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Tourism Suitability Index and Ecological Carrying Capacity in the Citepus, Karang Hawu, and Cikaso Beaches, Sukabumi Regency, Indonesia

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Abstract

Indonesia is known as a country with the second-longest coastline in the world. This geological condition offers promising potential for coastal tourism. However, the potential of coastal tourism is not without its management challenges. This study was conducted to analyze the tourism suitability index and ecological carrying capacity of coastal tourism at Citepus, Karang Hawu, and Cikaso Beaches. The assessment was conducted for three tourism categories: beach recreation, swimming, and camping. The tourism suitability index was assessed based on 12 physical beach criteria, including beach type and width, substrate type, depth, water transparency, current velocity, wave height, beach slope, vegetation, the presence of dangerous biota, freshwater availability, and scenery diversity. The ecological carrying capacity of the tourism area was calculated based on the coastal area and the optimal ecotourism area criteria for each type of recreation. The study was conducted from April to June 2025. The results of the tourism suitability index assessment showed that Citepus and Cikaso Beaches were categorized as very suitable for all three tourism activities. In contrast, Karang Hawu Beach was categorized as very suitable for beach recreation, moderately suitable for swimming, and conditionally suitable for camping. The coastal ecological carrying capacity assessment varied by beach size. Citepus Beach can accommodate 503 tourists for beach recreation, 378 for swimming, and 1,558 for camping. Karang Hawu Beach can accommodate 403 tourists for recreation, 302 for swimming, and 1,171 for camping. Cikaso Beach can accommodate 269 tourists for beach recreation, 201 for swimming, and 957 for camping.

Keywords: Beach suitability assessment, coastal ecotourism management, environmental carrying capacity, sustainable coastal utilization.

1. Introduction

Indonesia is a country renowned worldwide for its stunning natural beauty [1]. This attraction has significant potential, particularly in nature tourism. One of Indonesia's most popular forms of nature tourism is its beach tourism. As an archipelagic nation, Indonesia boasts the second-longest coastline in the world after Canada. This geological condition reinforces the immense potential of Indonesia's beach tourism sector [2,3].

Indonesia boasts a variety of internationally renowned beach destinations, some of which are located in Sukabumi Regency [4]. The southern coastal waters of Sukabumi Regency offer stretches of white beaches complemented by exotic natural beauty. The stunning blue sea, complemented by the enchanting views of mountains, forests, and rivers, makes this area one of Indonesia's most popular beach destinations. Many local and international tourists come here to find tranquility and self-reflection during their holidays [5–7]. The southern coast of Sukabumi Regency boasts several renowned beach destinations, including Citepus, Karang Hawu, and Cikaso Beaches [8–10].

The immense potential for coastal tourism on the southern coast of Sukabumi Regency is inextricably linked to management challenges. As a form of coastal area utilization, tourism can also have devastating negative impacts if not managed appropriately. Excessive tourism activities can lead to environmental degradation and even damage to coastal ecosystems [11,12]. Therefore, management needs to focus on coastal area sustainability to achieve long-term benefits. The principles of sustainable use, responsible tourism, and

environmental sustainability must be explicitly implemented in coastal tourism development management strategies [13,14].

Another challenge in coastal tourism management is ensuring tourists' security, safety, and comfort. These three aspects are closely related to the study of suitability assessments for tourism activities. A coastal tourism activity suitability assessment is necessary to identify the best tourism activities that can be undertaken in a coastal area, based on security, safety, and tourists' comfort. The importance of a tourism suitability assessment underscores the urgency of coastal tourism management [15–17]. However, research examining the suitability index and ecological carrying capacity of coastal tourism is still rare, especially on the Sukabumi Coast. Ciletuh Beach is one example that has been studied [18]. Many other coastal tourist spots on the Sukabumi Coast require similar research to develop their coastal tourism management.

This study analyzed the tourism suitability index and ecological carrying capacity of three beaches: Citepus Beach, Karang Hawu Beach, and Cikaso Beach, located along the coast of Sukabumi, Indonesia. The tourism suitability index assessment and ecological carrying capacity calculations were conducted for three tourism categories: beach recreation, swimming, and camping. The ecological carrying capacity was calculated based on the principle of regional sustainability to accommodate the number of tourists without potentially causing environmental degradation. The results of this study can serve as a valuable baseline for coastal tourism management across the three regions.

Furthermore, this study can contribute significantly to the sustainable management of tourism areas across the three regions by integrating tourism suitability index values and ecological carrying capacity. The novelty of this study lies in the comparative analysis of coastal areas with different physical characteristics. The results of this study can provide a scientific and practical basis for developing coastal tourism area management plans in Sukabumi in particular, and in Indonesia in general.

2. Basic Concepts

2.1. Basic Principles of Ecotourism Concept

Ecotourism is a form of sustainable tourism that prioritizes conservation and environmental education and empowers local communities in its management [19]. According to the International Ecotourism Society [20], ecotourism emphasizes ecological conservation, nature conservation education, and community involvement. Ecotourism emphasizes achieving long-term benefits for local communities by establishing responsible tourism ethics. Today, adapting the ecotourism concept to coastal tourism development is a crucial step to reduce environmental pressures caused by uncontrolled tourism. Several assessment aspects in ecotourism management include assessing tourism suitability and the ecological carrying capacity of tourist areas to ensure the sustainability of ecosystem functions and the quality of the tourist experience [20].

2.2. Tourism Suitability Index and Ecological Carrying Capacity

The tourism suitability index is a widely used tool for assessing the suitability of various tourism activities in an area based on existing biophysical parameters [21]. In tourism studies, coastal aspects assessed in tourism balance generally include beach slope, beach width, substrate type, current velocity, and so on. In general, the assessment of the tourism suitability index is based on the safety and security of tourists visiting tourist attractions in an area, taking into account the area's biophysical conditions [22]. According to Yulianda [23], tourism suitability index studies generally produce several strata categories: Very suitable (S1), suitable (S2), less suitable (S3), and unsuitable (N). These categories can help guide the development of the most appropriate tourist attraction segmentation in each region.

Ecological carrying capacity refers to an area's ability to support tourism activities without degrading the environment or its natural resources [24]. In studies, calculating ecological carrying capacity involves several variables, including area size, average visit time per tourism activity, and the minimum area required for each activity [23]. Studies on the ecological

carrying capacity of tourism have been widely conducted in Indonesia, particularly in coastal areas. Yulianda [23] cited the management of an ecotourism area in the Seribu Islands as an example, concluding with recommendations for attracting visitors. Trisakti and Putra [25] assessed Bali's coastal tourism areas, emphasizing the importance of spatial planning based on the tourism suitability index and ecological carrying capacity to prevent uncontrolled impacts from tourism activities. Furthermore, Suryawan et al. [26] reported that most coastal areas in West Java Province lack adequate ecological monitoring systems, leading to under-monitoring of the potential for environmental degradation from tourism activities. Therefore, integrating the results of the tourism welfare index and ecological carrying capacity is very important for underpinning sustainable tourism management strategies.

2.3. Urgency of Research

The coastal areas of Sukabumi Regency boast beautiful coastal attractions. Several coastal areas have significant potential for development as ecotourism destinations, including Citepus, Karang Hawu, and Cikaso Beaches. However, significant challenges exist in their management. Appropriate management strategies require a database that prioritizes conservation and sustainability, while also ensuring the safety, security, and comfort of tourists. Therefore, research assessing the tourism suitability index and ecological carrying capacity is essential to inform policy strategies for managing and zoning tourism areas. This research was conducted in response to this urgency.

3. Materials and Methods

3.1. Study Area

This research was conducted at three coastal locations in the Sukabumi coastal area: Citepus Beach, Karang Hawu Beach, and Cikaso Beach. On-site research was conducted from April to June 2025. The sampling period was chosen to illustrate seasonal variations. The transition season spans from the beginning of April to the peak of the summer season in June. During this observation period, fluctuations in coastal biophysical parameters are possible, providing a diverse dataset for analysis. On each beach, four research stations were established as replications, with a distance between stations ranging from 0.7–1 km, depending on the total length of the coastline. The length of the coastline and the area of each beach were determined based on in situ mapping of the region. The research map and observation stations are presented in Figure 1.
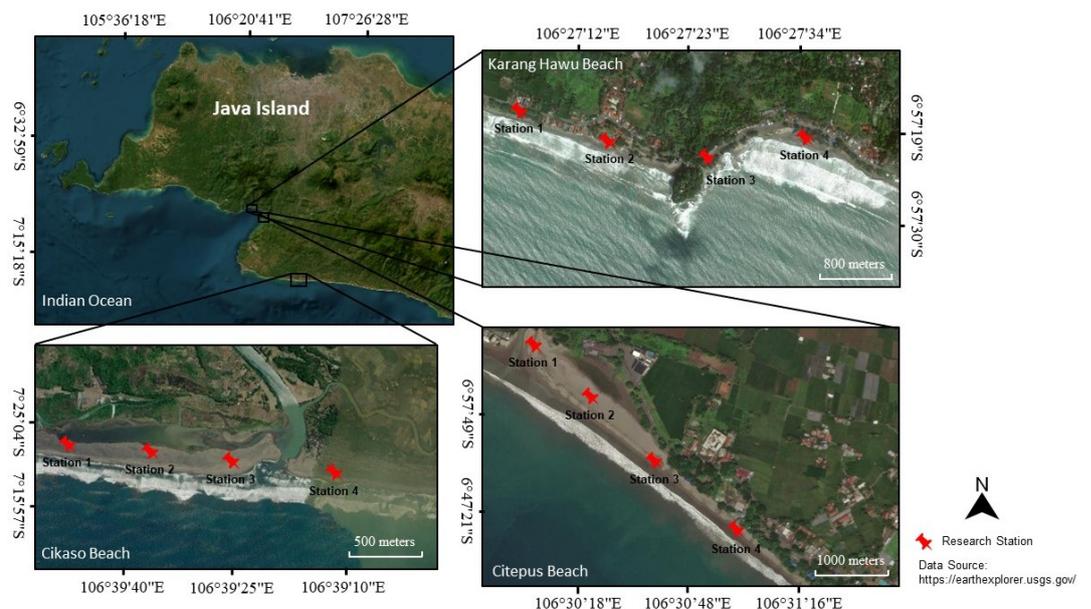

Figure 1. Map of the research location. Each research location was divided into four sampling points, equally spaced. The source of the research map imagery was obtained from https://earthexplorer.usgs.gov/.

3.2. Data Analysis

Tourism Suitability Index

The tourism suitability index was analyzed based on three beach-based tourism activities: beach recreation, swimming, and camping. Each activity has its own weight and assessment parameters, as stated by Yulianda [27]. The tourism suitability index for the beach recreation category comprises ten parameters, each with its respective weight and assessment class (**Table 1**). Nine assessment criteria, along with their respective assessment weights and classes, were assigned to beach tourism activities in the swimming category. **Table 2** presents the nine assessment criteria for the suitability of beach tourism for swimming, as outlined by Yulianda [27]. There are only five criteria for assessing tourism suitability in the camping category: The five assessment criteria, along with their weights and assessment classes, for analyzing beach tourism suitability in the camping category, are presented in **Table 3** [27].

Table 1. Assessment aspects used to calculate the tourism suitability index in the beach recreation category. The assessment was based on 12 parameters, each with a weighting for each condition.

No.	Criteria	Criteria weight	Score distribution class			
			3	2	1	0
1	Beach category	0.200	White sand	White sand mixed with coral fragments	Black sand is a bit steep	Mud, rocky, steep
2	Width of the beach (meters)	0.200	x > 15	10 < x $\leq$ 15	3 $\leq$ x < 10	< 3
3	Type of Substrate	0.170	Sand	Sandy coral	Muddy sand	Mud or sandy mud
4	Water depth (meters)	0.125	0 < x $\leq$ 3	3 < x $\leq$ 6	6 < x $\leq$ 10	> 10
5	Water transparency (%)	0.125	x > 80	50 < x $\leq$ 80	20 < x $\leq$ 50	$\leq$ 20
6	Current velocity (cm/s)	0.080	0 < x $\leq$ 17	17< x $\leq$ 34	34 < x $\leq$ 51	> 51
7	Coastal slope angle (°)	0.080	x $\leq$ 10	10 < x $\leq$ 25	25 < x $\leq$ 45	> 45
8	Type of vegetation	0.010	Coconut tree, open area	Low shrubs, savanna	Tall bushes	Mangrove forests, settlements, ports
9	The presence of dangerous biota	0.005	There are no dangerous biota	Sea urchins	Sea Urchins and Stingrays	Sea urchins, stingrays, lionfish, sharks
10	Nearest fresh water source (km)	0.005	x < 0.5	0.5 < x $\leq$ 1	1 < x $\leq$ 2	> 2

Table 2. Assessment aspects used to calculate the tourism suitability index in the swimming activity category. The assessment was based on nine parameters, each with a weighting for each condition.

No.	Criteria	Criteria weight	Score distribution class			
			3	2	1	0
1	Water depth (meters)	0.143	0 < x $\leq$ 3	3 < x $\leq$ 6	6 < x $\leq$ 10	> 10
2	Substrate materials	0.143	Sand	Sandy coral	Muddy sand	Mud or sandy mud
3	Current velocity (cm/s)	0.143	0 < x $\leq$ 0.17	0.17 < x $\leq$ 0.34	0.34 < x $\leq$ 0.51	> 0.51
4	Wave height (meters)	0.143	0 < x $\leq$ 0.5	0.5 < x $\leq$ 1	1 < x $\leq$ 1.5	> 1.5
5	Beach category	0.086	White sand	White sand mixed with coral fragments	Black sand is a bit steep	Mud, rocky, steep
6	Width of the beach (meters)	0.086	x > 15	10 < x $\leq$ 15	3 < x $\leq$ 10	$\leq$ 3
7	Water transparency (%)	0.086	x > 80	50 < x $\leq$ 80	20 < x $\leq$ 50	$\leq$ 20
8	The presence of dangerous biota	0.086	There are no dangerous biota	Jellyfish	Sea urchins, jellyfish	Water snakes, sea urchins, jellyfish
9	Nearest freshwater source (km)	0.086	x $\leq$ 0.5	0.5 < x $\leq$ 1	1 < x $\leq$ 2	> 2

Direct observations were conducted to review the value of each assessment criterion in each matrix of the coastal tourism suitability categories. Some assessment criteria can be obtained through direct observation, such as beach category, substrate type, vegetation diversity, scenic features, and distance to freshwater sources. Several other criteria require specific measurement techniques and tools, such as measuring water current speed with a flowmeter (least count (LC) 0.01 cm/s), water depth with a scale board (LC 0.1 m), wave height and coastal slope angle with a scale board and with theodolite (LC 0.1 m and 1°), water clarity using a disk secchi, and width of beach with a meter and area mapping (LC 0.1 m).

Table 3. Assessment aspects used to calculate the tourism suitability index in the camping category. The assessment was based on five parameters, each with a weighting for each condition.

No.	Criteria	Criteria weight	Score distribution class			
			3	2	1	0
1	Plains type	0.375	Grass or sand	Grassy land	Mud or rocky	Rock or unstable soil
2	Beach width (meters)	0.225	x >10	$7 < x \leq 10$	$5 < x \leq 7$	≤ 5
3	Diversity of vegetation	0.150	Coconut, Pine, and Acacia trees	A tree system and a little undergrowth	Tall bushes	Tall bushes and swamps or non-vegetation
4	Coastal slope angle (°)	0.150	x <5	$5 < x \leq 15$	$15 < x \leq 30$	> 30
5	Landscape view	0.100	Beach, mountains, forest, rivers	Beach and 2 other views	Only one type of view	There is no beautiful view

The tourism suitability index data analysis was performed after matching the matrix based on the value class and weight. The assessment of the tourism suitability index follows Yulianda [24] as follows:

$$TSI = \sum \left[\frac{N_i}{N_{max}} \right] x \ 100\%$$

TSI: Tourism Suitability Index (%), Ni is the calculated value of the criteria (weight × score), and Nmax represents the maximum value for each observed criterion.

The tourism suitability index values are then classified into four categories. These four classes are presented in **Table 4** [28].

Table 4. Tourism suitability is classified based on the tourism suitability index value. The final value is broken down into four categories based on the tourism suitability index percentage range. A higher index percentage indicates greater suitability for tourism activities in the area being studied.

No.	Categories	TSI Value
1	Very suitable	$81 < x \leq 100\%$
2	Quite appropriate	$63 < x \leq 81\%$
3	Conditionally appropriate	$44 < x \leq 63\%$
4	Not feasible	$x \leq 44\%$

Ecological Carrying Capacity

The ecological carrying capacity (ECC) of beach tourism was also assessed for each tourism activity. The formula for calculating the ECC for tourists in each tourism category is from Yulianda [28].

$$ECC = K \ x \ \left(\frac{L_p}{L_t} \right) \ x \ \left(\frac{W_p}{W_t} \right)$$

ECC is the ecological carrying capacity with units of number of visitors; K represents the ecological potential number of tourists per unit area; LP is a measure of length (meters) or area (m²) available for tourism activities; Lt is the unit of area for each tourism activity; WP is the time in hours available for tourism activities per day; and Wt is the average time spent by tourists for each tourism activity.

The ecological potential value (K) per area (Lt) was calculated based on the provisions submitted by Yulianda [27], considering the ecotourism concept. This consideration is based on the number of tourists an ecological system can accommodate without compromising its environmental functions. The ecological potential value per unit area is differentiated for each category of coastal tourism: one tourist per 25 m of coastline for beach recreation and swimming, and four tourists per 400 m^2 of coastal area for camping activities. Coastline length (Lp) data at each location were obtained from a geospatial analysis system (GIS) obtained from mapping collected via the Global Positioning System.

The available time for each tourism activities (Wp) is differentiated for each tourism category: eight operational hours per day for beach recreation and swimming activities and 24 hours for camping activities. Meanwhile, the average time each tourist spends on beach tourism activities is 4 hours for swimming, 3 hours for beach recreation, and 24 hours for camping [27].

4. Results and Discussion

4.1. Results

Observations of the biophysical parameters of the three beaches indicate differences in specific characteristics (**Table 5**). Citepus and Cikaso beaches have delicate white sand substrates, while Karang Hawu has a coral sand substrate. The tourism suitability index value was calculated for the three observed beaches based on their existing characteristics. We found that Citepus and Cikaso Beaches have a very suitable category for the three beach tourism activities considered, including beach recreation, swimming, and camping, with a Tourism Suitability Index value greater than 81%. Meanwhile, Karang Hawu Beach has a tourism suitability index value that is suitable for beach recreation and swimming activities and is conditionally ideal for camping activities (**Table 6**). The difference in the tourism suitability index between Karang Hawu Beach and Citepus and Cikaso Beaches is primarily due to Karang Hawu Beach's rocky sand substrate, steeper beach slope, greater depth range, and higher wave heights.

Table 5. Twelve physical characteristics were observed at Citepus, Karang Hawu, and Cikaso Beaches. Characteristic differences between the three beaches primarily lie in beach type, coastal slope angle, water depth, wave height, and object view.

No.	Criteria	Beach Location		
		Citepus Beach	Karang Hawu Beach	Cikaso Beach
1	Beach category	White sand	White sand mixed with coral fragments	White sand
2	Width of the beach (m)	18-28	16-24	19-30
3	Substrate materials	Sand	Sandy coral	Sand
4	Water depth (m)	1.8-2.7	2.2-2.9	1.2-2.4
5	Water transparency (%)	82-84	80-82	80-83
6	Current velocity (cm/s)	48-50	43-51	40-48
7	Wave height (m)	0.6-1.2	0.7-1.8	0.4-1.1
8	Coastal slope angle (°)	14-18	13-22	13-17
9	Type of vegetation	Coconut tree, open area	Coconut tree, open area	Coconut tree, open area
10	The presence of dangerous biota	There are no dangerous biota	There are no dangerous biota	There are no dangerous biota
11	Nearest freshwater source (km)	<0.5	<0.5	<0.5
12	Landscape view	Beach, mountains, forest, rivers	Beach, mountains, forest	Beach, mountains, forest, rivers

Table 6. Tourism suitability index for Citepus, Karang Hawu, and Cikaso Beaches. Citepus and Cikaso Beaches were categorized as very suitable for all three tourism activities. In contrast, Karang Hawu Beach was categorized as very suitable for beach recreation, moderately suitable for swimming, and conditionally suitable for camping.

No.	Beach Location	Tourism Suitability Index		
		Beach Recreation	Swimming	Camping
1	Citepus Beach	92.0%	81.1%	95.0%
2	Karang Hawu Beach	79.7%	64.0%	61.7%
3	Cikaso Beach	92.0%	81.1%	90.0%

The ecological carrying capacity for tourism activities on the three beaches varied, reflecting differences in coastline length and coastal area. Citepus Beach has the most significant environmental carrying capacity, primarily because of its longer coastline and beach location. This ecological carrying capacity value represents the number of tourists each beach can accommodate without compromising its health and environmental quality (Table 7).

Table 7. Ecological carrying capacity for tourism activities at Citepus, Karang Hawu, and Cikaso Beaches.

No.	Tourism Site	Length of Coastline (km)	Suitable area (ha)	Carrying capacity (Tourists/Day)		
				Beach recreation	Swimming	Camping
1	Citepus Beach	4.72	15.58	503	378	1,558
2	Karang Hawu Beach	3.79	11.71	403	302	1,171
3	Cikaso Beach	2.52	9.57	269	201	957

4.2. Discussion

Citepus and Cikaso have fine white sandy beaches, whereas Karang Hawu has a beach decorated with coral sand substrate. Beaches with delicate sandy substrates are suitable for a wide range of beach tourism activities, including beach recreation, swimming, and camping. Fine sandy beaches provide comfort to tourists who want to walk barefoot, sit, or lie down to sunbathe. Meanwhile, rocky or coral beaches often pose obstacles to tourists during tourism activities [23,29].

The three beaches have a wide range of widths, ranging from 16 m to 30 m. Beaches with wide characteristics are preferred for tourism. Beaches with a width of more than 15 m have characteristics that are very suitable for beach tourism activities. This is related to the size of the beach recreation areas. The wider a beach is, the wider the tourist area, providing greater comfort and freedom for tourists to engage in tourism activities [30,31].

The measured depth values at the three beaches ranged from 1.2 to 2.9 meters, with water clarity ranging from 80 to 84%. Both parameters fall within the acceptable range for beach tourism activities and provide tourists with a sense of comfort and safety. Shallow, clear beaches offer a sense of security, enabling tourists to engage in various activities [18,32].

On the other hand, the three beaches are known to have relatively high current velocities, ranging from 40 to 51 cm/s. The southern coastal waters of Java, including the Sukabumi coast, are known to have relatively high average current velocities [11,33]. This is undoubtedly an important consideration in maintaining the safety and security of tourists. Several other studies have shown that beaches along the Sukabumi coast, such as Karang Hawu Beach, experience natural phenomena known as rip currents. Rip currents are the movement of water currents along the coastline and away from the coast toward the sea at a specific point where two colliding currents meet. This phenomenon is also an essential consideration for the management of coastal tourism areas in Sukabumi's coastal waters [34,35]. The presence of lifeguards is a practical step necessary to maintain security and avoid unwanted dangers.

Another parameter that deserves greater attention regarding tourist safety and security is the average wave height at the three beaches. Wave height is one of the factors tourists consider when visiting a beach destination, especially those who want to enjoy safe, comfortable beach recreation rather than water sports like surfing [23,36]. In this study, monitoring results showed that Karang Hawu Beach had the highest wave height parameters, ranging from 0.7 to 1.8 meters. Meanwhile, wave heights at Citepus Beach ranged from 0.6 to 1.2 meters and at Cikaso Beach between 0.4 and 1.1 meters. The higher wave height at Karang Hawu Beach is suspected to be based on the relatively steep and uneven contour of the beach floor and the presence of rocks and coral. This is supported by the slope at Karang Hawu Beach, which ranges from 13-22° and falls within the steep category.

The three beaches are not inhabited by dangerous biota, such as sea urchins, rays, snakes, or stinging jellyfish. The absence of hazardous biota is undoubtedly a positive aspect of the three beaches for beach tourism. The presence of dangerous biota can cause feelings of insecurity and incidents that result in undesirable tourism experiences [23].

The southern coast of Sukabumi Regency is unique because it lies between mountainous and coastal areas. This makes fresh water easily accessible near each beach, including the three we observed. These three beaches also offer a wealth of natural beauty, including green, forest-covered mountains, beautiful blue oceans, and flowing rivers in several locations. The geographic strength of these three beaches is further enhanced by lush coastal areas adorned with coconut trees, other vegetation, and expansive open spaces. These geographical advantages and natural beauty offer significant potential to attract tourists.

The Sukabumi Regency Tourism Office noted that daily tourist visits were higher at Citepus Beach and Karang Hawu, with around 300–400 visitors per day. Cikaso Beach generally receives between 100 and 250 visitors per day [37]. Compared with the research results, this value indicates that the condition of tourist visits is still within the ecological carrying capacity of the environment. The value of tourist visits should be surveyed to prevent excessive tourism accumulation, which can lead to environmental degradation in the three coastal areas studied. Tourism activities are expected to provide long-term benefits to local communities rather than short-term benefits that result in the loss of coastal ecological functions [38,39].

The research results can serve as a basis for strategic tourism development policy in the three coastal areas. Management should implement an ecotourism concept rooted in natural resource conservation, environmental education, and local community involvement. Tourism development focused solely on increasing visitor numbers can lead to mass tourism, which can cause environmental damage due to uncontrolled tourist pressure. Closer attention to visitor numbers is essential, especially during peak holiday seasons, as these periods can indicate surges [37].

The findings of this study emphasize the need to shift perspectives in coastal tourism development policies from a more exploitative approach to one grounded in the values and ethics of responsible tourism. Managers need to establish coastal attraction zones based on tourism harmony index values and support visitor numbers in line with existing ecological carrying capacity values. By implementing these aspects, it is hoped that tourism activities will provide long-term benefits to local communities [40,41].

Furthermore, this research highlights the often-overlooked importance of adapting scientific dimensions and spatial data to regional development policies. In the realm of tourism development, particularly nature tourism, the involvement of all stakeholders is essential. Not only business actors but also academics and local communities must be involved to develop management strategies that are not only profitable in the short term but also deliver long-term benefits while maintaining environmental sustainability and landscape quality [42–44].

5. Conclusions

Citepus and Cikaso Beaches are suitable for beach recreation, swimming, and camping. Karang Hawu Beach is suitable for beach recreation, moderately suitable for swimming, and

conditionally acceptable for camping activities. The ecological carrying capacity for each tourism activity in each region varies with the length and area of the beach. Citepus Beach had the highest overall ecological carrying capacity, with 503 for beach recreation, 378 for swimming, and 1,558 for camping. Karang Hawu Beach has an ecological carrying capacity of 403 for beach recreation, 302 for swimming, and 1,171 for camping. Meanwhile, Cikaso Beach has an ecological carrying capacity of 269 tourists for beach recreation, 201 for swimming, and 957 for camping. This study provides novel baseline information regarding the suitability index and ecological carrying capacity of several tourist attractions on three beaches in Sukabumi. The results can serve as a basis for developing coastal tourism management plans in Sukabumi Regency, considering tourist comfort and safety, as well as environmental sustainability.

Author Contributions

SBA: Conceptualization, Methodology, Software, Investigation, Writing – Review, Finalization - Editing; **FB**: Conceptualization, Methodology, Software, Investigation, Writing – Review, Editing; **RR**: Investigation, Writing – Review; **YSW**: Investigation, Writing – Review.

AI Writing Statement

The authors did not use any artificial intelligence assisted technologies in the writing process.

Conflicts of interest

There are no conflicts to declare.

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