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The impact of climate change on tourism and socio-culture in Depok Beach

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Abstract

Purpose - The purpose of this study is to measure tourists' perceptions of the quality of sustainable tourism services in Lombok and analyze which dimensions of service quality most influence tourist satisfaction.

Methodology/Design/Approach - The study involves both domestic and foreign tourists, analyzing their perceptions of sustainable tourism services. It examines various dimensions of service quality, including environmental sustainability, local wisdom, and facilities, to understand their impact on tourist satisfaction.

Finding - The study found that tourists highly value environmental sustainability, local wisdom, and the quality of facilities. These factors significantly influence their satisfaction with sustainable tourism services in Lombok.

Originality/Value - This research provides valuable insights into how sustainable tourism practices, particularly those focused on environmental and cultural aspects, contribute to tourist satisfaction. It emphasizes the importance of incorporating local wisdom and quality facilities into sustainable tourism development to enhance the overall visitor experience in Lombok.

Keywords: Climate Change, Tourist Destinations, Sustainable Tourism, Tourism and Climate Resilience

Introduction

Depok Beach is one of the beaches located in the southern coastal area of Yogyakarta. Depok Beach with its unique beach is one of the main destinations for tourists to enjoy the beauty of the beach while enjoying culinary dishes that is mainly seafood dishes. The existence of restaurants located on the coastal stretching on the beach by serving various processed seafood, as well as traditional fishery activities, makes Depok Beach both an economic center of and a tourism destination in the coastal area of Bantul.

However, like many tourist destinations in other coastal areas, Depok Beach faces serious challenges due to the impact of weather changes influenced by global climate change. Phenomena such as coastal abrasion, increased storm intensity, and extreme rainfall pose a real threat to the sustainability of the coastal environment (Abrasion et al., 2022; Armono et al., 2023; Haq et al., 2023; Savitri, 2023). The abrasion that continues to occur causes

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the coastline to erode, thus threatening the existence of tourist infrastructures, such as parking areas, food stalls, and main road access. In addition, increasingly frequent and intense storms worsen coastal conditions, damage tourist facilities, and endanger the safety of tourists.

Weather changes also have a direct impact on the social and economic life of the surrounding community (Abbass et al., 2022). Most of the residents of Depok Beach depend on the fisheries and tourism sectors for their livelihoods (Putri et al., 2024). Seasonal uncertainty and extreme weather often hamper fishing activities, which ultimately reduces the supply of fresh fish to traditional markets and restaurants around the beach (BPS, 2023). This not only affects the income of fishermen, but also reduces the attractiveness of culinary tourism, which is one of the characteristics of Depok Beach in relation to tourism potential.

In addition to the physical and economic impacts, weather changes also affect the sustainability of local traditions that are closely related to the lives of coastal communities (Fu, 2020). Traditional ceremonies and customs that are usually held on the beach are often disrupted by uncertain weather conditions, thus presenting challenges in preserving local cultural values. Based on these challenges, integrated efforts are needed to maintain the sustainability of Depok Beach as a tourist destination as well as the economic center of the community. A sustainable tourism-based approach can be a solution in addressing the impacts of climate change, while maintaining the cultural and social values of local communities (Song, 2023). Based on the description above, research is needed to answer how the impact of climate change affects the preservation of local culture on Depok Beach, and how can a sustainable tourism approach help address the impact of climate change on Depok Beach.

Methode

The research uses a qualitative descriptive approach. Data collection was carried out by conducting interviews with local community informants and Depok Beach tourism managers. This aims to get diverse perspectives on the impact of weather change on the region. Then it is carried out by observation through direct observation at the location to see the physical conditions, human activities, and environmental changes that occur. This data supports the results of the interviews. In addition, literature reviews are carried out using references from journals, books, and other documents to strengthen theoretical analysis of the impact of climate change.

Findings and discussion

The Impact of Weather Change on the Environment on Depok Beach

Depok Beach is located in Bantul Regency, Yogyakarta, Indonesia, with geographical coordinates at Latitude: -8.1144° S, Longitude: 110.2676° E. Most of the surrounding residents on Depok Beach area have livelihood as fishermen and the tourism sector. Residents who live close to the coastal area are the main supporting factor in the study of differences in coastlines and vice versa (Umar, H., Rachman, T., & Sari, 2019). With this, the impact of weather change is felt by the surrounding community. Based on this position, Depok Beach is a coastal area with great potential as a tourist destination. However, because of its position around the Indian Ocean, this beach is often exposed to extreme weather and large waves, which have an impact on the ecosystem and economy of the local community. In addition, one of the impacts of this weather change is abrasion.

The phenomenon of abrasion on the beach due to sea level rise and high waves has led to a reduction in the beach area, which has a direct impact on tourist attractions (Fu, 2020). This abrasion occurs due to extreme rainfall that has an impact on beach cleanliness, because flowing

water carries garbage from the mainland to coastal areas. Abrasion occurs due to stronger sea waves, triggered by extreme weather and increased storm frequency, causing coastline erosion. In addition, rising air temperatures threaten the continuity of the marine ecosystem, which also has an impact on fishermen's catches, which are an important part of the culinary tourism sector on Depok Beach.

Figure 1. Location Depok Beach
Source : https://www.google.com/maps/place/Depok

Socio-Cultural Impact on Local Communities

This socio-cultural impact on local communities has affected the lives of fishermen, and the unpredictable weather causes uncertainty in carrying out their activities. These weather changes result in storms and high waves. This incident has disrupted the duration and schedule of going to sea. In addition, weather changes also result in changes in sea temperature, thus having an impact on fish catches and types of fish catches. This change has an impact on the social conditions of existing fishermen. Fishermen who depend heavily on fishing for their livelihood will lean more on the edge of the beach waiting for good weather conditions.

In addition, the uncertainty of these weather changes is exacerbated by cultural taboos, in which fishermen must stop going to sea on certain days (such as Tuesday *Kliwon* and Friday *Kliwon*). While this is part of traditional beliefs, in the context of climate change, frequent weather uncertainty makes time at sea even more limited. This time limitation has the potential to reduce fishermen's income.

Weather changes have affected the performance of communities that depend on tourism and fisheries. Fishermen's activities are often disrupted by bad weather (Boda & Jerneck, 2019), which in turn has an impact on the supply of seafood for fish markets and restaurants around Depok Beach. In addition, local cultural activities, such as *labuhan* traditions or traditional ceremonies, are also disrupted by uncertain weather conditions, posing challenges in preserving cultural values.

Impact on Tourism on Depok Beach

Weather changes also have an impact on the tourism sector due to abrasion. The abrasion that has occurred on Depok Beach has resulted in several things in the field of tourism. These include:

a. Narrowing of the Tourist Area

The narrowing of this tourist area is due to the expansion of the beach area, thereby reducing the space for movement and tourist activities. These activities include walking on the beach, playing in the sand and enjoying the waves. This narrowing also affects the visual aesthetic value of the beach. This is because abrasion has resulted in damage to the coastline, so the visualization has changed.

Figure 2. Tourist Area in Depok Beach
Source: Field survey, 2024

Figure 3. Tourist Area in Depok Beach
Source: Field survey, 2024

b. Infrastructure Damage:

Tourist facilities are damaged due to abrasion, these facilities include food stalls, gazebos, and parking lots. Many of these facilities become damaged, especially after abrasion during the change of weather from good weather to extreme weather. Several food stalls and gazebos where tourists enjoy the typical dishes of Depok Beach and enjoy the beauty of Depok Beach have been destroyed. Hence, this damage has reduced the comfort of tourists in enjoying the view of the beach as well as a location to take selfies. Meanwhile, the owners of food stalls were forced to close their stalls temporarily until conditions improved with calculations and predictions that could not be determined with certainty. In fact, this culinary stall typical of Depok Beach is one of the main attractions for tourists to visit.

Figure 4. Tourist facilities
Source: Field survey, 2024

Figure 5. Tourist facilities
Source: Field survey, 2024

c. Decline in Tourism Sector Revenue
The low level of tourist visits during climate change will have an impact on the closure of culinary stalls and fish sellers on the beach, so that it will directly affect the income of the people around Depok Beach who depend on the tourism sector for their livelihoods. In addition, the fisheries sector is also highly dependent on the tourism sector, as the supply of fresh fish is the main attraction for visitors who come to enjoy seafood. If tourist facilities are damaged, the number of tourists will decrease, which will have an impact on income from the tourism sector.

d. Impact on Tourism and Fisheries Sector Workers
Based on the impacts above, there is one factor that is affected by this weather change, namely Tourism and Fisheries Sector Workers. Many residents around Depok Beach depend on this sector for their economy, so if there is a change in the weather, it will have an impact on tourism economic activities. Not only fishermen, traders in culinary but also small business actors, such as traders who sell souvenirs or local goods, will also feel the impact. The lack of tourists visiting has led to a decline in turnover and increased poverty among coastal communities. Workers in the tourism sector, such as the managers of culinary stalls, and their employees have been affected due to the reduced demand for tourists. Reduction in working hours or even layoffs have occurred in these sectors, further worsening the economic situation of local communities.

e. Garbage Pile
Extreme weather changes have resulted in high rainfall that brings garbage from the Opak river to Depok Beach. This condition has worsened the cleanliness and aesthetics of the beach, thus disrupting the comfort of tourists. Every time there is an increase in rainfall, the river discharge in the Opak River area and other streams becomes large by carrying garbage flows. This waste is diverse, ranging from plastic waste, household waste to garbage from tree trunks that have collapsed and carried away by the river stream. This becomes scattered around Depok Beach, thus reducing the beauty of the beach.

f. Threats to Tourism Sustainability
Coastal Ecosystem Damage: Abrasion threatens coastal vegetation and marine habitats that are ecological tourism attractions. The loss of biodiversity will reduce the interest of tourists.

g. Tourist Safety: Severe abrasion can create dangerous situations such as erosion approaching building areas or roads, which can endanger tourists.

Conclusion

Weather changes have a significant impact on environmental sustainability and socio-cultural life on Depok Beach. A sustainable tourism approach is needed to combine environmental mitigation efforts and the preservation of local values, so that Depok Beach remains an attractive and sustainable destination for tourists.

In a more detailed discussion, it is presented in Table 1.1.

Focus Area	Impact	Stakeholders Involved	Coordination Mechanism	Expected Results
1. Understanding Climate Change Risks	- Identify climate change risks (e.g., flooding, abrasion).	Local governments, universities, community organizations, tourism managers.	Workshops, surveys, community meetings.	Comprehensive assessment of risks and vulnerabilities.
	- Analysis of socio-cultural and tourism impacts.	Local cultural leaders, tourism sector, local residents.	Group discussions, surveys.	A clear understanding of socio-cultural impacts.
2. Strengthening Risk Governance	- Facilitate cross-sector collaboration.	Local governments, NGOs, the private sector (tourism, infrastructure).	Memorandum of understanding, working team together.	Better coordination and shared responsibility.
	- Carry out awareness campaigns about climate change risks.	Educational institutions, local media, community leaders.	Public campaigns, social media.	Increased public awareness and active participation.
3. Investing for Risk Reduction	- Build resilient infrastructure (e.g., breakwater, mangroves).	City planners, environmental agencies, contractors, local communities.	Feasibility studies, planning meetings, funding proposals.	Reduction of physical vulnerability through infrastructure.
	- Encourage economic diversification to reduce dependence on tourism.	MSMEs, local businesses, tourism entrepreneurs.	Training programs, business support initiatives.	Increasing the economic resilience of local communities.
4. Improving Preparedness and Recovery	- Implement an early warning system.	Emergency services, local governments, meteorological agencies.	Collaboration with the national warning system.	Improving preparedness and response to disasters.
	- Design post-disaster recovery plans.	Reconstruction agents, local governments, community groups.	Community-based recovery plan, policy coordination.	Faster and more effective recovery after disasters.
5. Monitoring and Evaluation	- Monitor climate data and its impact on communities.	Meteorological institutions, environmental NGOs, universities.	Data sharing platform, research collaboration.	Continuous monitoring and effective risk management.
	- Conduct regular impact evaluations.	Independent evaluators, local authorities, community representatives.	Periodic reporting, feedback sessions.	Data-driven improvements and better adaptation strategies.

Source: analysis data, 2024

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NB and TM conceptualization, methodology, validation, formal analysis. RS and AS investigation, data curation, writing -original draft preparation, writing -review and editing, supervision, project administration. Allauthorshave read and agreed to the published version of the manuscript.

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