

Tourism Development Strategies in Goa Ergendang: SWOT and AHP Approaches for Sustainable Growth

ABSTRACT

Goa Ergendang, located in Deli Serdang, North Sumatra, is a natural tourism destination with significant untapped potential. This study aims to analyze the tourism development strategies for Goa Ergendang using **SWOT** (Strengths, Weaknesses, Opportunities, and Threats) and **AHP** (Analytical Hierarchy Process) approaches to support sustainable growth. Data was collected through field observations, in-depth interviews with local stakeholders, and a questionnaire distributed to tourists and the local community. The analysis reveals that the site's strengths include its pristine natural environment, unique cave formations, and strong community support, while its weaknesses stem from poor infrastructure and limited promotion. The external opportunities identified involve eco-tourism development and increased community involvement, while threats include accessibility issues and competition from other destinations. Based on the **SWOT analysis**, Goa Ergendang is positioned in **Quadrant I**, indicating that a **progressive strategy** leveraging strengths and capitalizing on opportunities is essential. The **AHP** results suggest prioritizing infrastructure improvements, promoting the site through digital platforms, and introducing innovative tourism attractions. The study concludes that collaboration between the government, private investors, and local communities is crucial to achieve long-term sustainable development for Goa Ergendang.

Keywords: Goa Ergendang, Ecotourism Development, SWOT Analysis, Analytical Hierarchy Process (AHP), Sustainable Tourism development, regional planning

I. INTRODUCTION

Indonesia is endowed with an abundance of natural resources, positioning it as one of the most attractive tourist destinations across various global markets (Yuniarti, 2018). One of the rapidly growing sectors is ecotourism, which leverages natural resources to attract visitors. The development of tourism in Indonesia is expected to boost economic growth and enhance the well-being of local communities (Suharyanto et al., 2020; Ekapratwi et al., 2021).

Ecotourism, particularly conservation-based tourism, is increasingly favored by travelers seeking unique and authentic experiences. According to Putri et al.

(2019), successful ecotourism must balance environmental sustainability with local cultural preservation. This integration is critical to the long-term success of natural tourism destinations (Rusita et al., 2016).

One of the ecotourism sites with significant untapped potential is Goa Ergendang in Deli Serdang, North Sumatra. The cave is known for its unique stalactite and stalagmite formations, as well as a natural pool with varying water temperatures (Hadiwijoyo&Suryo, 2018). Despite its remarkable attributes, the number of visitors to Goa Ergendang has sharply declined, especially after the COVID-19 pandemic (Setiani&Sugiyanto, 2021).

The decrease in visitor numbers can be attributed to several factors, including poor accessibility and inadequate facilities (Pangat, 2021). As a leading natural attraction in Deli Serdang, Goa Ergendang faces challenges in infrastructure management and accommodations that are essential for drawing more tourists (Sudaryono, 2016; Suwantoro, 2000).

The role of government and local community participation is crucial in tourism development. While the government is expected to improve infrastructure, local communities are encouraged to actively support tourism activities (Ardiansyah et al., 2020). Involving local communities in economic activities around tourist destinations can increase local income and support sustainable development (Wulandari, 2019; Lincoln, 2013).

Besides poor accessibility, a lack of effective promotion is also hindering the development of Goa Ergendang. According to Herdynata and Rudianto (2016), appropriate promotion can enhance destination visibility, attract investors, and increase tourist visits. Social media and digital promotion can be strategic tools for boosting the popularity of Goa Ergendang among both domestic and international tourists.

Previous research by Rabbaniyah (2021) explored the attractiveness and development of Goa Ergendang's hot springs through qualitative observational and interview methods. The findings revealed that visitors rated the natural landscape and biodiversity positively, but perceptions of historical and cultural heritage were less favorable. Meanwhile, Ningrum et al. (2021) examined the influence of the "SaptaPesona" program and facilities on visitor numbers at Goa Ergendang, concluding that these factors significantly impacted visits, contributing to 57.2% of the overall increase. Bangun and Dewi (2022) also highlighted the influence of "SaptaPesona" and facilities but found a smaller contribution of 22.7%.

This study differs from previous research by adopting a holistic approach to the sustainable development of Goa Ergendang, employing both SWOT and AHP methodologies. In addition to evaluating tourist attractions and facilities, this research prioritizes the development of various aspects such as accessibility, accommodations, and community involvement. This comprehensive approach is

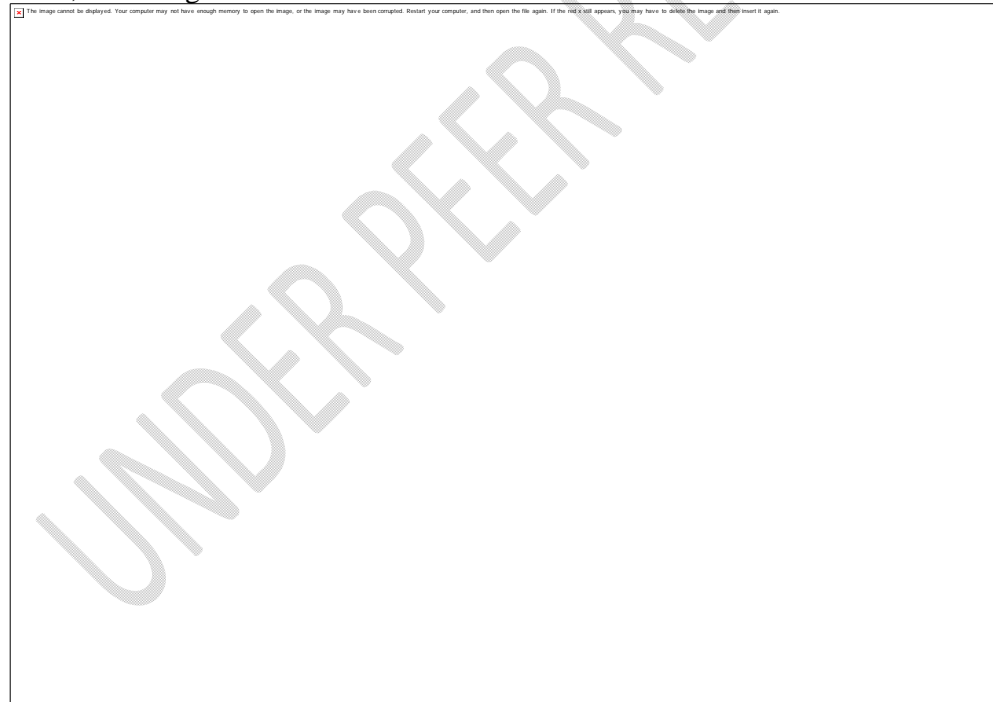
intended to provide a structured development strategy, enhancing Goa Ergendang's competitiveness as a sustainable ecotourism destination.

II. RESEARCH METHODOLOGY

This study adopts a mixed-methods approach, combining **qualitative and quantitative** techniques. The research employs **SWOT analysis** and **Analytical Hierarchy Process (AHP)** to identify the potential and strategies for developing ecotourism at Goa Ergendang. The primary objective of this research is to analyze the site's tourism appeal, prioritize development factors, and formulate appropriate strategies for enhancing the ecotourism potential of Goa Ergendang.

Location and Time of Study

The research was conducted in the natural tourism area of **Goa Ergendang**, located in Penungkiren Village, Sibiru-biru District, Deli Serdang Regency, North Sumatra. This location was chosen because it is a prominent ecotourism destination with untapped potential. The study took place from **July to December 2024**, involving field observations and data collection from relevant stakeholders.



Types and Sources of Data

This research utilizes **primary and secondary data**. Primary data was collected through **in-depth interviews** with tourism management teams and direct **field observations** of the physical conditions and facilities at Goa Ergendang. Secondary data was obtained from **previous studies** and **official documents** from

the local government and tourism authorities (Pusat Statistik, 2022; Dinas Pariwisata, 2021).

Data Collection Techniques

The following data collection methods were employed:

- **Participant Observation:** The researcher observed the conditions at Goa Ergendang, including accessibility, facilities, and the number of visitors. The observation also included analyzing the natural environment, such as flora, fauna, and the cave's ecosystem, which are major attractions (Rusita et al., 2016).
- **In-depth Interviews:** Interviews were conducted with the **management team**, local officials, and several tourists to gain insights into the current conditions and development opportunities. The interview questions covered topics such as perceptions of tourist attractions, challenges faced, and suggestions for improvement (Hadiwijoyo&Suryo, 2018; Setiani&Sugiyanto, 2021).
- **Questionnaires:** Surveys were distributed to tourists and local residents to gather data on their experiences at Goa Ergendang and their perceptions of the available facilities. The questionnaires used a **Likert scale** to measure tourist satisfaction (Bangun& Dewi, 2022).
- **Literature Review:** Secondary data was collected by reviewing relevant literature on ecotourism development, particularly those utilizing SWOT and AHP methodologies to determine development strategies (Rangkuti, 2008; Susilawati, 2020).

Data Analysis Techniques

The data analysis methods used in this study include:

- **SWOT Analysis:** SWOT analysis was employed to identify the strengths, weaknesses, opportunities, and threats in the development of ecotourism at Goa Ergendang. The SWOT analysis was conducted based on interviews, observations, and quantitative data from the distributed questionnaires (Rangkuti, 2008).
- **Analytical Hierarchy Process (AHP):** AHP was used to prioritize the development aspects of the Goa Ergendang tourism area. This process involved evaluating various factors such as **accessibility, tourism appeal, accommodations, and community participation**. The evaluation was carried out through **Focus Group Discussions (FGDs)** with stakeholders, including tourism managers, academics, and local government officials. The data from FGDs was then processed using **Expert Choice software** to determine the priority weights of each development aspect (Susilawati, 2020).

Data Validity and Reliability

To ensure the **validity** and **reliability** of the data, this research employed **method triangulation**, comparing data from observations, interviews, and questionnaires

to ensure consistency. Additionally, the use of **AHP**, a data-driven quantitative approach, ensured that the findings were measurable and could be analyzed objectively (Bangun& Dewi, 2022).

III. RESULTS AND DISCUSSION

General Overview of the Study Location

Deli Serdang Regency spans an area of **2,497.72 km²** with a population of approximately **1,953,986** in 2022. Penungkiren Village, where Goa Ergendang is located, is predominantly inhabited by the **Karo ethnic group** and is situated **35 km** from Medan City. Goa Ergendang is part of the **STM Hilir** region and falls under the regulation of **Law No. 10 of 2009 on Tourism**. Despite its proximity to Medan, accessibility to Goa Ergendang remains challenging, with a travel time of around **1.5 hours** by private vehicle or **2 hours** by public transportation.

Ecotourism Appeal of Goa Ergendang

The tourism potential of Goa Ergendang was assessed based on six main criteria: attraction, accessibility, socio-economic conditions, accommodation, supporting infrastructure, and clean water availability. Each criterion was evaluated using a weighted scoring system to provide an overall assessment.



Figure 1. Natural Conditions of the Goa Ergendang Tourist Site

Tourism Attraction

The attractiveness of Goa Ergendang is crucial for tourism development, focusing on natural uniqueness, flora and fauna, cleanliness, safety, and comfort. The table below summarizes the assessment:

Table 1. Assessment of Tourism Attraction Elements at Goa Ergendang

Element	Weight (a)	Score (b)	Total Score (a × b)
Uniqueness of natural resources	6	30	180
Prominent natural resources	6	25	150
Tourism activities	6	30	180
Cleanliness	6	20	120
Safety	6	30	180
Comfort	6	25	150
Total Score			960

Goa Ergendang achieved a total score of **960**, indicating that the site holds strong potential for further development.

Accessibility

The evaluation of accessibility reveals that, while Goa Ergendang has significant potential, poor road conditions are a critical issue affecting tourist numbers.

Table 2. Assessment of Accessibility for Goa Ergendang

Element	Weight (a)	Score (b)	Total Score (a × b)
Road conditions	5	15	75
Distance from city	5	20	100
Type of road	5	25	125
Travel time	5	30	150
Total Score			450

Accessibility is identified as the main challenge that needs immediate improvement.

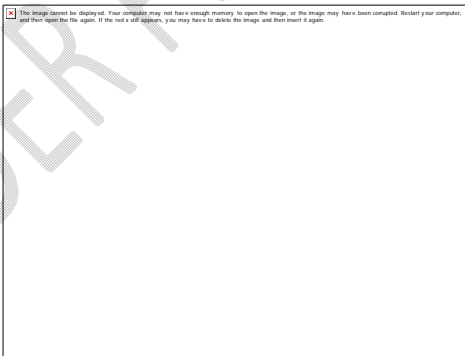


Figure 2. Road Leading to the Goa Ergendang Tourist Site

Socio-Economic Conditions

The majority of Penungkiren Village residents are farmers, with most having completed secondary education. Although the community supports tourism development, more effort is needed to maximize the economic benefits for the local population.

Table 3. Socio-Economic Condition Assessment of Penungkiren Village

Element	Weight (a)	Score (b)	Total Score (a × b)
Spatial planning	5	15	75
Occupation	5	20	100
Community response	5	25	125
Land status	5	15	75
Education level	5	30	150
Total Score			525

Accommodation

The assessment shows that accommodation facilities at Goa Ergendang remain limited, directly impacting visitor numbers.

Table 4. Accommodation Assessment for Goa Ergendang

Element	Weight (a)	Score (b)	Total Score (a × b)
Accommodation	3	15	45
Number of rooms	3	10	30
Total Score			75

Supporting Infrastructure

The supporting infrastructure at Goa Ergendang is considered adequate, with a total score of **240**, reflecting that existing facilities help support tourism development.

Table 5. Supporting Infrastructure Assessment for Goa Ergendang

Element	Weight (a)	Score (b)	Total Score (a × b)
Supporting facilities	3	50	150
Basic infrastructure	3	30	90
Total Score			240

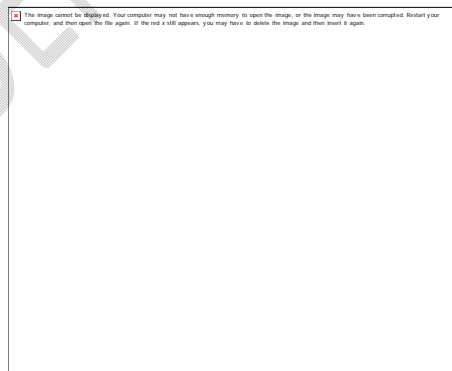


Figure 3. Well Infrastructure

Clean Water Availability

The availability of clean water at Goa Ergendang is excellent, with a total score of **720**, indicating that the site is highly suitable for development in terms of water resources.

Table 6. Clean Water Availability Assessment for Goa Ergendang

Element	Weight (a)	Score (b)	Total Score (a × b)
Water volume	6	30	180
Distance to the site	6	30	180
Water quality	6	30	180
Flow ease	6	30	180
Total Score			720

Ecotourism Development Priorities

Based on the Focus Group Discussions (FGD) and analysis using **Expert Choice**, the priority development aspects for Goa Ergendang are presented in the table below:

Table 7. Priority Development Aspects for Goa Ergendang Based on AHP

Criteria	Weight	Rank
Management aspects	416	1
Attraction aspects	227	2
Institutional aspects	157	3
Socio-economic aspects	149	4
Environmental aspects	54	5

Management aspects emerge as the top priority, which includes improving accessibility, accommodations, and supporting infrastructure. **Attraction aspects** are the second priority, focusing on innovating tourism activities such as cave exploration and additional facilities.

Development Strategy Analysis

The development strategy for Goa Ergendang tourism is based on a detailed **Internal Strategic Factors Analysis Summary (IFAS)** and **External Strategic Factors Analysis Summary (EFAS)**. These factors help identify key strengths, weaknesses, opportunities, and threats to create a strategic plan.

Internal Factors

Internal factors are divided into strengths and weaknesses that affect the development of Goa Ergendang.

Table 8. Internal Strategic Factors Analysis Summary (IFAS) for Goa Ergendang

Internal Strengths	Weight	Rating	Score
Pristine and cool environment	0.12	4.00	0.47
Beautiful caves and hot springs	0.10	4.00	0.40
Affordable food and beverage facilities	0.08	3.00	0.25
Proximity to Medan	0.08	3.00	0.23

Unique cave tourism experience	0.10	3.00	0.30
Strong community support	0.08	3.00	0.25
Total Strengths Score			1.89

Internal Weaknesses	Weight	Rating	Score
Limited freshwater availability	0.08	3.00	0.23
Lack of tourism promotion	0.09	3.00	0.27
Green zone restrictions limiting development	0.09	4.00	0.37
Declining visitor numbers due to limited funding	0.09	4.00	0.35
Insufficient facilities to become a tourism village	0.10	3.00	0.29
Total Weaknesses Score			1.50

External Factors

External factors consist of opportunities and threats that can influence the site's development.

Table 9. External Strategic Factors Analysis Summary (EFAS) for Goa Ergendang

External Opportunities	Weight	Rating	Score
Safe environment	0.11	4.00	0.44
Eco-friendly area	0.11	4.00	0.44
Preservation of trees and green spaces	0.11	4.00	0.44
High potential for further natural development	0.11	4.00	0.46
Productive economic activities	0.10	3.00	0.30
Opportunity for forming tourism awareness groups	0.09	3.00	0.26
Total Opportunities Score			2.35

External Threats	Weight	Rating	Score
Inadequate infrastructure	0.09	3.00	0.28
Poor accessibility	0.10	3.00	0.29
Competition from other tourism sites	0.07	3.00	0.22
Lack of innovation	0.10	3.00	0.30
Total Threats Score			1.10

SWOT Matrix and Strategic Planning

Based on the IFAS and EFAS analysis, the total score places Goa Ergendang in **Quadrant I** of the SWOT matrix, indicating a **Strengths-Opportunities (SO) Strategy**. This strategy leverages internal strengths to capitalize on external opportunities, focusing on aggressive development.

Table 10. SWOT Matrix and Strategic Development Plan for Goa Ergendang

SWOT Matrix	Strategy	Strengths (S)	Weaknesses (W)
Opportunities (O)		SO Strategies	WO Strategies
- Safe and eco-friendly environment		- Maximize natural beauty and community support for tourism	- Improve security through partnerships with government
- High development potential		- Promote the site through digital channels	- Collaborate with stakeholders to improve infrastructure
- Opportunity to create tourism awareness groups		- Innovate tourism activities (e.g., cave lighting, photo spots)	- Train locals in tourism management
Threats (T)		ST Strategies	WT Strategies
- Poor infrastructure		- Improve road access and provide alternative routes	- Educate tourists and locals on eco-friendly tourism practices
- Competition from other sites		- Differentiate with unique features (e.g., private hot springs)	- Repair outdated infrastructure
- Lack of innovation		- Collaborate with local businesses for better service quality	- Organize events to attract visitors

Strategic Recommendations

1. **Promote Tourism:** Utilize digital media to promote the unique aspects of Goa Ergendang, such as its caves and hot springs. Provide information on alternative access routes to improve visitor numbers.
2. **Leverage Community Support:** Engage the local community in tourism activities and encourage their participation in managing the site sustainably.
3. **Improve Infrastructure:** Collaborate with the local government to enhance infrastructure, including roads, facilities, and accommodations, to provide a better visitor experience.
4. **Innovation:** Introduce new attractions, such as photo spots, eco-friendly lighting within the caves, and private hot springs to differentiate the site from competitors.
5. **Partnerships:** Strengthen partnerships between local government, private investors, and the community to boost funding and resources for long-term sustainable growth.

IV. CONCLUSIONS AND RECOMMENDATIONS

Conclusion

The development of ecotourism at **Goa Ergendang** holds significant potential, driven by the area's unique natural resources and strong community support. The

SWOT analysis highlights key strengths, such as the site's pristine environment, the beauty of the caves and hot springs, and the active involvement of the local community. Despite these strengths, **weaknesses** such as limited freshwater availability, insufficient promotion, and inadequate facilities pose challenges to the site's optimal development.

Externally, the analysis identified opportunities in the eco-friendly and safe environment, along with the potential for natural resource development. However, the site faces threats, including poor infrastructure, accessibility issues, and competition from other tourism destinations. The **SWOT matrix** positions Goa Ergendang in Quadrant I, indicating that the best strategy is to leverage the site's strengths and capitalize on opportunities while addressing its weaknesses and mitigating threats.

To ensure sustainable development, it is essential to focus on improving infrastructure, promoting the destination through digital channels, and introducing innovative features to attract tourists. The active collaboration between the government, private sector, and local communities is vital to achieving long-term success.

Recommendations

To enhance the development of Goa Ergendang as a prominent ecotourism destination, several key recommendations are proposed. First, improving accessibility and infrastructure is crucial. Immediate efforts should focus on upgrading road conditions and providing alternative routes, which can be achieved through collaboration between local government and private stakeholders. Furthermore, enhancing infrastructure, including accommodations and other supporting facilities, will play a pivotal role in increasing visitor satisfaction and boosting tourist numbers.

Strong digital promotion strategy is essential to raise awareness of Goa Ergendang's unique attractions. Utilizing social media and other digital platforms will help attract both domestic and international tourists, significantly improving the site's visibility and appeal. By leveraging modern marketing tools, the tourism potential of the area can be maximized.

Fostering strong partnerships between the government, private investors, and local businesses is essential for sustainable growth. Public-private collaborations can provide the necessary funding and resources for infrastructure development, promotional efforts, and environmental conservation initiatives. Such partnerships will ensure that Goa Ergendang continues to grow as a sustainable ecotourism destination, benefiting both the local economy and the environment.

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