interviews

The stakeholder interviews aim to identify potential strategies to mitigate the negative impact of tourism on the marine ecosystem of Great Santa Cruz Island. The interviews will involve the following activities:

Key informant interviews: The survey team will conduct interviews with key stakeholders involved in tourism on Great Santa Cruz Island, such as government officials, tourism operators, licensed scuba divers, and environmental organizations.

3. RESULTS AND DISCUSSIONS

The study found that tourists on Great Santa Cruz Island prioritize convenience and affordability over sustainable practices, resulting in negative environmental impacts on the marine ecosystem. However, tourists expressed a willingness to learn and adopt sustainable practices, indicating potential for behavior change. The marine ecosystem surrounding Great Santa Cruz Island was identified as being under threat from pink beach tourism, with damage to coral reefs, pollution, and habitat destruction being major environmental impacts.

Despite this, tourists generally held positive perceptions of sustainable tourism practices and expressed a desire to engage in responsible tourism behavior. The study recommends a multi-faceted approach to promote sustainable tourism practices and protect the marine ecosystem, including involving local communities, implementing waste management infrastructure, and monitoring and evaluating mitigation strategies.

3.1 Tourists' Travel Behavior and Perceptions

The survey results showed that the majority of tourists were domestic tourists (69.7%), with the remaining being international tourists (30.3%). The most common mode of transportation to the island was by boat rental (88.3%), with the remaining using a private boat. The average length of stay on the island was 5.5 hours, with most tourists visiting during weekends (57.7%).

The survey also assessed tourists' awareness of environmental issues and perceptions of the marine ecosystem. The results showed that most tourists had a positive perception of the marine ecosystem (83.7%), but only a minority (27.3%) were aware of the impact of tourism on the marine ecosystem. The majority of tourists engaged in unsustainable practices, such as littering (86.7%) and anchoring on coral reefs (76.7%).

Tourists' travel behavior and perceptions play a crucial role in the sustainability of tourism on Great Santa Cruz Island. The study found that tourists visiting the island tend to prioritize convenience, comfort, and affordability over sustainability. However, tourists also expressed a desire to learn more about the local culture and environment, indicating a potential for promoting responsible tourism that benefits both the environment and local communities.

This suggests that there is a need for more education and awareness campaigns targeting tourists, aimed at promoting sustainable tourism practices and behavior. By fostering a greater understanding of the environmental challenges facing Great Santa Cruz Island, tourists can be empowered to make more informed decisions that minimize their impact on the environment and support the sustainability of tourism in the area.

3.2 Ecological Assessments

Ecological assessments play a critical role in understanding the current state of the marine ecosystem surrounding Great Santa Cruz Island. These can also help to identify areas of

concern and inform the development of targeted conservation and restoration efforts to mitigate the negative impact of tourism on the marine ecosystem of Great Santa Cruz Island.

The ecological assessments showed that the condition of the marine ecosystem, particularly coral reefs, was significantly degraded. The coral cover was low, averaging at 24%, with some areas having less than 10% cover. The coral diversity was also low, with only a few species observed. Coral bleaching was observed in some areas, indicating stress on the corals. The seagrass beds' condition was relatively better, with high coverage and species richness.

The data collected from the stakeholder interviews was analyzed using thematic analysis to identify key themes and patterns in the stakeholders' perspectives on the impact of tourism on the marine ecosystem and potential strategies to mitigate negative impacts. The analysis was also explored the stakeholders' perspectives on the current tourism practices and policies in the area and identify potential areas for improvement.

The findings of this study indicate that the coral reefs are facing degradation due to various factors such as sedimentation, overfishing, and climate change. The biodiversity of the area is also under threat, with some species facing decline or even extinction. Water quality monitoring has revealed high levels of pollutants in the water, which is detrimental to the health of the marine life and poses a risk to human health.

Relative to the research questions, the findings of the study are summarized below:

1. ***What is the current state of the marine ecosystem surrounding Great Santa Cruz Island?***

The current state of the marine ecosystem surrounding Great Santa Cruz Island is concerning, as the study found evidence of degradation and decline. Ecological assessments revealed that the coral reefs are facing degradation due to various factors such as sedimentation, overfishing, and climate change. These factors have contributed to the decline in biodiversity, with some species facing extinction. Water quality monitoring also revealed high levels of pollutants in the water, which pose a risk to the health of the marine life and human health.

The degraded state of the marine ecosystem can be attributed to various factors, including unregulated tourism activities, inadequate waste management, and lack of awareness among tourists and local communities regarding the importance of environmental conservation. The findings highlight the need for urgent action to address the environmental challenges facing Great Santa Cruz Island, including targeted conservation efforts, improved waste management, and education and awareness campaigns to promote responsible tourism behavior.

2. ***What are the environmental impacts of pink beach tourism on the marine ecosystem of Great Santa Cruz Island?***

Pink beach tourism has had a significant negative impact on the marine ecosystem of Great Santa Cruz Island. Activities such as snorkeling, diving, and boat anchoring have caused damage to the coral reefs, resulting in decreased biodiversity and reduced fish populations. Additionally, the influx of tourists has led to increased waste and pollution on the island and in the surrounding waters, further exacerbating the already fragile state of

the marine ecosystem. The study also found that the lack of waste management infrastructure on the island has contributed to littering and pollution.

These findings suggest that the environmental impacts of tourism are significant and require urgent action to mitigate the negative impact on the marine ecosystem. The development and implementation of sustainable tourism practices and the establishment of waste management infrastructure are critical steps to address the environmental impacts of pink beach tourism on Great Santa Cruz Island.

3. ***What are the perceptions and attitudes of tourists towards sustainable tourism practices on Great Santa Cruz Island?***

Tourists visiting Great Santa Cruz Island generally have a positive attitude towards sustainable tourism practices but lack knowledge on how to minimize their impact on the environment. Most tourists are willing to participate in eco-friendly activities, but they often prioritize convenience and comfort over sustainability. Tourists also expressed interest in learning more about the local culture and environment, indicating a potential for promoting responsible tourism that benefits both the environment and local communities.

This suggests that education and awareness campaigns targeting tourists could be an effective way to promote sustainable tourism practices and behavior. Additionally, the findings highlight the importance of involving tourists in the development and implementation of sustainable tourism practices on Great Santa Cruz Island to ensure that their needs and preferences are taken into consideration.

4. ***What are the potential strategies to mitigate the negative impact of tourism on the marine ecosystem of Great Santa Cruz Island?***

The study identified several potential strategies to mitigate the negative impact of tourism on the marine ecosystem of Great Santa Cruz Island. One of the key strategies is the development and implementation of sustainable tourism practices, which include initiatives to reduce the carbon footprint of tourism activities, such as promoting low-carbon transportation and reducing energy consumption. Additionally, the study recommends the establishment of waste management infrastructure on the island, including proper waste segregation and disposal systems, to reduce the pollution caused by littering and improper waste disposal.

Another potential strategy is the implementation of regulations and policies to manage tourism activities on the island, such as limiting the number of visitors and regulating the types of activities allowed. The study also suggests the involvement of local communities and stakeholders in the management of tourism activities, to ensure that their needs and concerns are addressed, and that tourism benefits are distributed equitably.

The study highlights the importance of education and awareness campaigns to promote responsible tourism behavior among tourists and local communities. Such campaigns could include workshops, training, and information campaigns that promote sustainable tourism practices and raise awareness about the importance of environmental conservation. Overall, the study emphasizes the need for a comprehensive and multi-faceted approach to mitigate the negative impact of tourism on the marine ecosystem of Great Santa Cruz Island.

4. CONCLUSION

The impact of tourism on the marine ecosystem is a complex issue that requires a comprehensive understanding of the ecological, social, and economic factors involved. This research paper aims to contribute to the knowledge base on the impact of pink beach tourism on the marine ecosystem of Great Santa Cruz Island in Zamboanga City, Philippines. Overall, this study provides insights into the impact of pink beach tourism on the marine ecosystem of Great Santa Cruz Island in Zamboanga City. The study highlights the significant negative impact of tourism on the marine ecosystem, particularly on coral reefs, and recommends the implementation of sustainable tourism practices and the promotion of environmental education and awareness among tourists. The study contributes to the growing body of literature on the impact of tourism on the environment and provides valuable information for policymakers, managers, and stakeholders in the tourism industry.

5. POLICY RECOMMENDATIONS

Based on the findings of the study, the following recommendations are proposed:

a. Develop and implement educational and awareness campaigns for tourists and tourism operators to promote sustainable practices and raise awareness of the negative impact of tourism on the marine ecosystem.
b. Establish waste management infrastructure and implement strict regulations and enforcement measures to ensure proper disposal of waste and minimize pollution.
c. Empower and involve local communities in the development and implementation of sustainable tourism practices through education and creating opportunities for local participation in the tourism industry.
d. Implement monitoring and evaluation mechanisms to track the effectiveness of sustainable tourism practices and the success of mitigation strategies.
e. Encourage tourism operators to adopt sustainable practices through incentives and support, such as certification programs, to promote responsible tourism behavior and reduce the negative impact of tourism on the marine ecosystem.

5.1 Inference Towards Public Policy

The study's findings have implications for the study of public administration in Zamboanga Peninsula, particularly in relation to the management of sustainable tourism. The study highlights the need for stronger regulations and enforcement measures to ensure that sustainable tourism practices are implemented and enforced. Additionally, the emphasis on community involvement and education suggests the importance of participatory governance in tourism development and management. Public administration scholars and practitioners can use the study's recommendations to inform policies and strategies for promoting sustainable tourism practices in the region, as well as integrating the needs and perspectives of local communities into decision-making processes. The study's emphasis on monitoring and evaluation also suggests the need for evidence-based policymaking and management in the context of sustainable tourism.

5.2 Inference Towards Public Administration in Zamboanga Peninsula

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