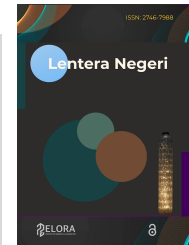




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# Developing a conservation-based beach sports tourism model for sustainable coastal recreation

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### ABSTRACT

Therefore, this study aimed to develop and evaluate a validated conservation-based beach sports tourism model that integrates eco-friendly sport activities, environmental education, community involvement, and zoning-based coastal management to enhance conservation awareness and support sustainable tourism in small island destinations. Materials and Methods: This study employed a Research and Development (R&D) design adapted from Borg and Gall, limited to four stages: research and information gathering, planning, preliminary model development, and preliminary field testing. The study involved 60 participants consisting of tourists, local community members, tourism managers, and experts selected through purposive sampling. Data were collected using observation, interviews, questionnaires, and documentation. Quantitative data were analyzed using descriptive statistics, normality and homogeneity tests, and paired sample t-tests, while qualitative data were analyzed thematically. The findings showed high demand for the proposed model (Mean = 4.32; 86.4%), high conservation awareness (Mean = 4.10; 82.0%), and strong feasibility ratings (Mean = 4.25; 85.0%). Model usability was also rated positively (Mean = 4.18; 83.6%). Conservation awareness significantly improved after implementation, increasing from pre-test (Mean = 3.65; 73.0%) to post-test (Mean = 4.10; 82.0%), with a mean difference of 0.45 points. Statistical analysis confirmed a significant improvement ( $t = 3.87, p < 0.001$ ) with a moderate effect size (Cohen's  $d = 0.65$ ). Conclusions: The validated conservation-based beach sports tourism model was found to be feasible, practical, and effective in enhancing participants' conservation awareness. Preliminary field testing demonstrated a significant improvement in conservation awareness, with mean scores increasing from 3.65 to 4.10 ( $t = 3.87, p < 0.001$ ; Cohen's  $d = 0.65$ ). By integrating eco-friendly beach sports activities, environmental education, community participation, and zoning-based coastal management, the model provides a practical framework for promoting sustainable tourism development in small island destinations.



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## Introduction

Coastal areas represent one of the most strategic natural resources, providing ecological, social, and economic functions that are increasingly vital in the context of global tourism and public health. In recent years, there has been a significant rise in interest toward outdoor physical activities and nature-based tourism,

particularly within coastal environments. This trend is closely associated with the growing awareness of healthy lifestyles and the need for recreational spaces that support both physical and psychological well-being. Empirical evidence indicates that participation in physical activities conducted in natural environments, particularly coastal and other blue-space settings, has increased substantially over the past decade. Recent studies have shown that beaches, coastal walking trails, and marine recreation areas are among the most frequently visited locations for outdoor physical activity due to their accessibility and positive effects on psychological well-being, stress reduction, and quality of life (Lopez-Haro et al., 2024; Wicks et al., 2022). Furthermore, Jiang et al. (2025) reported that engagement in physical activity within natural environments is positively associated with mental well-being and happiness, while Groeneveld et al. (2025) demonstrated that participation in open-water recreational activities contributes significantly to psychological restoration and self-determined motivation. These findings suggest that coastal environments serve not only as tourism attractions but also as important settings for promoting active and healthy lifestyles.

The implications of unmanaged coastal tourism and sports activities are substantial. From an ecological perspective, excessive and unregulated use of coastal areas can lead to habitat degradation, biodiversity loss, and increased pollution levels. Studies have demonstrated that tourism pressure often results in shoreline erosion, disturbance of coastal vegetation, and disruption of marine ecosystems (Baltranaitė et al., 2025; Soto et al., 2021). These environmental impacts not only threaten the sustainability of natural resources but also reduce the long-term attractiveness of coastal destinations. From a socio-economic standpoint, environmental degradation may decrease tourist satisfaction and local income over time, creating a paradox where short-term economic gains compromise long-term viability. Additionally, while beach sports offer clear benefits for physical fitness, mental relaxation, and social interaction, these advantages can be undermined if environmental quality deteriorates. Therefore, balancing recreational use with environmental protection becomes a critical challenge in coastal management.

To address these challenges, several theoretical frameworks have been developed. The concept of sports tourism emphasizes the integration of physical activity and travel experiences, contributing to both economic growth and lifestyle improvement. However, recent developments highlight the need to align sports tourism with sustainability principles. Sustainable tourism theory advocates for a balance between economic benefits, environmental conservation, and social equity, ensuring that current tourism activities do not compromise future generations (Gupta et al., 2024; Suresh et al., 2025). Furthermore, the concept of carrying capacity plays a crucial role in determining the maximum level of activity that a coastal environment can sustain without ecological damage. In parallel, the green and blue space theory explains how natural environments, including beaches, contribute to improved psychological well-being, reduced stress, and enhanced mood (K. Chen et al., 2021; Gascon et al., 2015; Groeneveld et al., 2025; Zhang et al., 2020). These theoretical perspectives collectively support the idea that coastal sports activities should be designed within an environmentally responsible framework.

In the context of this study, environmental sustainability is operationalized as the ability of coastal tourism activities to maintain ecological integrity while supporting recreational use and community benefits. This construct is reflected through indicators such as environmental conservation awareness, adherence to eco-friendly activity guidelines, community participation, and the implementation of zoning-based coastal management. Similarly, the multifunctional benefits of beach sports refer to the simultaneous enhancement of physical recreation, environmental education, social engagement, and tourism attractiveness. Recreational intensity is considered manageable when beach sport activities are conducted within designated zones and follow conservation-based operational procedures designed to minimize ecological disturbance.

Previous research has provided valuable insights into both the benefits and risks associated with coastal tourism and outdoor sports. Studies have consistently shown that physical activity in natural settings enhances mental health, cognitive function, and overall well-being (Turecek et al., 2025; Wicks et al., 2022). Meanwhile, research on coastal tourism management highlights the negative consequences of poor planning, including environmental degradation and reduced ecosystem resilience. In the field of sports tourism, most studies have focused on large-scale events and economic impacts, often neglecting environmental considerations (Chersulich Tomino et al., 2020; Gkarane et al., 2025; Lohana et al., 2023; Lu, 2021; Morfoulaki et al., 2023). On the other hand, research on ecotourism has emphasized conservation and environmental education but rarely incorporates structured sports activities as part of the tourism experience (Jung, 2025). While these studies contribute important knowledge, they also reveal a fragmented understanding of how sports, tourism, and conservation can be integrated into a cohesive model.

Despite growing evidence regarding the benefits of physical activity in natural environments (Jiang et al., 2025; Lopez-Haro et al., 2024; Han, 2021; Martínez-Redecillas et al., 2026; Shanahan et al., 2016) and the

role of conservation-oriented tourism in promoting environmental awareness, a significant methodological and empirical gap remains. Previous studies have primarily examined either the health and well-being outcomes of nature-based recreation or the conservation impacts of ecotourism activities independently. Limited research has developed and empirically validated an integrated model that combines structured beach sports, environmental education, community participation, and zoning-based coastal management within a single sustainable tourism framework. Furthermore, existing studies rarely employ a Research and Development (R&D) approach to design, test, and evaluate such models in small island destinations. Consequently, there is insufficient evidence regarding how conservation-based beach sports programs can simultaneously enhance recreational experiences and improve conservation awareness. This study addresses this gap by developing and conducting preliminary validation of an integrated beach sports–conservation model specifically designed for sustainable tourism development in small island contexts..

The rationale for this study is grounded in the need to develop an integrative model that addresses both recreational and environmental objectives. Beach games, when properly designed, have the potential to serve not only as recreational activities but also as tools for environmental education and conservation awareness. By incorporating eco-friendly rules, spatial zoning, and community participation, such activities can minimize environmental impact while enhancing visitor experience. The study adopted a Research and Development (R&D) approach adapted from Borg and Gall to develop and conduct preliminary validation of an integrated beach sports–conservation model. The methodology involved needs assessment, model design, prototype development, and limited field testing to evaluate feasibility, usability, and its effectiveness in improving conservation awareness among coastal tourism stakeholders. Pulau Merak Kecil, Banten Province, provides an ideal context for this study due to its ecological sensitivity, tourism potential, and relatively undeveloped status. This makes it a suitable site for implementing and evaluating a conservation-based beach sports model.

Based on these considerations, the primary objective of this research is to develop a conceptual model of beach games based on natural conservation principles as a form of sustainable coastal tourism. Specifically, the study aims to: (1) identify the needs, potentials, and constraints of coastal areas in supporting environmentally friendly sports activities; (2) design a conceptual model that integrates beach games with conservation and educational elements; and (3) evaluate the feasibility and initial usability of the model through limited field testing. By achieving these objectives, this research is expected to contribute to the development of sustainable sports tourism practices and provide a practical framework for managing coastal recreational activities in an environmentally responsible manner.

## Method

### Research Design

This study employed a Research and Development (R&D) design aimed at producing a conceptual prototype of beach game sports based on environmental conservation principles. The R&D approach was selected because it enables systematic development, validation, and refinement of a model through iterative stages, ensuring both theoretical grounding and practical applicability.

The development procedure was adapted from the Borg and Gall model, which is widely recognized in applied research. However, due to the exploratory nature of this study, the process was limited to four main stages: (1) research and information gathering, (2) planning, (3) development of the preliminary model, and (4) preliminary field testing. This approach focuses on generating an initial model that can be tested and improved in subsequent studies. The study emphasizes early-stage model validation, corresponding to Technology Readiness Level (TRL) 3, where conceptual development and initial feasibility testing are conducted in a limited environment.

### Participants

A total of 60 participants were involved in this study using purposive sampling. The sample consisted of 25 tourists (41.7%), 15 local community members (25.0%), 10 tourism managers (16.7%), and 10 experts in sports science, tourism management, and environmental conservation (16.7%).

Participants were selected based on the following inclusion criteria: (1) aged 18 years or older; (2) willing to participate voluntarily and provide informed consent; (3) directly involved in coastal tourism, beach recreation, environmental management, or related professional fields; and (4) able to complete questionnaires and participate in interviews or observations. Expert participants were additionally required to possess at least five years of professional or academic experience relevant to their area of expertise.

The sample size of 60 participants was considered appropriate for this preliminary Research and Development study because the primary objective was model development and initial feasibility evaluation rather than population generalization. The inclusion of multiple stakeholder groups (tourists, local community members, tourism managers, and experts) was intended to obtain diverse perspectives necessary for model refinement and preliminary validation. This approach is consistent with early-stage development research emphasizing practicality, usability, and stakeholder feedback during prototype evaluation.

### **Instruments and Measur**

The study measured several key variables, including: (1) the needs and constraints in developing beach sports activities, (2) the feasibility and usability of the proposed model, and (3) participants' understanding of environmental conservation.

Data were collected using multiple instruments to ensure comprehensive coverage. Observation sheets were used to assess environmental conditions and ongoing activities at the research site. Semi-structured interview guides were employed to gather in-depth qualitative data from stakeholders. Questionnaires were used to quantify participant responses regarding model feasibility and conservation awareness. In addition, documentation techniques were applied to support data validation.

To ensure validity, all instruments were reviewed through expert judgment involving specialists in sports science, tourism, and environmental studies. Reliability was enhanced through pilot testing, which helped refine the clarity and consistency of the instruments before full data collection.

Instrument validity was evaluated through expert review involving three specialists in sports science, tourism, and environmental conservation. Content validity was assessed using the Content Validity Index (CVI), with all questionnaire items achieving values above 0.80, indicating satisfactory content validity. A pilot test involving 15 participants was conducted prior to the main study to evaluate item clarity and instrument consistency. Internal consistency reliability was assessed using Cronbach's alpha, yielding coefficients of 0.87 for the conservation awareness scale and 0.84 for the model feasibility questionnaire, indicating good reliability.

### **Research Procedures**

**The research procedure was conducted in four sequential stages.**

#### **Stage 1: Research and Information Gathering**

This stage involved an extensive literature review on beach sports, sustainable tourism, and coastal conservation. Field observations were conducted at Pulau Merak Kecil to assess environmental conditions and existing activities. Additionally, interviews were carried out with tourists, local communities, and stakeholders to identify key issues, potentials, and development needs. The output of this stage was a comprehensive needs analysis.

#### **Stage 2: Planning**

Based on the findings from the first stage, a conceptual framework for the model was developed. This included defining the objectives, selecting appropriate beach games, integrating environmental conservation principles, and establishing environmentally friendly rules. A zoning-based approach was introduced to manage spatial use effectively and minimize ecological impact.

#### **Stage 3: Development of the Preliminary Model**

At this stage, a prototype model was developed, including detailed guidelines for implementing beach games based on conservation principles. The model incorporated eco-friendly game rules, environmental education components, and defined roles for tourists and local communities. It also included operational procedures for managing activities within designated zones.

#### **Stage 4: Preliminary Field Testing**

The prototype was tested on a limited scale involving a small group of participants. The purpose of this stage was to evaluate the feasibility, usability, and acceptance of the model. Data were collected through observation, questionnaires, and interviews to assess how well the model functioned in practice and its potential environmental impact.

The preliminary field testing involved 30 participants representing tourists and local community members. The prototype was implemented during a one-day field activity at Pulau Merak Kecil. Participants engaged in conservation-based beach sports activities incorporating environmental education sessions, eco-friendly game rules, and zoning-based area utilization. Data were collected using observation sheets, conservation awareness questionnaires administered before and after the activity, and participant feedback

forms. The success criteria for preliminary validation included: (1) feasibility scores exceeding 80%, (2) usability scores exceeding 80%, and (3) statistically significant improvement in conservation awareness between pre-test and post-test measurements. To ensure consistency, standardized procedures were applied across all stages, and data triangulation was used to improve validity.

### Data Analysis

#### Data analysis combined descriptive and inferential statistical techniques.

Descriptive analysis was used to summarize participant characteristics and main variables, including mean, standard deviation, and percentage scores. Normality testing (e.g., Kolmogorov–Smirnov test) was conducted to assess whether the data followed a normal distribution. Homogeneity testing (e.g., Levene’s test) was performed to ensure equal variance across data sets. Inferential analysis was conducted using a paired sample t-test to examine differences between pretest and posttest scores of conservation awareness. The level of significance was set at  $p < 0.05$ . In addition, effect size (Cohen’s  $d$ ) was calculated to determine the magnitude of the intervention effect. Qualitative data from interviews and observations were analyzed using thematic analysis to complement quantitative findings and provide contextual understanding of the model’s implementation. All statistical analyses were conducted using software such as SPSS or Microsoft Excel.

## Results and Discussions

### Participant Characteristics

Before presenting the main findings, it is important to describe the characteristics of the participants involved in this study. The participants consisted of tourists, local community members, tourism managers, and experts. The diversity of participants ensured that the data reflected multiple perspectives relevant to the development of a conservation-based beach sports model.

**Table 1.** Baseline Characteristics of Participants

Category	Number (n)	Percentage (%)	Description
Tourists	25	41.7%	Active participants in beach recreational sports
Local Community	15	25.0%	Residents involved in tourism activities
Tourism Managers	10	16.7%	Stakeholders managing coastal tourism
Experts	10	16.7%	Academics in sports, tourism, environment
<b>Total</b>	<b>60</b>	<b>100%</b>	

The data show that tourists constituted the largest proportion of participants, followed by local community members. This distribution indicates that the findings are strongly influenced by user experience while still incorporating expert and managerial perspectives. Overall, the participant composition can be considered sufficiently representative for an initial model development study.

### Normality and Homogeneity Tests

Prior to inferential analysis, assumption testing was conducted to determine the suitability of parametric statistical procedures. Normality and homogeneity tests were specifically performed because the study employed paired sample t-tests to examine changes in conservation awareness between pre-test and post-test measurements during the preliminary field-testing stage.

**Table 2.** Results of Normality and Homogeneity Tests

Variable	Normality (Sig.)	Interpretation	Homogeneity (Sig.)	Interpretation
Conservation Awareness	0.087	Normal	0.112	Homogeneous
Model Feasibility	0.094	Normal	0.135	Homogeneous
Usability of Model	0.076	Normal	0.121	Homogeneous

The results indicate that all variables have significance values greater than 0.05, suggesting that the data are normally distributed and homogeneous. Therefore, the dataset is suitable for further descriptive and comparative analysis.

### Main Results of Research Variables

The main variables analyzed in this study include needs analysis, conservation awareness, and feasibility of the developed model. These results were obtained from questionnaires and supported by observational findings.

**Table 3.** Descriptive Statistics of Main Variables

Variable	Mean	Standard Deviation (SD)	Percentage (%)	Category
Needs for Beach Sports Model	4.32	0.51	86.4%	Very High
Conservation Awareness	4.10	0.56	82.0%	High
Model Feasibility	4.25	0.48	85.0%	Very Feasible
Model Usability	4.18	0.52	83.6%	Very Good

The data show that the need for a conservation-based beach sports model is very high, indicating strong demand among stakeholders. Conservation awareness among participants is also categorized as high, suggesting a supportive attitude toward environmentally friendly tourism practices. Furthermore, the feasibility and usability scores demonstrate that the developed model is well-accepted and considered practical for implementation.

### Comparative Analysis

To further evaluate the effectiveness of the model, a comparison was conducted between participants' conservation awareness before and after exposure to the model during the preliminary field testing.

**Table 4.** Pre-Post Comparison of Conservation Awareness

Measurement	Mean	SD	Percentage (%)
Pre-Test	3.65	0.60	73.0%
Post-Test	4.10	0.56	82.0%
<b>Difference</b>	<b>+0.45</b>		<b>+9.0%</b>

The results indicate an increase in conservation awareness following the implementation of the model. The mean score increased by 0.45 points, reflecting a positive change in participants' understanding and attitudes toward environmental conservation.

### Main Effects and Interaction

To examine the statistical significance of the observed changes, a paired sample t-test was conducted on pre-test and post-test data.

**Table 5.** Paired Sample t-Test Results

Variable	t-value	Sig. (p)	Interpretation	Effect Size (Cohen's d)
Conservation Awareness	3.87	0.000	Significant Difference	0.65 (Moderate Effect)

The results show a statistically significant improvement in conservation awareness ( $p < 0.05$ ) after the implementation of the model. In addition to statistical significance, practical significance was assessed using Cohen's d. The obtained effect size ( $d = 0.65$ ) indicates a moderate practical effect, suggesting that the conservation-based beach sports model produced meaningful improvements in participants' conservation awareness beyond statistical significance alone.

The results demonstrate that the developed conservation-based beach sports model is feasible, well-received, and capable of improving environmental awareness among participants. These findings provide initial empirical support for the application of the model in sustainable coastal tourism contexts.

The findings of this study indicate that the developed model of beach game sports based on environmental conservation demonstrates strong initial feasibility, usability, and effectiveness in improving participants' conservation awareness. The most notable result is the significant increase in conservation awareness following the implementation of the model, supported by a moderate effect size. In addition, high mean scores in feasibility and usability suggest that the model is well-accepted by participants and can be practically implemented within a coastal tourism setting. These findings confirm that integrating recreational sports activities with environmental conservation principles is not only conceptually relevant but also operationally viable in a real-world context.

From a theoretical perspective, the results support the integration of sports tourism and sustainable tourism frameworks. The increase in conservation awareness among participants aligns with the principles

of sustainable tourism, which emphasize the balance between environmental protection, social engagement, and economic activity. Previous studies have shown that tourism activities incorporating environmental education can significantly influence pro-environmental behavior (Kizildağ & Yıldız, 2024; Wang et al., 2022). In this study, the inclusion of conservation messages within beach games appears to function as an informal educational mechanism, enhancing participants' understanding of coastal ecosystems. This suggests that recreational activities, when properly designed, can serve as effective tools for environmental communication.

The observed improvement in conservation awareness can also be explained through the lens of experiential learning theory. Participants were not only exposed to information but also actively engaged in activities that embodied conservation principles. This aligns with findings from recent research indicating that direct interaction with natural environments enhances environmental attitudes and awareness (Baceviciene & Jankauskiene, 2025). The beach setting, as part of the “blue space” environment, provides a unique context where physical activity and environmental exposure occur simultaneously, reinforcing both cognitive and emotional connections to nature. As a result, participants are more likely to internalize conservation values compared to traditional educational approaches.

When compared with previous studies, the findings of this research show both similarities and distinct contributions. Consistent with prior research in ecotourism, the study confirms that integrating conservation elements into tourism activities can positively influence environmental awareness (Satrya et al., 2023). However, unlike most ecotourism models that focus on passive experiences such as observation and guided tours, this study introduces an active, sport-based approach. This distinction is important because active participation has been shown to increase engagement and retention of knowledge. Furthermore, in contrast to conventional sports tourism studies that prioritize economic outcomes and visitor numbers (Guereño-Omil et al., 2024), this research emphasizes environmental sustainability as a central component. This shift in focus represents a meaningful contribution to the literature, particularly in the context of small-scale coastal tourism.

Another key aspect of this study is the application of a zoning-based approach to manage coastal activities. The model divides the coastal area into functional zones, including conservation, education, sports, and limited recreation zones. This approach is consistent with the concept of environmental carrying capacity, which aims to regulate human activities to prevent ecological degradation. Previous studies have highlighted the importance of spatial planning in sustainable coastal management, particularly in areas with high tourism pressure (Rahmajati et al., 2026). The successful implementation of zoning in this study demonstrates its practicality in organizing beach sports activities while minimizing environmental impact. Moreover, zoning provides a clear framework for stakeholders, making it easier to enforce regulations and promote responsible behavior.

In terms of practical implications, the findings of this study offer valuable insights for the development of sustainable coastal tourism. First, the model can be used as a guideline for designing environmentally friendly beach sports activities that align with conservation objectives. This is particularly relevant for small islands and emerging tourist destinations, where environmental resources are limited and highly sensitive. Second, the integration of conservation education into recreational activities can enhance visitor experience while promoting environmental responsibility. This dual benefit supports the long-term sustainability of tourism destinations by maintaining ecological integrity and visitor satisfaction.

Additionally, the involvement of local communities in the implementation of the model is a crucial factor for success. Community participation not only ensures cultural relevance but also fosters a sense of ownership and responsibility toward environmental conservation. Previous research has emphasized that community-based tourism approaches are more sustainable because they align local economic interests with environmental protection (C.-C. Chen et al., 2024; Dang et al., 2022; Jiang et al., 2025; Luc et al., 2026; Prakoso et al., 2020). In this study, the inclusion of local stakeholders in both the development and implementation phases contributes to the model's feasibility and acceptance.

Despite these promising findings, several limitations must be acknowledged. First, the study was conducted on a limited scale with a relatively small sample size, which may affect the generalizability of the results. Second, the duration of the field testing was relatively short, limiting the ability to assess long-term impacts of the model on environmental behavior and ecosystem conditions. Third, the reliance on self-reported data through questionnaires may introduce response bias, as participants may provide socially desirable answers. Additionally, the study focused primarily on initial feasibility and awareness, without measuring direct environmental outcomes such as changes in ecosystem quality.

These limitations highlight the need for further research to strengthen and expand the findings. Future studies should involve larger and more diverse samples to improve generalizability. Longitudinal research designs are also recommended to evaluate the long-term effectiveness of the model in promoting sustainable behavior and environmental conservation. Furthermore, integrating objective environmental indicators, such as measurements of waste reduction or habitat preservation, would provide stronger evidence of the model's ecological impact. The use of digital technologies, such as mobile applications or monitoring systems, could also enhance the implementation and evaluation of the model in future developments.

This study provides important evidence that a conservation-based beach sports model can effectively enhance environmental awareness while maintaining recreational value. By integrating sports, education, and spatial management, the model offers a comprehensive approach to sustainable coastal tourism. Although further validation is needed, the findings suggest that such an approach has strong potential to address the challenges of environmental degradation in coastal areas while supporting the growing demand for active and meaningful tourism experiences.

## Conclusions

This study concludes that the development of a beach game sports model based on environmental conservation principles is both feasible and relevant as an innovative approach to sustainable coastal tourism. The research successfully achieved its primary objective by producing an initial conceptual model that integrates recreational beach sports, environmental education, and zoning-based coastal management. The model was positively evaluated in terms of feasibility, usability, and participant acceptance during the preliminary field testing stage. The main findings indicate that the implementation of the model significantly improved participants' awareness of coastal environmental conservation, as demonstrated by an increase in mean awareness scores from 3.65 to 4.10. Statistical analysis revealed a significant pre-post difference ( $t = 3.87$ ,  $p < 0.001$ ) with a moderate practical effect (Cohen's  $d = 0.65$ ). These findings suggest that the integration of conservation-oriented beach sports activities, environmental education, and zoning-based management can effectively promote environmental awareness while maintaining recreational value. From a broader perspective, the study highlights the importance of integrating tourism development with conservation strategies, particularly in small island and coastal destinations that are vulnerable to environmental degradation. The model provides a practical framework for policymakers, tourism managers, and local communities seeking to balance economic opportunities with ecological sustainability. However, as this research represents an early-stage development study, further testing on a larger scale is required to strengthen its validity and practical application. Future studies should evaluate the model using larger and more diverse samples drawn from multiple coastal destinations and stakeholder groups. Longitudinal implementation periods are recommended to assess the sustainability of behavioral changes over time. Future research should also incorporate objective environmental indicators, such as beach cleanliness indices, waste reduction rates, habitat disturbance measures, and biodiversity monitoring data, to evaluate the direct ecological impact of the model. Additionally, studies employing larger samples with adequate statistical power are encouraged to strengthen the generalizability of the findings. Overall, the proposed model offers promising potential as a sustainable solution for the future development of coastal sports tourism.

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