

(Research/Review) Article

Optimization of Green Open Space-Based Tourism Object Development (Case Study of Panatapan Panyabungan Park in Mandailing Natal)

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Abstract: This study aims to analyze the factors influencing the optimization of green open space (GOS)-based tourism object development at Panatapan Panyabungan Park, Mandailing Natal Regency. This area possesses high ecological and visual potential, yet its management remains suboptimal in terms of facilities, community participation, and institutional support. The study employs a mixed methods approach, combining quantitative methods using multiple linear regression analysis on 150 respondents, and qualitative methods through in-depth interviews with key informants. The results show that simultaneously, the four independent variables—GOS quality (X1), tourism facilities and infrastructure (X2), community participation (X3), and local government support (X4)—significantly influence the optimization of tourism development (Y). However, partially, only X2 has a significant positive effect, while X1 and X3 have significant negative effects, and X4 has no significant effect. Qualitative findings reveal that the community is not involved in decision-making, and the local government has not demonstrated concrete intervention in managing the area. These findings suggest that the strategy for developing GOS-based tourism objects should emphasize improving basic facilities, establishing participatory governance, and strengthening the structural role of local governments. A collaborative and community-based approach is key to realizing a sustainable tourism area in environmental, social, and economic aspects.

Keywords: Area Development; Community Participation; Facilities and Infrastructure; Green Open Space.

Received: May 30, 2025;

Revised: June 30, 2025;

Accepted: July 12, 2025;

Published : July 30, 2025

Curr. Ver.: July 30, 2025



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1. Introduction

Environment-based tourism has now become a strategic approach in regional development, particularly in areas with natural potential and green open spaces (GOS). Green open space serves not only ecological functions but also holds aesthetic, educational, and recreational value that can be invested in the development of sustainable tourism destinations (Damanik & Weber, 2021). Mandailing Natal Regency, especially in the Panatapan Panyabungan Park area, possesses such potential with its natural landscapes, unique topography, and strong connection to local culture (Aini et al., 2023; Nuraini, 2021, 2024).

However, this potential has not been fully optimized. Several obstacles—such as the lack of supporting infrastructure, limited community participation, and the absence of environmentally based spatial planning—hinder the comprehensive development of GOS-based tourism (Hidayat et al., 2023). In fact, according to Ritonga and Lubis (2023), the integration of environmental sustainability principles and community involvement is a crucial prerequisite for resilient regional development.

Currently, Panatapan Panyabungan Park functions primarily as a rest stop and scenic viewpoint, but its role as a competitive public space and tourism destination remains limited.

In terms of spatial planning, the area lacks land use direction aligned with green land use principles. Optimizing tourism development in this area is essential not only to boost visitor numbers and the local economy, but also as part of a green open space conservation strategy (Siregar & Harahap, 2022; Akbar et al., 2025; Pakpahan et al., 2025; Suprianto et al., 2025).

A previous study by Harahap and Daulay (2021) highlighted that the development of GOS-based tourism requires a synergistic approach involving ecological, social, and spatial planning factors. Unfortunately, no prior research has specifically examined the integration of tourism optimization based on GOS in Mandailing Natal through a comprehensive mixed-method approach (Nuraini, 2019a, 2019b, 2021). Therefore, this study seeks to fill that gap.

This research is significant because it will produce development recommendations for GOS-based tourism areas that can serve as a model for other regions. The optimization referred to includes physical, social, and policy aspects that are interrelated in building sustainable tourism destinations. This approach also aligns with green development directions and spatial use control as mandated in Government Regulation No. 26 of 2008 on the National Spatial Planning and the principles of sustainable development.

Based on the background described above, the research questions are: 1) What is the current condition of the management of Panatapan Panyabungan Park as a green open space in Mandailing Natal Regency?; 2) What factors influence the optimization of green open space-based tourism development in the area?; 3) What optimization strategies can be applied to sustainably develop GOS-based tourism in Panatapan Panyabungan Park?

This study aims to: 1) Analyze the existing condition of Panatapan Panyabungan Park management as a green open space (GOS) in Mandailing Natal Regency, 2) Identify the factors influencing the optimization of GOS-based tourism development in the Panatapan Panyabungan area, 3) Formulate sustainable optimization strategies for GOS-based tourism development in Panatapan Panyabungan Park.

This research offers the following benefits: 1) Theoretical Benefits; • Contribute to the development of knowledge in the field of regional and urban planning, particularly in managing green open spaces integrated with sustainable tourism, • Enrich academic literature on strategies for developing GOS-based tourism objects; 2) Practical Benefits; • Provide input and strategic recommendations for the local government of Mandailing Natal Regency in managing and developing Panatapan Panyabungan Park as a GOS-based tourism destination, • Serve as a reference for stakeholders in designing environmentally friendly and sustainable tourism development policies, • Raise public awareness about the importance of green open space preservation in supporting the tourism sector.

2. Preliminaries or Related Work or Literature Review

Sustainable Tourism Development Theory

Sustainable tourism emphasizes the importance of maintaining a balance between economic growth, environmental preservation, and the empowerment of local socio-cultural systems. According to Lubis and Ritonga (2022), sustainable tourism development must take into account environmental carrying capacity and community participation at every stage of tourism development. This highlights that tourism development strategies should adopt sustainability principles as a core foundation (Siregar et al., 2023).

Green Open Space (GOS) Theory

Green open space serves ecological, aesthetic, and social functions. Harahap (2023) asserts that GOS not only provides visual and psychological comfort but also acts as ecological infrastructure that supports air quality, microclimate regulation, and biodiversity conservation. In the context of tourism, GOS can serve as an attractive element that strengthens the image of nature-based tourist destinations.

Community Participation Theory

Community participation is a vital component in the process of regional planning and development. According to Siregar and Daulay (2022), the success of tourism management is largely determined by local community involvement in planning, implementation, and monitoring processes. This approach not only enhances a sense of ownership but also fosters social responsibility in managing the area.

Regional Development Strategy Theory

Regional development requires strategies that integrate local resource potential, government policies, and the strengthening of regional competitiveness. Ritonga and

Hasibuan (2023) state that effective development strategies should be data-driven, participatory, and adaptive to local environmental dynamics. This approach is relevant for formulating the optimization of tourism development based on ecological and socio-cultural potential. pengembangan objek wisata yang berbasis pada potensi ekologis dan sosial budaya.

Previous Studies

Previous studies provide a strong foundation for this research. Siregar and Harahap (2022) found that the quality of green open space (GOS) significantly affects visitor satisfaction and loyalty in Sipirok's nature tourism area. This aligns with the study by Putri and Siregar (2022), which evaluated the social function of GOS in urban areas and concluded that GOS plays a strategic role in supporting community social interaction while also attracting tourists.

Furthermore, Lubis and Ritonga (2023) emphasized the importance of a participatory approach in developing community-based ecotourism in the Tapanuli region, showing that community involvement is a key factor in the success of nature-based tourist destinations. The emphasis on strengthening collaboration is also reflected in the study by Daulay and Hasibuan (2024), which recommended rural tourism development strategies through infrastructure improvement, digital promotion, and stakeholder cooperation.

In addition, Harahap and Siahaan (2023) revealed that tourism infrastructure has a dominant influence on visitor numbers in the mountainous areas of Mandailing, reinforcing that the availability of facilities and infrastructure is a crucial element in supporting tourism appeal. These findings provide relevant theoretical and empirical support for this research, particularly in understanding the relationship between environmental quality, social roles, community participation, and infrastructure support in sustainable tourism development.

3. Proposed Method

Research Approach

This study uses a mixed-method approach, combining both quantitative and qualitative methods to obtain a comprehensive picture of the optimization of green open space (GOS)-based tourism development. This approach was chosen to integrate statistical (quantitative) data on visitor satisfaction and available facilities with narrative (qualitative) data from the local community and stakeholders directly involved in managing the area (Ritonga & Lubis, 2023). The quantitative method was used to analyze visitor perceptions and satisfaction through questionnaires, while the qualitative method explored the views and experiences of village officials, park managers, and the community through in-depth interviews.

Research Location and Time

The study was conducted at Panatapan Panyabungan Park, located in Panyabungan Sub-district, Mandailing Natal Regency, North Sumatra Province. This location was chosen due to its growing potential in nature tourism and green open space, which has not yet been fully optimized as a sustainable tourism destination. The research was carried out from January to April 2025, covering the stages of field observation, questionnaire distribution, in-depth interviews, and data analysis.

Population and Sample

The population in this study consists of two main groups: (1) Visitors to Panatapan Panyabungan Park, and (2) Local communities and stakeholders, including village officials, park managers, and local business actors. The quantitative sample includes 150 respondents, selected through purposive sampling based on specific criteria: individuals aged 17–60 years, who have visited the park more than once, and who are willing to complete the questionnaire. For the qualitative approach, 10–15 informants were purposively selected based on their knowledge of and direct involvement in the management and development of the park area.

Conceptual Framework and Research Variables

Based on the theoretical foundation and previous studies, the conceptual framework of this research is illustrated as follows:

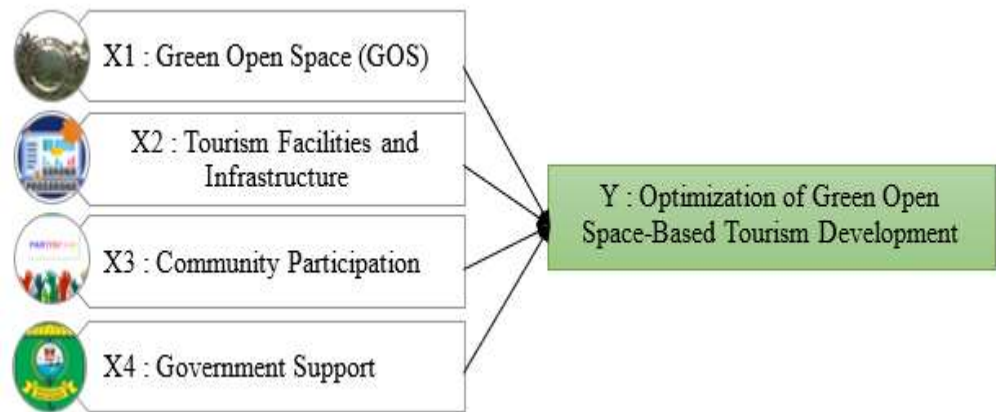


Figure 1. Conceptual Framework of the Research

Source: Author's Design, 2025

Based on the conceptual framework developed, the development of tourism destinations based on Green Open Space (GOS) is influenced by various interrelated factors that collectively support the achievement of sustainable tourism optimization. This framework illustrates the relationship between several independent variables representing environmental, infrastructure, social, and policy aspects, and a dependent variable representing the success of GOS-based tourism development.

The independent variables (X) in this study consist of four main components:

- X1: Quality of Green Open Space, measured by indicators such as cleanliness, comfort, vegetation, and ecological function.
- X2: Tourism Facilities and Infrastructure, indicated by accessibility, availability of public facilities, signage, and safety levels.
- X3: Community Participation, which includes community involvement in the planning, management, and evaluation of tourism development.
- X4: Local Government Support, assessed through policies issued, budget allocation, promotional activities, and the existence of supportive regulations.

Meanwhile, the dependent variable (Y) is the Optimization of GOS-Based Tourism Development, observed through indicators such as the number of tourist visits, visitor satisfaction levels, economic benefits for the local community, and the level of public demand or interest in green spaces.

By analyzing the relationships between these variables, this study aims to identify key factors that should be considered in designing strategies for the optimal, sustainable, and participatory development of GOS-based tourism, while maintaining the balance between ecological functions and the economic potential of the tourism area.

Types and Sources of Data

This research utilizes both primary and secondary data:

- Primary data is obtained from questionnaires and direct interviews with respondents and key informants.
- Secondary data is collected from planning documents, local government reports, academic literature, and relevant publications.

Data Collection Techniques

The data collection techniques applied in this study include:

- Observation: Directly observing the physical condition of the park, its facilities, and visitor activities.
- Questionnaire: Distributed to 150 visitors to assess perceptions regarding park quality, facilities, and visitor satisfaction.
- In-depth Interviews: Conducted with local residents, park managers, and village authorities to explore insights into challenges and development potential.
- Documentation: Collection of secondary data from planning documents, local news, and tourism statistics.

Data Analysis Techniques

Data analysis in this study is carried out through:

- a. Quantitative Analysis
 - Descriptive Statistics: To describe the characteristics of respondents and questionnaire responses.
 - Multiple Linear Regression (if applicable): To examine the influence of independent variables on tourism development.
- b. Qualitative Analysis
 - Thematic Analysis: Interview results will be organized by grouping emerging themes from informant narratives.

The integration of these two analyses will provide a comprehensive conclusion to formulate strategic directions for optimizing sustainable GOS-based tourism development.

Problem-Solving Approach

The problem-solving approach in this research is based on a systematic framework that integrates quantitative and qualitative analyses (mixed methods). Quantitatively, data is collected through surveys to understand visitor satisfaction, needs, and perceptions of green space facilities. Qualitatively, in-depth interviews are conducted with local stakeholders, park managers, and the community to explore potential, challenges, and management practices for GOS-based tourism.

This analysis adopts a theoretical framework that synthesizes Butler's Sustainable Tourism Development Theory (2021) and Ritonga's Participatory Spatial Management Approach (2023). Moreover, the evaluation strategy involves integrating field analysis results with best practices applied in other regions.

Through this approach, the research is expected to provide policy directions and development strategies that not only focus on increasing tourist visits but also support environmental conservation and improve the welfare of the surrounding community.

4. Results and Discussion

General Overview of the Research Location

Panatapan Panyabungan Park is located in Panyabungan Subdistrict, Mandailing Natal Regency, North Sumatra Province. This area is known as a strategic viewpoint representing the mountainous and hilly landscape that characterizes the local natural tourism icon. Its primary function as a green open space as well as a rest area makes it a promising candidate for development into a leading environmentally based tourism destination.

Spatially, the park is situated along an inter-subdistrict main route, with relatively good accessibility via the provincial road. However, facilities such as sanitation support, rest areas, and promotional media are still very limited. The park's existence is not yet fully included in the regional tourism development plan, resulting in informal management and limited community participation.

The preserved natural vegetation, cool atmosphere, and educational potential make this park highly relevant to strategies for green open space conservation and local economic empowerment. RTH-based development is expected to enhance environmental quality while serving as a driving force for sustainable tourism visits in Mandailing Natal.

Respondent Characteristics

This study involved 150 visitors who had previously visited Panatapan Panyabungan Park. Respondents were selected using a purposive sampling technique based on the following criteria: a minimum age of 17 years, having visited the park at least once within the last six months, and willingness to complete a questionnaire. The results obtained are presented in the following table:

Table 1. Characteristics of Research Respondents

Criteria	Characteristics	Number of Respondents	Percentage (%)
Gender	Male	85	56.7
	Female	65	43.3
Age	17–25 years	42	28.0
	26–35 years	48	32.0
	36–45 years	33	22.0
	>45 years	27	18.0
Education Level	High School/Vocational	40	26.7
	Diploma/Bachelor's	91	60.7
	Postgraduate	19	12.6
Purpose of Visit	Recreation	102	68.0
	Short rest	30	20.0
	Photography/content	18	12.0
Visit Frequency	Once	45	30.0
	2–3 times	64	42.7
	>3 times	41	27.3

Source: Author's Analysis, 2025

Based on Table 1, it is evident that the majority of respondents are male (56.7%), with the largest age group falling within the 26–35 year range (32%). Most respondents hold a Diploma or Bachelor's degree (60.7%), indicating a relatively high level of literacy regarding environmental and tourism issues. The primary purpose of visiting the park is recreation (68%), and most have visited more than once, suggesting the park's potential to be developed as a sustainable tourism destination.

Qualitative Analysis Results

The qualitative analysis in this study was obtained through in-depth interviews with key informants, including village officials, park managers, local community leaders, and small business owners around the Panatapan Panyabungan Park area. The data were analyzed thematically to identify patterns, meanings, and key narratives related to the optimization of green open space (GOS)-based tourism development.

Village Government's Perspective on Area Development

The village government acknowledges that Panatapan Panyabungan Park holds strategic value from both ecological and economic perspectives. However, the absence of a clear management plan and dedicated budget from the regional government remains a significant barrier. One village official stated:

"We don't yet have a clear development framework from above. So far, it's only been local initiatives, and those are quite limited in capacity."
(Informant 1, Village Governance Officer)

This statement reflects the weakness of structural support, which should serve as a foundation in promoting well-planned green open space development.

Local Community Participation in Park Management

Community involvement remains limited to informal aspects such as maintaining cleanliness, but they have not been included in decision-making processes. Most community members expressed willingness to be more involved if a clear management direction were established.

“We join in community clean-up events, but we’ve never been involved in tourism development or planning for new facilities.”

(Informant 3, Community Leader)

This indicates a low level of deliberative participation, despite participatory development theory emphasizing the importance of active community involvement throughout the development process (Ritonga & Hasibuan, 2023).

Challenges in GOS-Based Tourism Development

Several key challenges were identified:

- Lack of basic facilities (toilets, lighting, trash bins)
- Insufficient digital and physical promotion
- Absence of specific regulations for park management

The park manager mentioned that most facilities were built independently without any involvement from district or provincial governments:

“Most of the facilities were built independently, by residents or donors. We need support and a plan we can implement together.”

(Informant 2, Field Manager)

Strategies Expected by Stakeholders

From the interviews, several strategies were identified as desirable by stakeholders:

- Development of a community-based park management plan
- Provision of basic facilities funded by the village budget
- Training local residents to become tour guides
- Community-based social media promotion

These strategies align with the concept of adaptive and sustainable regional development as proposed by Lubis and Ritonga (2023), which emphasizes the importance of strengthening local capacity in environmentally based development.

Quantitative Analysis Results

The quantitative analysis in this study aims to determine the influence of the independent variables on the dependent variable. The analytical technique used is multiple linear regression, supported by normality testing and Pearson correlation analysis to interpret the model. A total of 150 respondents participated in the study. The descriptive statistics for each variable are presented below:

Table 2. Descriptive Statistics – Mean & Standard Deviation

Variable	Mean	Standard Deviation	N
Y (Tourism Development)	3.98	0.979	150
X1 (GOS Quality)	4.19	0.932	150
X2 (Facilities & Infrastructure)	4.08	0.945	150
X3 (Community Participation)	3.94	1.063	150
X4 (Government Support)	3.10	1.085	150

Source: SPSS 20 – Data Processing, 2025

The highest average score is for GOS Quality (4.19), indicating a positive public assessment of the park’s physical condition. Conversely, Government Support received the lowest score (3.10), reflecting public perception of the government's suboptimal role.

Table 3. Normalitas Test - One-Sample Kolmogorov-Smirnov

Kolmogorov-Smirnov Z	1.338
Asymp. Sig. (2-tailed)	.056

Source: SPSS 20 – Data Processing, 2025

The normality test was conducted using the Kolmogorov-Smirnov method on the predicted regression values. The result shows a significance value of 0.056 (> 0.05), indicating that the data are normally distributed and meet the assumptions for multiple linear regression analysis.

Subsequently, the Pearson correlation test was conducted to assess the degree of bivariate relationships between the independent variables and the dependent variable. The correlation results are presented in the following table:

Table 4. Pearson Correlation Test

Independent Variable	Correlation with Y (r)	Significance (1-tailed)
X1 (GOS Quality)	0.106	0.018
X2 (Facilities & Infrastructure)	0.002	0.032
X3 (Community Participation)	0.156	0.028
X4 (Government Support)	0.046	0.288

Source: SPSS 20 – Data Processing, 2025

The results indicate that the relationships between the independent variables and the dependent variable fall into the weak category ($r < 0.30$). However, statistically, variables X1, X2, and X3 show significant bivariate correlations ($p < 0.05$), with X3 demonstrating the strongest correlation with Y. Variable X4 (government support) does not show a significant direct relationship with Y. The following section outlines the multiple linear regression analysis used to determine both the simultaneous and partial effects of all independent variables on the dependent variable, as presented below:

Table 5. Multiple Linear Regression Test

Model Summary	
R1	= 0,182
R Square	= 0,083
Adjusted R Square	= 0,007
Standard Error of the Estimate	= 0,976
Durbin-Watson	= 1,869

Source: SPSS 20 – Data Processing, 2025

The R Square value of 0.083 indicates that only 8.3% of the variation in tourism development (Y) can be explained by the independent variables (X1 to X4), while the rest is influenced by factors outside the model. The Durbin-Watson value close to 2 indicates no serious autocorrelation problem in the model.

Table 6. ANOVA Test

Sumber	df	Mean Square	F	Sig.
Regression	4	1.185	1.244	0.025
Residual	145	0.953		
Total	149			

Source: SPSS 20 – Data Processing, 2025

The regression model is simultaneously significant with a sig. value of 0.025 (< 0.05), meaning that all four independent variables collectively have a significant influence on GOS-based tourism development.

Table 7. Regression Coefficients

Variable	B (Unstandardized)	Std. Error	Beta (Standardized)	Sig.
Constant	4.677	0.604	—	0.000
X1	-0.093	0.087	-0.088	0.040
X2	0.031	0.086	0.030	0.023
X3	-0.132	0.079	-0.143	0.016
X4	0.028	0.076	0.031	0.710

Source: SPSS 20 – Data Processing, 2025

The interpretation of the regression coefficients is presented as follows:

- X1 (Quality of Green Open Space/RTH) has a significant negative effect on Y ($p = 0.040$), which may indicate a gap between community expectations and the actual outcomes of tourism development.
- X2 (Facilities and Infrastructure) has a significant positive effect on Y ($p = 0.023$), meaning that the more complete the amenities, the more optimal the development of the area.
- X3 (Community Participation) also has a significant negative effect ($p = 0.016$), suggesting that community involvement is not yet matched by corresponding development outcomes.
- X4 (Government Support) is not statistically significant ($p = 0.710$), indicating that it has no measurable effect on tourism development within this model.

Overall, the multiple linear regression model used in this study is simultaneously significant, yet the R^2 value is low (8.3%), implying that the model's predictive ability is limited. Facilities and infrastructure emerge as the **only variable with a significant positive influence**, while the quality of green open spaces and community participation show significant negative effects. This highlights the need for **a qualitative approach** to explain why the community's positive perception of these aspects does not align with their perception of successful tourism development.

Discussion

This discussion provides an in-depth analysis of the relationship between the findings from both the quantitative and qualitative data, and compares them with existing theories and prior research. The objective is to clarify the factors influencing the optimization of green open space (GOS)-based tourism development in Panatapan Park, Panyabungan.

Alignment with the Mixed Methods Approach

The use of a mixed methods approach in this study offers a comprehensive picture of the actual condition of the area and stakeholders' perceptions. The quantitative findings show that tourism facilities and infrastructure (X2) are the only factor with a significant positive influence on tourism development. In contrast, quality of green open space (X1) and community participation (X3) have significant negative effects, while local government support (X4) has no significant effect.

These results are enriched by qualitative data indicating that both the community and park managers feel that their involvement is still limited, especially in terms of planning and decision-making. Local government officials also noted the absence of clear governance or regulatory support from the district level, despite the area's recognized potential.

The Gap Between Perception and Reality

The negative coefficients for X1 and X3 in the regression results indicate a conflict between expectations and reality. While the community perceives the quality of green spaces and their participation to be relatively high, this perception does not translate into successful tourism development. This is consistent with interview findings suggesting that community participation remains limited to informal actions such as maintaining cleanliness, without involvement in strategic aspects.

Therefore, increasing expectations that are not supported by collaborative planning and strong institutional responses may result in negative perceptions of program success. This supports the argument in Arnstein's "Ladder of Citizen Participation" theory (1969), where participation is tokenistic—symbolic but lacking real influence.

Relevance to Previous Studies

The finding that tourism facilities and infrastructure (X2) are the most positively influential factor aligns with the study by Harahap and Siahaan (2023), which states that infrastructure is key to attracting and retaining tourists. Well-developed facilities provide comfort, increase visitor satisfaction, and enhance destination appeal.

Conversely, the finding that community participation has a significant negative impact contradicts studies by Lubis and Ritonga (2023) and Harahap and Daulay (2021), who emphasized community participation as the foundation of successful environmentally-based tourism. However, this discrepancy can be explained by the local context of Mandailing Natal, where participatory mechanisms are not yet well-established. This suggests that unstructured or non-institutionalized participation can lead to public dissatisfaction with development programs that do not inclusively reflect their values.

Moreover, the insignificant role of local government support in the regression model is consistent with interview results showing a lack of concrete interventions in terms of policy or budget allocation. This indicates a disconnect between the government's strategic role in planning documents and the reality on the ground. This finding contrasts with the study by Daulay and Hasibuan (2024), which found that active intervention from village governments significantly accelerated the implementation of community-based tourism programs.

Implications for Area Development Strategies

The findings indicate that optimizing the development strategy of green open space (GOS)-based tourism in Panatapan Park, Panyabungan, cannot rely on a single approach. An integrated intervention is required, encompassing the following:

a. Enhancement of Tourism Facilities and Infrastructure

Given that X2 is the strongest influencing variable, the local government should prioritize the provision of public amenities such as toilets, lighting, photo spots, and tourist information media.

b. Reformulating Community Participation

Participation must be elevated from the operational to the strategic level. The village government can establish a community-based park management team to bridge communication between residents and policymakers.

c. Strengthening the Role of the Local Government

The district government needs to include the park in the regional tourism development plans (RPJMD/RTRW), supported by regulatory frameworks, budget allocations, and digital promotion strategies.

d. Collaborative Governance Approach

Collaboration between local authorities, communities, and the government is the key to success. The development of GOS-based tourism areas will only be effective if jointly planned and inclusively implemented.

Academic Context and Sustainability

From an academic standpoint, this study demonstrates that positive public perception does not always correlate with optimal outcomes, especially when governance and institutional coordination are weak. It builds upon previous findings by emphasizing that physical infrastructure and institutional support cannot be separated from community-based strategies, particularly in the context of public green spaces.

In terms of practical implications, this study lays the foundation for a tourism development approach that not only relies on natural beauty but also establishes adaptive governance mechanisms grounded in data, participation, and collaboration.

6. Conclusions

This study aimed to analyze existing conditions, identify influencing factors, and formulate strategies to optimize the development of green open space (GOS)-based tourism at Panatapan Park, Panyabungan, Mandailing Natal Regency, using a mixed methods approach. Based on both quantitative and qualitative analyses, several conclusions can be drawn: The

current condition of Panatapan Park shows strong landscape potential for development as a GOS-based tourism destination, supported by natural vegetation and a strategic location. However, area management remains informal, with minimal community involvement and a lack of regulatory and institutional support from local government. Quantitative analysis reveals that, simultaneously, the variables of GOS quality (X1), tourism facilities and infrastructure (X2), community participation (X3), and government support (X4) significantly influence the optimization of GOS-based tourism development. However, partially, only X2 has a significant positive effect, while X1 and X3 show significant negative effects, and X4 is not significant. These findings suggest that available facilities are the most tangible benefit felt by visitors, whereas GOS quality and community participation tend to create expectations that are not matched by on-the-ground realities. Qualitative findings confirm that community participation remains limited to technical activities such as cleanliness and park maintenance, without involvement in planning strategies. The village government also acknowledged the absence of direction and support from the district level, particularly in terms of funding and governance. Moreover, the park is mostly managed independently by local residents and community leaders. Overall, the development strategy for GOS-based tourism in Panatapan Park should adopt a collaborative approach that focuses not only on improving the physical environment but also on empowering the community and strengthening the institutional and functional role of local government.

Based on these findings and conclusions, the following specific, realistic, and actionable recommendations are proposed:

- a. The village government, together with the local community, should immediately develop a participatory-based park governance plan, including the formation of a local management team, the preparation of management guidelines, and a role-sharing scheme involving residents, traditional leaders, small business actors, and village officials.
- b. The provision of basic facilities such as public toilets, permanent trash bins, information boards, and park lighting should be included in the current year's Village Fund budget, with technical assistance from the Mandailing Natal District Tourism and Environmental Offices to ensure adherence to principles of inclusion and spatial efficiency.
- c. Tourism promotion should be gradually carried out through community-based social media, collaboration with youth groups, and the strengthening of locally-rooted tourism narratives to attract visitors who value nature and local wisdom.
- d. The Mandailing Natal District Government should designate Panatapan Park as a priority site in its regional tourism development plans (RPJMD/RIPPARD), which would serve as a basis for budget allocation, institutional support, and cooperation with the private sector and environmental organizations.
- e. Regular training and capacity-building programs should be provided for local communities—particularly youth and women's groups—in the form of tour guide training, homestay management, local product processing, and tourism destination management. This would enable the park to serve not only as a recreational space but also as a center for economic empowerment and environmental education.

With the phased and integrated implementation of these recommendations, the development of Panatapan Park as a tourism destination is expected to become more optimal, sustainable, and beneficial for the local community while preserving green open spaces in Mandailing Natal Regency.

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