Grouper : Jurnal Ilmiah Perikanan
Vol. 16 No. 1 (2025) pp. 267-281
pISSN: 2086-8480 | eISSN: 2716-2702
Journal Homepage: https://grouper.unisla.ac.id/index.php/grouper

Analysis of Conservation and Environmental Education Strategies in the Nirwana Beach Tourism Area, Padang City

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Submitted: 30 Maret 2025 Revised: 15 April 2025 Accepted: 30 April 2025

Keywords:
environmental conservation; tourism education; SWOT analysis; strategy; Nirwana Beach

ABSTRACT

Nirwana Beach is one of the leading coastal tourism destinations in Padang City, offering significant potential for development as an educational and sustainable tourism area. However, the management of this area still faces various challenges, such as low community participation, limited environmental education facilities, and the lack of integration of conservation programs into tourism activities. This study aims to analyze conservation and environmental education strategies at Nirwana Beach to support sustainable coastal area management. The study was conducted using a quantitative approach using questionnaires with 100 respondents, supported by field observations and interviews with key informants. Data were analyzed descriptively and then followed by a SWOT analysis approach. The results showed that tourist awareness and concern for the environment were high (score >4.0), but educational facilities and community involvement were still limited. The SWOT analysis resulted in a total score of strengths (1.30), weaknesses (0.35), opportunities (1.22), and threats (0.52), placing conservation and education strategies in Quadrant I (aggressive strategies). The main recommended strategies include developing educational programs based on direct experience, providing environmental information facilities, involving local communities, and promoting the area as an environmentally friendly tourism destination. With its dominant potential strengths and opportunities, this area needs to be managed through multi-stakeholder synergy to create a tourist destination that is not only economically attractive, but also contributes to environmental conservation and public education.

INTRODUCTION

Coastal areas play a crucial role as productive areas supporting social, economic, and ecological life (Yusri et al., 2019; Anwar & Zakaria, 2014). In Padang City, Nirwana Beach is a coastal tourism destination with significant potential for sustainable development (Ical & Mane, 2019). Located approximately 11–14 kilometers from the city center and adjacent to Teluk Bayur Port, Nirwana Beach offers beautiful ocean views, stretches of white sand, and panoramic sunsets, attracting both local and international tourists. This natural beauty makes Nirwana Beach a strategic point for developing marine tourism in Padang City (Nuryadin & Sugiri, 2023).

Data from the Tourism Office and local media reports indicate that during the 2025 Eid al-Fitr holiday, Nirwana Beach was visited by over 23,700 tourists in just one week (Abdullah et al., 2021; Wijaya et al., 2023; Wati et al., 2023). However, despite its high economic potential, tourist visits are still seasonal and not accompanied by sustainable area management. Furthermore, various challenges such as a lack of public facilities, suboptimal waste management, and a lack of educational activities pose serious obstacles to the area's development as an environmentally friendly tourist destination (Davelta et al., 2024; Aditya & Amin, 2019; Uki et al., 2022). From an environmental perspective, the Nirwana Beach area shows signs of degradation due to uncontrolled tourism activities, such as plastic waste pollution, neglect of cleanliness, and a lack of environmental awareness among tourists (Mansyur et al., 2025; Sadarun & Mansyur, 2021). In fact, in the 2017–2027 Regional Tourism Development Master Plan (RIPPARDA) for Padang City, Nirwana Beach has been designated as a priority for tourism development. However, to date, there has been no systematic conservation strategy or environmental education program that actively involves tourists, local communities, and management.

This situation demonstrates the importance of developing a strategy that integrates environmental conservation and community-based education in the management of coastal tourism areas. Therefore, this study aims to: (1) identify the existing conditions of conservation and environmental education activities that have been carried out in the Nirwana Beach tourist area in Padang City; (2) analyze internal and external factors that influence the effectiveness of conservation and environmental education in the area; and (3) developing appropriate and sustainable conservation and environmental education strategies to support the management of the Nirwana Beach tourist area as an environmentally based tourism destination.

Through the SWOT analysis approach used in this research, it is hoped that a comprehensive overview of the strengths, weaknesses, opportunities, and threats facing the area will be obtained. The results of this analysis are expected to serve as a basis for developing conservation and environmental education strategies that are

relevant to local characteristics and can be applied to support sustainable tourism development. In the context of aquatic resource management science, this research makes an important contribution to strengthening adaptive, collaborative, and conservation-based coastal area governance.

METHOD

This study employed a descriptive quantitative approach, which is used to describe and analyze the actual conditions related to conservation and environmental education strategies in the Nirwana Beach tourist area in Padang City. This approach allowed researchers to measure and evaluate respondents' perceptions through a structured questionnaire, and analyze the data using descriptive statistics and SWOT analysis.

The study was conducted at Nirwana Beach, Padang City, West Sumatra Province, a coastal tourist area with a high tourist visit rate and significant environmental conservation potential. The study was scheduled for January to February 2025.

The population in this study consisted of three main groups. First, tourists visiting Nirwana Beach, who directly interact with the tourist area and have perceptions about the conservation and environmental education conditions at the location. Second, the local community involved in tourism activities or playing a role in environmental management, both formally and informally, thus playing a vital role in the area's conservation process. Third, business actors and tourism managers operating in the Nirwana Beach area, including food stall owners, tourist transportation providers, and other tourism facility managers, play a role in supporting or hindering the implementation of conservation and education strategies in the area. These three groups were selected because of their direct and indirect involvement in the dynamics of environmental management at Nirwana Beach.

The sampling technique used was accidental sampling, which randomly selects respondents found on-site during the research. The minimum sample size was 100 respondents to ensure representative data analysis.

Data Collection Techniques

Data in this study were collected using a closed-ended questionnaire designed based on conservation and environmental education indicators. These indicators cover four main aspects: respondents' knowledge and awareness of environmental issues, environmentally friendly behavior during visits to Nirwana Beach, perceptions of the availability of educational facilities and resources in the tourist area, and respondents' support for existing or ongoing conservation programs. Each statement in the questionnaire was structured using a Likert scale of 1–5, with 1 indicating a very low level of agreement (strongly disagree) and 5 indicating a very high level of agreement (strongly agree). In addition to primary

data collection through the questionnaire, this study also utilized secondary data obtained from official documents, such as the Regional Tourism Development Master Plan (RIPPARDA), reports from the Padang City Tourism Office, and scientific publications relevant to the theme of coastal area conservation and management.

Data Analysis Techniques

The data obtained from the questionnaire will be analyzed using:

1. Descriptive Statistics: to calculate the frequency, percentage, and average for each indicator.
2. Scoring: The Likert scale scores are processed to determine respondents' levels of knowledge, attitudes, and perceptions.
3. SWOT Analysis: used to develop environmental conservation and education strategies. This analysis is based on quantitative data input and processed in a SWOT matrix to identify strengths, weaknesses, opportunities, and threats.

Instrument Validity and Reliability Testing

The validity test in this study was conducted using the Pearson Product Moment correlation technique, which aims to ensure that each questionnaire item is statistically valid in measuring the intended variable. Questions are considered valid if the correlation coefficient is significant and above 0.30. Furthermore, to measure the internal consistency of the instrument, a reliability test was conducted using the Cronbach's Alpha method. An instrument is considered reliable if its alpha value is 0.6 or higher, indicating that the questionnaire items have an adequate level of interrelationship and can be used consistently in data collection.

Analysis Tools

Data processing and analysis in this study were conducted using Microsoft Excel and SPSS version 25 software. These tools were used to perform descriptive statistical analysis and to test the validity and reliability of the research instruments. The use of these two tools aimed to improve the accuracy of data processing and support a more systematic and measurable interpretation of the results.

RESULT AND DISCUSSION

The questionnaire instrument, consisting of 10 statement items, was first tested for validity and reliability. This test was conducted to ensure that each statement item accurately measured the intended aspect (validity) and that there was consistency between items within a single construct (reliability).

Table 1. Validity Test Results

No	Statements	Validity Coefficient	Information
1	Knowledge of the importance of environmental conservation	0.67	Valid
2	Concern for beach cleanliness	0.74	Valid

No	Statements	Validity Coefficient	Information
3	Behavior of disposing of waste properly	0.77	Valid
4	Understanding of environmental education in tourist areas	0.76	Valid
5	Availability of educational information at tourist locations	0.72	Valid
6	Participation in environmental conservation activities	0.71	Valid
7	Support for environmental management programs	0.68	Valid
8	Perception of the completeness of conservation facilities	0.66	Valid
9	Perception of local community involvement	0.65	Valid
10	Interest in participating in environmental education programs	0.69	Valid

Criteria: An item is declared valid if the Pearson correlation coefficient is ≥ 0.30.

The validity test results indicate that all items in the questionnaire have a Pearson correlation coefficient value above 0.30, indicating that all items are valid and accurately measure the intended construct. Therefore, no items need to be eliminated or revised from the instrument.

Furthermore, the reliability test results using the Cronbach's Alpha formula showed a value of 0.91, indicating that the instrument has a very high level of internal consistency. This value confirms that all items in the questionnaire support each other and can be used consistently in primary data collection.

Existing Conditions of Conservation and Environmental Education at Nirwana Beach

To determine the level of knowledge, attitudes, and perceptions of respondents regarding conservation and environmental education in the Nirwana Beach tourist area, a descriptive analysis of the questionnaire data was conducted. This analysis aimed to generally describe the extent to which respondents understand and support conservation efforts and respond to the educational facilities available at the tourist site. The summary of the average scores for each indicator is presented in Table 2.

Table 2. Average Respondent Scores for Conservation and Environmental Education Indicators at Nirwana Beach

No	Statements	Average Score	Category
1	Knowledge of the importance of environmental conservation	4.2	High
2	Concern for beach cleanliness	4.1	High

No	Statements	Average Score	Category
3	Behavior of disposing of waste properly	4.0	High
4	Understanding of environmental education in tourist areas	3.3	Medium
5	Availability of educational information at tourist locations	3.1	Medium
6	Participation in environmental conservation activities	3.0	Medium
7	Support for environmental management programs	4.0	High
8	Perception of the completeness of conservation facilities	3.2	Medium
9	Perception of local community involvement	3.1	Medium
10	Interest in participating in environmental education programs	3.4	Medium

Based on data obtained from 100 respondents, the existing condition of conservation and environmental education in the Nirwana Beach tourist area indicates a generally high level of environmental awareness and concern. This is demonstrated by an average score of 4.2 for knowledge of the importance of environmental conservation, 4.1 for concern for beach cleanliness, and 4.0 for proper waste disposal. These findings indicate that tourists have a fairly good awareness of environmental issues.

The average scores for understanding environmental education (3.3) and the availability of educational information at tourist sites (3.1) remain in the moderate category. This indicates that despite awareness, visitors do not receive sufficient information or educational media to support their understanding during their stay at the tourist area. Similarly, participation in conservation activities remains moderate (3.0), indicating a lack of direct involvement in environmental programs in the area.

Respondents also expressed high support for environmental management programs (4.0), but perceptions of local community involvement and conservation facilities remain moderate (3.1 and 3.2, respectively). Meanwhile, interest in environmental education programs was at 3.4, indicating that tourists are open to further involvement if the programs offered are engaging and informative.

Overall, it can be concluded that tourist awareness of the importance of the environment is high, but institutional support, educational facilities, and community involvement still need to be improved to strengthen the conservation and environmental education aspects at Nirwana Beach.

The results of the study indicate that tourists' level of knowledge and concern for the importance of environmental conservation in the Nirwana Beach tourist area is relatively high. The average scores for indicators such as knowledge about conservation (4.2), concern for beach cleanliness (4.1), and waste disposal behavior

(4.0) indicate that the majority of visitors have pro-environmental awareness and attitudes. This finding aligns with research by Gea & Manakane (2024), which states that tourists in coastal areas have a fairly good level of knowledge regarding the environmental impacts of tourism activities, especially if previously exposed to them through the media or formal education.

However, there is a significant gap between tourists' knowledge and the educational and conservation practices available in the field. Moderate scores on the availability of educational information (3.1) and understanding of environmental education (3.3) indicate that educational facilities at Nirwana Beach are still inadequate. Research by Apriyanthi et al. (2022) in the context of coastal areas indicates that the presence of information media and conservation education boards significantly contributes to increasing awareness and environmentally friendly practices among tourists. The lack of visual and interactive information media at Nirwana Beach likely contributes to the low effectiveness of education in the area.

Furthermore, this study also found that tourist participation in conservation activities is still relatively low (3.0). This condition is similar to the findings of Putri & Setiawan (2024), who stated that low visitor participation in conservation in tourist areas occurs due to the lack of direct involvement programs such as beach cleanups, planting coastal vegetation, or short training sessions during visits. The absence of such activities leaves tourists merely enjoying nature without feeling a real role in maintaining the area's sustainability. Interestingly, despite the lack of educational facilities and participation, visitors showed high support for conservation programs (4.0) and moderate interest in environmental education (3.4). This reinforces the findings of Ohyver et al.'s (2024) study, which stated that tourists are generally willing to actively participate in environmental programs provided that mechanisms and approaches are communicative, attractive, and do not disrupt the tourist experience.

Overall, this discussion confirms that conservation management and environmental education at Nirwana Beach remain passive and unstructured, despite the potential for significant support and involvement from tourists. By strengthening environmental communication strategies, providing visual and digital-based educational facilities, and systematically designing programs to engage tourists and the local community, Nirwana Beach can be developed into a sustainable, conservation-based educational tourism destination.

Internal and External Factors Influencing the Effectiveness of Conservation and Environmental Education

Based on data obtained through a questionnaire with 100 respondents and interviews with key informants, various internal and external factors were identified that influence the effectiveness of conservation and environmental

education in the Nirwana Beach tourist area. The analysis was conducted using a SWOT approach to identify strengths, weaknesses, opportunities, and threats.

A. Internal Factors

Internal factors relate to conditions within the Nirwana Beach area. Some of the identified strengths include:

1. High levels of environmental awareness and concern among tourists, as demonstrated by indicators of environmental knowledge, concern for cleanliness, and waste disposal behavior.
2. Tourist support for environmental conservation programs.
3. The beauty of the natural landscape and easy accessibility of the area, due to Nirwana Beach's strategic location south of Padang City and close to Teluk Bayur Port.

Meanwhile, identified weaknesses include:

1. Lack of educational facilities at tourist sites, such as information boards, educational banners, or outreach activities.
2. Unstructured participation of local communities in conservation activities.
3. The absence of scheduled and ongoing educational programs, resulting in passive education.

B. External Factors

External factors originate from conditions outside the area and encompass both opportunities and threats. Identified opportunities include:

1. High tourist arrivals during the holiday season, with more than 23,000 visitors recorded in a single week during Eid al-Fitr.
2. Policy support from the local government, through the Padang City Regional Tourism Development Master Plan (RIPPARDA), which designates Nirwana Beach as a strategic tourism area.
3. Potential collaboration with schools, universities, and environmental communities to develop community-based education and conservation programs.

Meanwhile, several threats identified include:

1. Environmental pollution from plastic waste and tourist waste, especially during peak periods.
2. The area's dependence on the long holiday season, which leads to fluctuations in visits and unstable management.
3. Lack of ongoing environmental monitoring and regulation, which results in low visitor compliance with conservation regulations.

Based on the identification of internal and external factors, it is clear that Nirwana Beach has significant potential to become a conservation and

environmental education-based tourism destination. However, improvements in institutional aspects, the provision of educational facilities, and the establishment of participatory programs are needed to optimize existing strengths and opportunities while minimizing identified weaknesses and threats.

Developing an Appropriate and Sustainable Environmental Conservation and Education Strategy in the Nirwana Beach Tourism Area in Padang City

Based on the identification of internal factors (strengths and weaknesses) and external factors (opportunities and threats), a conservation and environmental education strategy was developed using a SWOT analysis approach. This strategy aims to strengthen the management of the Nirwana Beach tourism area to make it more educational, sustainable, and participatory.

Table 3. SWOT Matrix of the Conservation and Environmental Education Strategy at Nirwana Beach in Padang City

	Opportunities	**Threats**
Strengths	**Strength-Opportunity (S–O) Strategy:** a. Develop experiential environmental education programs (eco-learning). b. Leverage government policy support for educational tourism branding. b. Promote the area as an eco-friendly educational tourism destination.	**S–T (Strength–Threat) Strategy:** a. Promote the "Green Tourist" campaign to encourage tourists to protect the environment. b. Empower tourists as educational agents through social media. b. Maintain the area's image through environmentally friendly activities.
Weaknesses	**W–O (Weakness–Opportunity) Strategies:** a. Provide educational resources (information boards, banners, digital content). b. Schedule collaborative conservation programs with schools and communities. b. Involve campuses/students in coastal education activities.	**W–T (Weakness–Threat) Strategy:** a. Establish community-based environmental management institutions. b. Develop regulations and routine monitoring. b. Cross-sector coordination to address pollution and the holiday season.

Key Strategies Based on the SWOT Matrix:

1. Strengthening Environmental Education. The SO and WO strategies emphasize the importance of developing experiential educational programs that are not only informative but also actively engage visitors, such as eco-tourism classes, beach clean-up tours, and interactive educational boards.
2. Community and Institutional Empowerment. The WT strategy emphasizes the importance of establishing inclusive, community-based management

institutions to improve the consistency of conservation and environmental monitoring.

3. Cross-Sector Collaboration. Opportunities for collaboration with schools, universities, and environmental communities can be optimized through the WO strategy to expand the scope of education and conservation, especially given limited facilities and management personnel.
4. Eco-Friendly Campaigns and the Role of Tourists. The ST strategy leverages the power of environmentally conscious tourists to act as promotional agents through digital campaigns and tourism experiences that encourage environmentally friendly behavior.

Table 4. SWOT Analysis Weights and Scores

No	SWOT Factors	Category	Weight	Score	Score × Weight
1	High tourist awareness	Strength	0.10	4	0.40
2	Support for conservation programs	Strength	0.10	4	0.40
3	Natural beauty and strategic location	Strength	0.10	5	0.50
4	Lack of educational facilities	Weakness	0.08	2	0.16
5	Low community participation	Weakness	0.07	2	0.14
6	No scheduled educational programs	Weakness	0.05	1	0.05
7	High number of visitors during the holiday season	Opportunities	0.10	5	0.50
8	Government policy support	Opportunities	0.10	4	0.40
9	Opportunities for cross-sector collaboration	Opportunities	0.08	4	0.32
10	Threat of plastic waste pollution	Threats	0.08	3	0.24
11	Dependence on the holiday season	Threats	0.07	2	0.14
12	Weak environmental monitoring	Threats	0.07	2	0.14

Table 5. Results of score and weight calculations

Category	Total Score × Weight
Strength	1.30
Weakness	0.35
Opportunities	1.22
Threats	0.52

Based on the table above, it can be seen that:

1. The Strength factor has the highest total score of 1.30, indicating that the Nirwana Beach area possesses dominant internal strengths. This is supported by high tourist awareness and support for conservation and its strategic location.

2. The Opportunity factor follows with a score of 1.22, indicating that there are many external opportunities that can be exploited, such as high tourist visits, policy support, and potential collaboration with external parties.
3. The Threat factor has a score of 0.52, which is quite significant but can still be anticipated with appropriate strategies. The main threats are pollution and fluctuations in tourist visits.
4. The Weakness factor has the lowest score of 0.35, indicating that although weaknesses exist, their significance and influence are relatively smaller compared to the strengths and opportunities available.

The following is a visualization of the SWOT Quadrant for conservation and environmental education strategies at Nirwana Beach in Padang City.

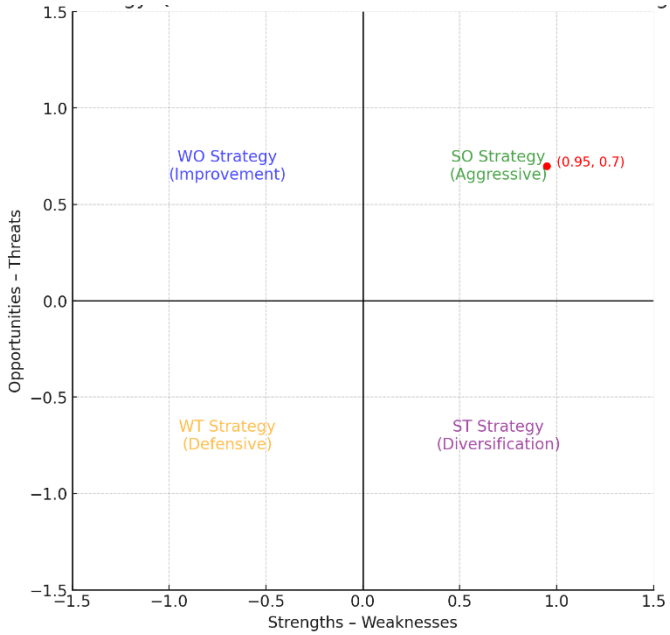

Figure 1. Nirwana Beach Environmental Management SWOT Strategy Quadrant

The results of the quantitative SWOT analysis show that the strategic coordinates of the Nirwana Beach tourist area are in a positive position on both the X-axis (Strength – Weakness) and Y-axis (Opportunity – Threat), namely at the coordinate points (+0.95; +0.70). This position places the area in Quadrant I, indicating a Strength–Opportunity (S–O) strategy, or an aggressive strategy. This strategy is used when an area has dominant internal strengths and significant external opportunities for development.

This means that Nirwana Beach is in a very supportive condition for active growth and development by utilizing all its potential. Strengths such as high tourist environmental awareness, natural beauty, and good accessibility, if optimized, can

form the foundation for seizing opportunities such as regional policy support, high tourist visits, and potential cross-sector collaboration.

The most appropriate strategies to implement include:

1. Optimizing the area's strengths, such as its strategic location and high tourist enthusiasm for environmental issues.
2. Develop innovations based on environmental education, through programs such as educational tours, interactive information boards, or digital applications that promote coastal conservation.
3. Expand collaboration and build the area's branding as an education and conservation-based tourism destination, by partnering with government agencies, environmental communities, academics, and tourism businesses.

By implementing this aggressive strategy, the Nirwana Beach area has a significant opportunity to grow as a leading destination that not only attracts tourists but also educates and contributes to environmental conservation.

The results of the strategy development based on the SWOT analysis indicate that the Nirwana Beach tourist area has strong potential to be developed as a conservation and environmental education-based tourism destination. This is reflected in the quantitative results of the SWOT analysis, where Strength (1.30) and Opportunity (1.22) scores are dominant compared to Weakness (0.35) and Threat (0.52). This strategic position places the area in Quadrant I, leading to the implementation of an aggressive strategy (S–O). This strategy focuses on maximizing internal strengths to seize and optimize existing external opportunities.

The resulting S–O strategies, such as developing experiential environmental education programs (eco-learning), promoting the area as an educational tourism destination, and utilizing regional policy support, are approaches aligned with the principles of sustainable tourism management. These results support the findings of Maudhinatu et al. (2024), who emphasized that strengthening educational programs and promoting conservation areas needs to be built through synergy between local potential and development policies.

Furthermore, the W–O and W–T strategies also provide policy direction for addressing weaknesses and anticipating threats. For example, providing educational facilities (information boards, digital media), establishing community-based management institutions, and strengthening cross-sector coordination. This strategy aligns with a study by Sudrajat et al. (2023), which stated that community involvement and local institutions are key to successful coastal tourism area conservation.

The S-T strategy, which leverages strengths to mitigate threats, also demonstrates the potential of tourists as agents of change. "Green Tourist" campaign programs, visitor engagement in digital content, and social media-based monitoring can be tools to strengthen collective awareness-based management.

This is reinforced by the findings of Wardhani et al. (2016), which emphasize the role of tourists in participatory monitoring at natural tourism destinations.

With the strategy positioned in Quadrant I of the SWOT, the direction of conservation and environmental education policies at Nirwana Beach should focus on expansion and innovation. This means that area managers need to proactively develop engaging, collaborative, and educational programs that not only involve the local community but also position tourists as partners in environmental conservation.

CONCLUSION

This study generally aims to analyze and develop appropriate conservation and environmental education strategies in the Nirwana Beach tourist area in Padang City. Based on the analysis and discussion, the following conclusions were reached:

1. The level of knowledge, concern, and behavior of tourists regarding environmental conservation at Nirwana Beach is relatively high. Respondents demonstrated awareness of the importance of preserving the coastal environment and relatively environmentally friendly behavior during their travels. However, it was noted that further education is needed to ensure this awareness has a more tangible impact on conservation practices on the ground.
2. Educational facilities and local community participation in the conservation of the area are still suboptimal. The availability of educational resources such as information boards, educational tourism activities, and collaborative programs between the community and management are still relatively limited. Despite the potential and interest, active community participation still needs to be increased through institutional approaches and targeted training.
3. Appropriate conservation and environmental education strategies fall into Quadrant I of the SWOT analysis, namely aggressive strategies (S–O). This indicates that Nirwana Beach has strong internal strengths and significant external opportunities for development. The main strategies developed include optimizing the region's strengths, developing educational innovations, and expanding cross-sector collaboration to make Nirwana Beach a sustainable, conservation-based tourism destination.

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