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Navigating Tourism Potential and Environmental Limits: A Suitability Analysis of Pal Beach (Indonesia) as an Emerging Coastal Recreational Destination

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Abstract

This study evaluates the suitability of Pal Beach in North Sulawesi, Indonesia, as a recreational beach tourism destination. Ten key parameters influencing beach tourism are assessed, including water depth, beach type and width, seabed material, vegetation, water clarity, currents, harmful marine life and freshwater availability. Data were collected through field measurements and observations. Data were analyzed to determine the Tourism Suitability Index for Beach Recreation, applying the Suitability Index. Results classify Pal Beach as 'Very Suitable' with a score of 2.82. The beach boasts features like shallow coastal waters, sandy white shores, ample width, good water visibility, coconut trees and gentle slopes catering to visitors. However, strong currents exceeding ideal speeds, the presence of stonefish and sea snakes, and limited onsite freshwater pose notable challenges needing mitigation for its sustainability. By analyzing tourism viability while identifying environmental constraints, this assessment contributes insights to guide the integrated management of emerging recreational destinations in Indonesia based on globally accepted principles of responsible, sustainable development.

Keywords: *Coastal tourism, Suitability analysis, Recreational activities, Pal beach*

Introduction

Pal Beach, situated within the Likupang Tourism Special Economic Zone (SEZ) in North Sulawesi, Indonesia, has rapidly become a sought-after coastal recreation hub. Its 2019 integration into the Likupang Special Economic Zone marked a milestone for tourism facilities improvement. Additionally, its selection for the national super-priority destinations program has boosted growth (Lagarense et al., 2022). However, research comprehensively evaluating its capacity for sustaining tourism based on environmental parameters remains lacking.

As Indonesia balances utilization and conservation across valued coastal zones, tourism assessments take on vital significance. Law No. 32/2014 mandates the sustainable management

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of marine resources, necessitating ongoing monitoring of recreation areas to determine preservation needs or rehabilitation efforts (Wullur et al., 2022). Frameworks integrating carrying capacity and sustainability concepts further reinforce responsible development aligned to ecological limits (Brummett et al., 2023; Yin et al., 2022).

This study aims to advance knowledge on evidence-based coastal tourism assessment by evaluating ten key parameters of Pal Beach related to recreational suitability and sustainability. The analysis intends to classify its current state and tourism prospects while revealing any limitations requiring addressing through integrated management strategies. Findings can shape policies on balanced tourism growth in Indonesia's expanding industry.

Globally, beach evaluations employ various indicators of physical infrastructure, water quality, climate risks, biodiversity, and community participation (Rudan, Nižić, 2018; Rutty et al., 2020). Assessments precisely gauging recreational viability analyze factors like accessibility, visual aesthetics, substrata suitability and hazardous marine life risks (Augustine et al., 2022; Carlos et al., 2023). Few other studies apply integrated approaches examining the aspects of interconnected environmental, social and economic sustainability. This paper analyses Pal Beach across diverse ecological parameters vital for recreation and conservation, contributing to interdisciplinary understanding at the intersection of tourism development and the management of coastal resources.

Literature Review

Introduction and background on assessing beach tourism suitability

Pal Beach, recently designated as a leading beach destination in North Sulawesi's Likupang Tourism Special Economic Zone, has exciting potential for sustainable tourism development. However, its capacity for recreational activities has never been comprehensively assessed from a sustainability perspective.

This study aims to fill that gap by evaluating ten key ecological parameters of Pal Beach: water depth, beach type, width and slope, substrate, land cover, water clarity, currents, harmful biota, and freshwater availability. By analyzing these indicators, we will determine the beach's tourism prospects while identifying any environmental constraints that must be addressed.

Overall, this research intends to advance knowledge on evidence-based, sustainable coastal tourism using Pal Beach as a case study. The results can inform tourism practices in Indonesia and abroad.

Studies evaluating beach tourism suitability employ diverse parameters and methods. Physical aspects like infrastructure and dangerous biota estimate tourism carrying capacity (Kelana et al., 2022). Climatic suitability and shoreline loss projections correlate with recreational beach use (Zajch et al., 2022). Additionally, online reviews inform positioning strategies to enhance beach destination value (Taecharungroj, 2022).

Beach-specific assessments consider water clarity, currents, accessibility, scenery, and community inclusion (Augustine et al., 2022; Phelan et al., 2020; Rudan, Nižić, 2018). Sand-based substrates are preferred over coral or mud for aesthetics and recreational suitability (Carlos et al., 2023). Integrated approaches emphasize preserving natural and cultural heritage while enabling community-driven economic growth (Phelan et al., 2020).

Climate projections for beach destinations assist tourism demand forecasts and suitability analyses (Gómez-Martín et al., 2020; Rutty et al., 2020). Comprehensive, sustainable

frameworks assessing physical, climatic, social, and management dimensions produce valuable insights for beach tourism development.

Beach assessment in Indonesia: a multidisciplinary exploration of global frameworks for sustainable management

Beach assessment research in Indonesia utilizes a multidisciplinary framework encompassing environmental, ecological, geological, and social dimensions. Recent foci include analyzing iron sand characteristics, intertidal biodiversity, marine debris, and mangrove sustainability (Hayati et al., 2020; Purwanti et al., 2021; Suardana et al., 2022; Susintowati et al., 2019). Methodologies span geospatial mapping, user perception surveys, tourism site selection models, and suitability analyses (Ambarwati et al., 2021; Hadiwijaya et al., 2018; Pattipawaej, Hardiyan, 2020).

Several studies evaluate sustainability, physical parameters, and visitor preferences to determine tourism potential, such as in Central Java, Yogyakarta, East Java, and West Papua (Hidajat et al., 2020; Saptutyningsih, Duanta, 2021; Sahirudin et al., 2023). However, assessments in North Sulawesi remain lacking despite growing popularity.

Therefore, this multidisciplinary research aims to fill the gap by evaluating Pal Beach in North Sulawesi across ten ecological parameters, providing insights into its tourism prospects while considering sustainability needs.

Diverse frameworks guide sustainable beach tourism practices and standardize assessments globally. These include Tourism Competitiveness Indices evaluating visitor satisfaction, infrastructure, and environmental sustainability (Rodríguez-Díaz, Pulido-Fernández, 2019). Policy and Regulation Frameworks address governance and legal considerations (Machado et al., 2021), while Inter-institutional Relationship Models foster collaboration among institutions (Parmawati et al., 2021).

Additional frameworks analyze carrying capacity, climate suitability, economic value, urbanization, conservation, and recreation (Gómez-Martín et al., 2020; Guo et al., 2019; Moosammy et al., 2022; Ritphring et al., 2023). Certification programs like Blue Flag and Green Flag recognize beaches meeting environmental, sustainability and safety criteria (Mooser et al., 2022; Uebelhoer et al., 2021).

Region-specific assessments evaluate aspects like beach safety knowledge, drowning prevention, COVID-19 impacts, and tourism offerings (Belucio et al., 2022; Cruz-Milán, Puls, 2021; Uebelhoer et al., 2021; Woods et al., 2022). Emerging methodologies utilize UAVs, spatial modeling, system dynamics, and more (Wiartha et al., 2022).

These interdisciplinary frameworks significantly contribute to standardized global beach assessments and sustainable management. This study aligns with globally accepted principles by evaluating parameters important for beach recreation from a sustainability perspective.

The strategic framework for sustainable tourism management integrates diverse approaches promoting sustainable livelihoods, conservation, and development. Methodologies include the Sustainable Livelihood Approach and indicator systems applied in the Sustainable Tourism Livelihood Framework (Shang et al., 2021). Additionally, the A'WOT analysis aligns strategies with regional visions and sustainability goals (Kişi, 2019).

Incorporating Sustainable Development Goals (SDGs) enables analyzing sustainability across economic, social, and environmental realms (Seraphin, Gowreesunkar, 2021). Digital integration through smart tourist cities transitions traditional frameworks to meet sustainable development needs (Bazazo et al., 2022).

Furthermore, strategic plans integrate carrying capacity to identify policies supporting sustainability based on ecological limits (Candia et al., 2020). These frameworks address complex tourism challenges while ensuring socio-economic benefits and environmental conservation.

Suitability analysis in beach tourism

Suitability indexes have emerged as standardized quantitative tools for assessing sustainable beach tourism. Augustine et al. (2022) exemplify this through their analysis of parameters like water depth and slope to determine the tourism suitability of Dreamland Beach. Similarly, Insani et al. (2019) apply the Travel Suitability Index and SOAR method to evaluate ecotourism suitability and propose management strategies for Pantai Ungapan.

Oktafianti et al. (2021) also utilize an Index of Tourism Suitability and suitability matrix, based on the work of Yulianda (2019), encompassing factors like water clarity and land cover to assess marine tourism conditions at Balangan Beach.

These integrated suitability assessments synthesize diverse data into interpretable indexes to inform tourism planning and management. This study applies these globally accepted methodologies to evaluate the sustainable tourism potential of Pal Beach.

Summary and purpose statement

This review synthesizes beach tourism assessment, sustainable development frameworks, suitability indices, and Indonesian and global contexts. Key gaps emerge. Integrated suitability analyses covering diverse parameters remain limited, especially for emerging Indonesian destinations like Pal Beach. Assessing sustainability alongside economic growth is also needed.

Therefore, this empirical study conducts an integrated suitability assessment of Pal Beach across ten ecological parameters important for recreation. The Index of Tourism Suitability evaluates its capacity as a sustainable destination. Findings provide insights to guide responsible tourism development, extending data-driven beach management knowledge in Indonesia's expanding industry. Overall, this research exemplifies integrating sustainability into tourism growth strategies.

Methods

Location and time of research

The research was conducted at Pal Beach, in Marinsow Village, East Likupang District, North Minahasa Regency, North Sulawesi Province, Indonesia (Figure 1), over seven months, from January to July 2023.

Data collection method

Data collection used a quantitative descriptive approach to gather primary and secondary data. Primary data comprised the Tourism Suitability Index (IKW) parameters for beach recreation, including beach type, beach width, water bottom material, water depth, water brightness, current speed, beach slope, land cover, harmful biota, and freshwater availability (Oktafianti et al., 2021). Secondary data were sourced from various journals, books, and official reports. Harm-

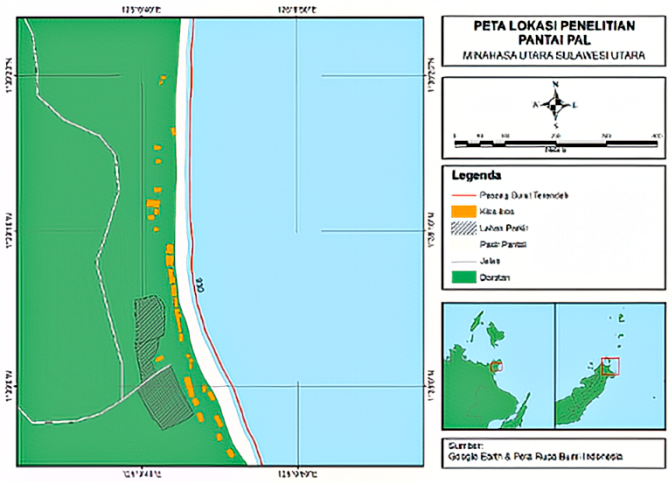

Figure 1. Research location
Source: Author's

ful biota observed directly in the field were identified using identification guides and other relevant references.

Data were collected through field measurements and observations conducted at sea and on land (Habibi et al., 2017). Marine data encompassed water depth, substrate, brightness, current speed, and the monitoring of harmful biota. On land, measurements included beach type, beach width, land cover, and freshwater availability.

a) ***Water Depth***
Depth measurements were taken at each station using a scale pipe or measuring stick inserted into the water until it touched the bottom substrate (Habibi et al., 2017). The recorded value on the scale pipe or measuring stick represented the depth measurement (Oktafianti et al., 2021).

b) ***Beach Type***
The beach type was determined through visual observation, examining sand type, color, and grain texture (Chasanah et al., 2017). This observation covered subtidal, intertidal, and supra-tidal areas (Habibi et al., 2017).

c) ***Beach Width***
Beach width was measured using a roll meter from the lowest tide to the last vegetation on the beach, with measurements taken perpendicularly from the sea to the land (Habibi et al., 2017; Oktafianti et al., 2021).

d) ***Beach Substrate***
Data on aquatic bottom material were obtained through direct observation at the research stations, including sand, silty sand, or mud (Oktafianti et al., 2021). Grain size analysis was conducted by sieving sediment samples collected at the research site and analyzed using the Miller Triangle method (Habibi, 2017).

e) ***Beach Slope***
Beach slope measurements were conducted using a roller meter and a 2-meter scale stick. Based on the horizontal height and length, the angle formed between the horizontal and vertical lines was used to calculate the beach slope (Oktafianti et al., 2021). Following was the formula used:

$$arc\tan = \frac{y}{x}$$

α was the angle formed (°); y was the horizontal height; and x was the horizontal length.

f) ***Beach Land Cover***
Land cover data were obtained through visual observation around the beach, encompassing vegetation, plantations, settlements, and buildings (Chasanah, 2017; Oktafianti et al., 2021).

g) ***Current Speed***
Measurement of current velocity involved using a moving current ball at 5 meters and a stopwatch to record travel time (Habibi et al., 2017; Oktafianti et al., 2021). The current velocity was calculated using the following formula:

$$V = \frac{s}{t}$$

Description:
V = current speed (m/s)
s = length (m)
t = time (s)

h) ***Water Brightness***
Brightness measurements were conducted using a Secchi disc. The depth at which the black-and-white color on the device was no longer visible and, when it became visible again, was recorded, along with the depth of coastal waters (Habibi et al., 2017).

$$C = 0.5\frac{(m+n)}{z}\cdot 100\%$$

Description:
C : Brightness (m).
m: Depth (when the Secchi disc border is not visible).
z: Depth of Water (m).
n: Depth (when the secchi disc boundary becomes visible)

i) ***Harmful biota***
Information on harmful biota was gathered through interviews with residents and observations around the beach, including snorkeling, to explore coastal waters to a certain depth.

j) ***Freshwater Availability***
Freshwater availability information was obtained from interviews with residents and beach tourist attraction managers. The distance between each research station and the nearest freshwater source was measured using GIS software, such as Sasplanet or Google Earth Pro (Habibi et al., 2017; Oktafianti et al., 2021).

Data analysis

Resource suitability analysis was conducted by calculating the Tourism Suitability Index, outlined by Yulianda (2019). Parameters were scored and weighted based on predefined criteria, as presented in Table 1.

Table 1. *Resource suitability parameters for beach tourism beach recreation category*

№	Parameters	Category	Score	Weight
1	Water Depth (m)	0-3 3-6 >6	3 2 1	0,125
2	Beach Type	Sandy Composing Muddy, Rocky, Cliffs	3 2 1	0,200
3	Beach Width (m)	>15 10-15 <3-10	3 2 1	0,200
4	Water Substrate	Sand Silty sand Mud	3 2 1	0,170
5	Beach slope (°)	‘10 10 - 25 ‘25 - 45 ‘ 45	3 2 1 0	0,080
6	Beach land cover	Coconut, open land bush, scrub, low, savanna Tall scrub, mangrove forest, settlement, harbor	3 2 1 0	0,010
7	Current speed (m/s)	0-0,17 0,17-0,51 >0,51	3 2 1	0,080
8	Brightness (m)	>10 >5-10 3-5	3 2 1	0,125
9	Harmful Biota	None Jellyfish, Sea snake Jellyfish, sea snakes, sea urchins and lepu	3 2 1	0.005
10	Freshwater Availability (km)	<0,5 >1-2 >2	3 2 1	0,005

Source: Yulianda, 2019

The Tourism Suitability Index (IKW) calculation refers to Yulianda (2019).

$$IKW = \sum_{i=1}^{n} \left(B_i \cdot S_i \right)$$

n = Number of fit parameters
B_i = Weight of parameter i
S_i = ith parameter score

Description:
Very suitable: IKW ≥ 2.5
Compliance: 2.0 ≤ IKW < 2.5
Unsuitable: 1≤ IKW < 2.0
Very unsuitable: IKW < 1

Results

The results of assessing resource suitability parameters for recreational beach tourism at Pal Beach in Marinsow Village, East Likupang District, Minahasa Regency, are summarized in Table 2. Ten parameters were calculated to determine the tourism suitability index for Pal Beach.

Table 2. *Calculation results of resource suitability parameters for beach tourism beach recreation category*

No.	Parameters	Calculation Result
1	Water Depth (m)	1 - 2,6
2	Beach Type	Sandy
3	Beach Width (m)	148
4	Water Substrate	Sand, rock, dead coral
5	Beach Slope (°)	7
6	Beach Land Cover	Coconut, trees, open land
7	Current speed (m/s)	1,17
8	Brightness (m)	68
9	Harmful Biota	Stingray, sea snake, stonefish
10	Freshwater Availability (km)	2,4

The data collected from the recreational beach area of Pal Beach yielded valuable insights. The results show that the beach's depth ranges from 1 to 2.6 meters, making it suitable for various water activities. Coastal waters exhibit a current speed of 1.17 meters per second, and the water is remarkably bright, with a visibility depth of 68 meters. Pal Beach boasts an impressive width of approximately 148 meters (about 485.56 ft), complemented by a gentle slope of 7 degrees. It is characterized as a sandy beach featuring a diverse beach composition, including sand, rocky sand, and sections with dead coral. Furthermore, the beach is adorned with coconut trees, other varieties of trees, and open land, enhancing its natural appeal and suitability for recreation.

The results also identified the harmful biota that inhabited the coastal waters, such as rays, sea snakes, and stonefish. Additionally, it was noted that fresh water was accessible near the beach, albeit sourced from a location 2.4 kilometers distant from Pal Beach.

The analysis of resource suitability for beach tourism in the beach recreation category at Pal Beach, based on the results of the ten parameters, was presented in Table 3. Pal Beach fell within the "Very Suitable" category with an Index of Tourism Suitability (IKW) value of 2.82.

Table 3. *Analysis of resource suitability for beach tourism beach recreation category at pal likupang beach*

№	Parameters	Calculation Result	Score (B_i)	Weight (S_i)	$B_i \times S_i$
1	Water Depth (m)	1- 2,6	3	0,125	0,375
2	Beach Type	Sandy	3	0,200	0,6
3	Beach Width (m)	148	3	0,200	0,6
4	Water Substrate	Sand, rock, dead coral	3	0,170	0,51
5	Beach slope (°)	7	3	0,080	0,24
6	Beachland cover	Coconut, trees, open land	3	0,010	0,03
7	Current speed (m/s)	1,17	1	0,080	0,08
8	Brightness (m)	68	3	0,125	0,375
9	Harmful Biota	Stingray, sea snake, *stonefish*	1	0.005	0,005
10	Freshwater Availability (km)	2,4	1	0,005	0,005
					2,82

Despite Pal Beach's high suitability rating in the Tourism Suitability Index (IKW), it is crucial to address three critical parameters to ensure the long-term sustainability of this beach as a recreational tourist destination. These critical parameters are current speed, harmful marine life, and freshwater availability.

Discussion

The comparative analysis reveals Pal Beach's exceptional suitability as a beach tourism destination, meeting several pivotal criteria. However, certain limitations pose notable challenges requiring mitigation strategies.

Water depth: a visitor-friendly sanctuary

The research uncovered shallow waters ranging from 1 to 2.6 meters, aligning seamlessly with ideal depths for secured swimming and recreation (Ariefianda et al., 2019). Compared to destinations with deeper waters, the shallow depth enhances enjoyment and safety, enabling more visitors to access and participate in water activities confidently (Oktafianti et al., 2021). The water depth involves shallow wading areas suitable for children and elderly visitors. However, changes in water levels during tides require marked swimming zones with warnings to avoid overexertion risks.

Beach type - pristine shores with natural defenses

The expansive sandy beach absorbs wave energy, providing a natural buffer against erosion (Hanley et al., 2014). This type of beach enables dynamic adaptation to fluctuating wave conditions, preserving aesthetic beauty and accessibility despite severe weather events (Scott et al., 2016). Preserving the integrity of Pal Beach's sandy composition through sustainable land use and conservation is paramount for maintaining this natural defense and tourist appeal.

Beach width - spacious recreational area

An impressive 148-meter width surpasses guidelines for tourist destinations (Yulianda, 2019), enabling diverse amenities placement while hosting various recreational pursuits without congestion even during peak capacity. However, capacity planning and zoning of activity areas can optimize visitor traffic flow. As Bustos et al. (2021) highlighted, monitoring usage patterns during tidal fluctuations informs strategic infrastructure decisions. Thus, demarcating activity zones can better assist visitors with disabilities.

In addition, Pal Beach, spanning 930 meters (about 3051.18 ft), is a prominent tourist destination influenced by property values and coastal appeal. Its extensive dimensions cater to various activities, requiring effective visitor safety and satisfaction management, including amenities like lifeguard stations (Boto-Garcia, Leoni, 2023).

Beach substrate: diverse seabed composition

The predominantly sandy bottom with sporadic rocky sand and coral fragments provides visitors with a multifaceted recreational setting. With its pristine white sandy surface, the beach perfectly suits recreational beach tourism (Saraswati et al., 2023), aligning seamlessly with visitors' preferences and enhancing Pal Beach's appeal. Conservation efforts prioritizing these unique substrates preserve ecological integrity while sustaining aesthetic charm.

Beach slope - gradual inclines for accessibility

The gentle slope facilitates safer swimming and easy water access (Ariefianda et al., 2019). It also enables visitors of all mobility levels to access and traverse the beach with relative ease compared to steeper shores (Anfuso et al., 2021). Pal Beach's gentle beach slope, measured at around 7^0, clearly positions it as an excellent choice for recreational tourism. To sustain it as a top tourist spot, prioritize preserving its natural slope and avoid human-induced alterations that could compromise safety and aesthetics.

Beach land cover - scenic beauty and ecological equilibrium

Lush coconut trees and vegetation complement the idyllic sandy shores, attracting nature-loving tourists (Yufaraj et al., 2023). The unique blend of beach land cover significantly contributes to its exceptional suitability, but uncontrolled changes can degrade ecological balance and aesthetic charm (Aji, Faniza, 2021). To address this, prioritized comprehensive management strategies, including sustainable land use practices, afforestation, and heightened oversight, are essential for striking a harmonious balance between tourist development and ecological preservation.

Water brightness – preserving pristine clarity

The 68-meter visibility signifies minimal pollution and ecosystem harm, attracting tourists while sustaining marine habitats (Agustine et al., 2022). Compare this to the blurry visibility caused by congestion and beach litter, particularly in popular beach destinations like Bali (Rahma, 2020). Strict regulation of waste disposal and runoff into coastal waters is imperative to maintain this pristine water quality.

Strong current - an ongoing safety challenge

The 1.17 meters per second current surpasses the 0.16 meters per second safety threshold (Reyes et al., 2020). Designating swimming areas based on the mapping of weaker currents is vital. Management should install clear warning signs and train lifeguards for oversight and emergency response based on high-risk zones within the beach. Continual visitor education is equally critical for promoting self-awareness of dangers.

Harmful biota - navigating coexistence

Documented sightings of venomous rays, sea snakes and stonefish pose safety hazards that warrant strategic actions like warning signs, first aid management and zoning of recreational areas to avoid encounters (Geng et al., 2023). However, beach closures during seasonal migration periods of hazardous marine species may be unavoidable despite impacting tourist activity. Another approach is to dissuade visitors from touching or disturbing marine life and advocate for designated swimming areas with a lower chance of encountering hazardous biota, minimizing risks.

Freshwater source - optimizing accessibility

The distant water source 2.4 km away inconveniences visitors wanting to rinse post-swimming and indirectly discourages beach activities (Yulianda, 2019). Establishing storage and pumping facilities within 500m (about 1640.42 ft) based on utilization forecasts caters better to visitor comfort without excessive resource or environmental impact.

In summary, while Pal Beach shows incredible potential as a beach tourism destination hosting recreational activities, realizing its potential requires mitigating limitations through an integrated approach focused on visitor wellbeing, safety, ecological conservation, and sustainability principles to enable enduring and responsible growth.

Comparative discussion

While Pal Beach possesses notable strengths as a prospective beach tourism destination, it also faces limitations in certain aspects. Comparing and contrasting the findings to established beach tourism sites provides meaningful insights.

The gently sloping sandy shores align closely with the features of renowned beaches like Bondi Beach in Australia, applauded for its accessibility, family-friendly waters and picturesque landscape that draws over 2.8 million visitors annually (Australian Government Department of the Environment and Water Resources, 2007; Moskovska, 2021). However, Bondi mitigates risks like rips through lifeguard surveillance over its long coastline (Warton et al., 2017). Similar risk management strategies tailored to local contexts strengthen Pal Beach's capability.

Like Pal Beach, Boracay Island in the Philippines rose to fame as an idyllic vacation spot acclaimed for its powdery white sand beaches and energetic beach activities. However, rapid unconstrained tourism growth degraded its environment, prompting authorities to close the island temporarily for rehabilitation (Maming et al., 2021). The careful reopening of Boracay, employing strategies such as visitor caps, enhanced waste management infrastructure, community participation, and impact monitoring, has proven effective in ensuring its preservation. These successful approaches can also be applied to safeguard Pal Beach to avoid potential environmental degradation,

The rapid growth of Punta Cana in the Dominican Republic from pristine beaches into an iconic coastal mega-resort exemplifies the lucrative potential and pitfalls of unchecked tourism expansion that Pal Beach should avoid. Excessive hotel developments, poor resource management and lagging infrastructure amidst surging visitors have damaged ecosystems and excluded locals (Goffi et al., 2020). This situation underscores the urgent need, as pointed out by Kai and Lintong (2023), for integrated sustainability as the priority that balances ecological and social integrity with economic growth over solely chasing economic gains. By learning from Punta Cana's lessons, Pal Beach can manifest responsible development where economic vitality and ecological integrity flourish in constructive collaboration rather than conflict.

Overall, benchmarking against established beach tourism ecosystems informs pragmatic recommendations. Blending suitable management models with localized knowledge can optimize Pal Beach's development. Fostering community participation also assists governance in sustainably harnessing the social, economic, and environmental potential while addressing tangible challenges and facilitating responsible growth.

Moreover, by examining common sustainability challenges faced by places like Boracay and Punta Cana as they gained notoriety, Pal Beach can proactively implement measured growth and conservation to protect its social, economic, and environmental well-being rather than resort to restrictive interventions after the fact.

Summary and future research

In conclusion, Pal Beach demonstrates immense potential for development as a recreational beach tourism destination, evidenced by evaluations against critical success parameters. However, capitalizing on its potential sustainably requires mitigating existing risks and limitations through an integrated management approach, stakeholder collaboration and environmental conservation, informed by comparisons with thriving global beach tourism models.

While this study offers meaningful findings, insights can be enriched by assessing post-occupancy sustainability after tourism establishment, conducting a cost benefit analysis of proposed interventions, and through demographic and perception surveys of tourist preferences and expectations. Exploring these future research directions will further strengthen the knowledge basis for efficiently maximizing local community livelihoods while upholding the ecological and social integrity of Pal Beach.

Conclusion

This assessment of Pal Beach reveals its exceptional potential as a beach tourism destination based on an analysis of ten critical parameters. The findings highlight several advantages, including shallow waters conducive to secured recreation, sandy shores with innate buffering capacity, and sufficient width to host amenities without congestion. Additionally, the gentle slopes facilitate accessibility for visitors with mobility constraints. Lush beach vegetation and remarkably clear waters add to the idyllic setting.

However, realizing the area's immense tourism potential requires actively addressing limitations posed by strong currents, harmful marine species risks and inadequate freshwater availability onsite through integrated management plans that balance safety, ecological conservation and sustainability while optimizing visitor experience.

The research holds broader implications for coastal tourism development policies in Indonesia and globally. As the tourism landscape evolves amidst declining water resources and climate challenges, Pal Beach offers a blueprint for leveraging economic opportunities without compromising ecological integrity. The use of sustainability indicators and evidence-based assessments of tourism viability applied in this study can guide decisions on regional developments.

To conclude, while Pal Beach possesses tremendous potential for beach tourism, capitalizing on its immense potential warrants mitigating current pitfalls. This existing condition demands an intersectional approach considering environmental, social, and economic perspectives. The solutions should blend innovation, localized knowledge, and global best practices for holistic, resilient, and responsible tourism growth. Beyond Pal Beach, the framework and findings contribute to scholarly discussion on sustainable coastal destination management.

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