Management strategies for natural tourism and non-timber forest products support the protection of The Gunung Leuser National Park Buffer Area in mitigating climate change

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Abstract. Gunung Leuser National Park (GLNP) is a critical conservation area with high biodiversity, providing essential ecosystem services, including climate regulation. This research aims to analyze Internal Strategic Factors (IFAS) and External Strategic Factors (EFAS) and determine appropriate strategies in the management of nature tourism and non-timber forest products to support the protection of the GLNP buffer area in climate change mitigation. This research uses SWOT analysis and Focus Group Discussions (FGD). The research results show an IFAS of 0.82 and an EFAS 1.55. The final IFAS and EFAS scores based on the SWOT diagram are in Quadrant I, indicating that strengths and opportunities are high, and weaknesses and threats are low in terms of managing natural tourism and non-timber forest products to support the protection of the GLNP in mitigating change climate. The research highlights the importance of involving local stakeholders, implementing community-based conservation initiatives, and leveraging traditional knowledge to foster sustainable practices. The findings suggest that a balanced approach, combining conservation efforts with economic incentives, is vital for enhancing the resilience of GLNP's buffer zones against climate change impacts. This study contributes to the broader discourse on climate change mitigation by offering actionable strategies for sustainable development.

1 Introduction

Gunung Leuser National Park (GLNP) is one of the most important conservation areas in Indonesia, located in two provinces, namely Aceh Province and North Sumatra Province.

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This area is not only known for its extraordinary biodiversity, but also its crucial role in providing ecosystem services, including climate regulation, which is important for climate change mitigation. Forests can absorb and store large amounts of carbon and help reduce the impacts of global climate change [1,2]. The GLNP area functions as a water catchment area, erosion control, and carbon storage, which are very important for climate change mitigation. Previous research results show that there has been a change in forest cover in the GLNP area [3]. his can threaten the sustainability of the ecosystem and ecological function of the GLNP area. An example that has been impacted by climate change, such as changes in temperature or soil characteristics [4]

As a buffer zone for GLNP, Pamah Simelir Hamlet located in Telagah Village, Sei Bingei Sub-district, Langkat Regency, North Sumatra Province, Indonesia, faces various challenges, including pressure from human activities such as logging and exploitation of natural resources. Sustainable management of nature tourism and non-timber forest products (NTFP) in Pamah Simelir Hamlet is very important to ensure the sustainability of the ecosystem and support the protection of the GLNP area. Sustainable management of nature tourism and non-timber forest products (NTFP) in Pamah Simelir is very important. Good management not only aims to preserve the ecosystem but also to improve the welfare of local communities that depend on these natural resources. An approach that involves the participation of local stakeholders and the implementation of community-based initiatives is needed to create effective solutions [5]. Community involvement can raise awareness of the importance of conservation and provide economic incentives for them to participate in environmental protection [5,6]

Based on the description above, this research was conducted in order to protect the GLNP buffer zone in an effort to mitigate climate change and develop sustainable economics and can contribute to policy. By empowering local communities, it can ensure the sustainability of management practices and improve the welfare of local communities without sacrificing the sustainability of the ecosystem.

This study aims to identify strategic factors that support and hinder the management of nature tourism and NTFP, and to formulate strategies that can be implemented to achieve the objectives of GLNP protection and climate change mitigation. The results of this study are expected to provide significant contributions to the development of more sustainable and responsive management policies to climate change and can provide relevant recommendations for policy makers in formulating effective management strategies. Thus, the policies taken can be more responsive to environmental conditions and community needs and contribute to environmental sustainability and socio-economic welfare in the GLNP area.

2 Method

2.1 Research location

This research was conducted in Pamah Simelir Hamlet, Telagah Village, Sei Bingei Sub-district, Langkat Regency, North Sumatra Province. This village directly borders the GLNP area. The condition of Pamah Simelir is presented in Figure 1.

Fig. 1. Condition of Pamah Simelir Hamlet.

2.2 Method of collecting data

Focus Group Discussion (FGD) activities and in-depth interviews with members of the *Komunitas Bambu Lestari* (KBL) group, community leaders, village officials, government representatives and academics. This study uses the SWOT analysis method [7-8] to evaluate Internal Strategic Factors (IFAS) and External Strategic Factors (EFAS) that influence the management of nature tourism and non-timber forest products in the GLNP buffer zone. The SWOT analysis was conducted by identifying and evaluating the strengths, weaknesses, opportunities and threats in the management of NTFP-based nature tourism.

2.3 Data analysis

Data analysis was conducted by calculating the IFAS and EFAS values obtained from the results of the SWOT analysis using Microsoft Excel. From the SWOT factors, the priority order is then determined, then the weight is determined and then each factor is ranked to get the score of each factor. After the weight and score of each SWOT factor are known, the EFAS and IFAS values are obtained. The IFAS and EFAS scores are calculated by adding up the scores on each factor and are used to determine the strategic position of NTFP-based nature tourism management in the SWOT diagram.

In the SWOT diagram, there is an X axis and a Y axis that divides it into 4 quadrants, namely quadrants 1, II, III, and IV (Figure 2). The X axis value is obtained from the result of subtracting the strength value minus the weakness value (W), while the Y axis value is obtained from the result of subtracting the Opportunity value minus the Threat value (T). Based on Figure 2, it can be seen that if the X axis has a positive value and the Y axis has a positive value, then it is included in Quadrant 1. If the X axis has a positive value and the Y axis has a negative value, then it is included in Quadrant I1. If the X axis has a negative value and the Y axis has a positive value, then it is included in Quadrant II1, and if the X axis has a negative value and the Y axis has a negative value, then it is included in Quadrant IV.

The results of the SWOT analysis are then used to formulate appropriate strategies in managing NTFP-based nature tourism in the GLNP buffer zone against the impacts of climate change, taking into account the involvement of local communities, in this case the sustainable bamboo community.

3 Results and Discussion

The results of the SWOT analysis are presented in Table 1.

Table 1. IFAS Factors.

No	Internal factors strategy factors	Weight	Ranking	Weight x Rating
	Strength			
1	The KBL group was given permission to manage the GLNP area in the context of climate change mitigation.	0.11	4	0.44
2	Provider of various economic, social and environmental benefits	0.04	4	0.16
3	Increasing knowledge and understanding of GLNP	0.07	3	0.21
4	Participation of group members in GLNP management	0.05	3	0.15
5	There is government support in managing GLNP	0.02	4	0.08
6	The existence of natural resource potential around GLNP for tourism and management of bamboo	0.09	4	0.36
7	Availability of sufficient bamboo	0.13	3	0.39
		0.51		1.79
	Weakness			
1	Hard to reach access	0.09	1	0.09
2	Management of GLNP is not yet optimal	0.04	3	0.12
3	People's income is still low	0.05	2	0.10
4	There is no funding yet for managing ecotourism areas in GLNP	0.11	1	0.11
5	There is no assistance in managing ecotourism areas in GLNP	0.13	3	0.39
6	Promotion of tourism and bamboo NTFP products is still low	0.07	2	0.14
7	Inadequate bamboo NTFP tourism infrastructure	0.02	1	0.02
		0.51		0.97

The results of the SWOT analysis show that there are 7 S, W, O points and 4 T points. The strengths in managing bamboo-based tourism based on priority are:

1. Government support in managing GLNP
2. Provision of various economic, social, and environmental benefits
3. Participation of group members in managing GLNP
4. Increased knowledge and understanding of GLNP
5. Potential natural resources around GLNP for tourism and management of bamboo NTFP
6. KBL groups are given permission to manage the GLNP area in the context of climate change mitigation
7. Availability of sufficient bamboo

For the weakness is:

1. Inadequate bamboo NTFP tourism infrastructure
2. Suboptimal management of GLNP
3. Low community income
4. Low promotion of bamboo NTFP tourism and products
5. Difficult access
6. No funding for managing ecotourism areas in GLNP
7. No assistance for managing ecotourism areas in GLNP

For the opportunity is:

1. Demand for bamboo craft products produced
2. Funding from donor agencies for forest management activities
3. High demand for forest products
4. World attention to tropical forest conservation
5. Support for community-based participatory forest management policies
6. Government programs to increase group capacity in managing tourism areas
7. Increasing needs of urban communities for nature tourism

For the challenge is:

1. Difficult road access
2. Lack of training and assistance to groups in ecotourism areas
3. The emergence of private nature tourism managers in areas around forests
4. Threat of damage to forest ecosystems in ecotourism areas

EFAS and IFAS values are presented in Table 2.

Table 2. EFAS Factors.

No	Strategy factors External factors	Weight	Ranking	Weight x Rating
	Opportunity			
1	There is a demand for bamboo craft products that are produced	0.03	4	0.12
2	The existence of a government program to increase the capacity of groups in managing tourist areas	0.16	3	0.48
3	The increasing need of urban communities for nature tourism	0.18	3	0.54
4	There is global attention to the preservation of tropical forests	0.11	2	0.22
5	The existence of funding from donor institutions for forest management activities	0.05	4	0.20
6	Support for community-based participatory forest management policies	0.13	2	0.26
7	High demand for forest products	0.08	3	0.24
		0.74		2.06
	Threat			
1	Difficult road access	0.03	1	0.03
2	Lack of training and assistance to groups in ecotourism areas	0.05	2	0.10
3	The emergence of private nature tourism managers in areas around forests	0.08	2	0.16
4	Threat of damage to forest ecosystems in ecotourism areas	0.11	2	0.22

		0.27		0.51

Table 3. Total score of EFAS and IFAS.

IFAS		EFAS	
S	1.79	O	2.06
W	0.97	T	0.51
S-W	0.82	O-T	1.55

If depicted in a SWOT diagram, it is in Quadrant 1, which means that the strengths and opportunities are high, and the weaknesses and threats are low. The quadrant position is as presented in Figure 2.

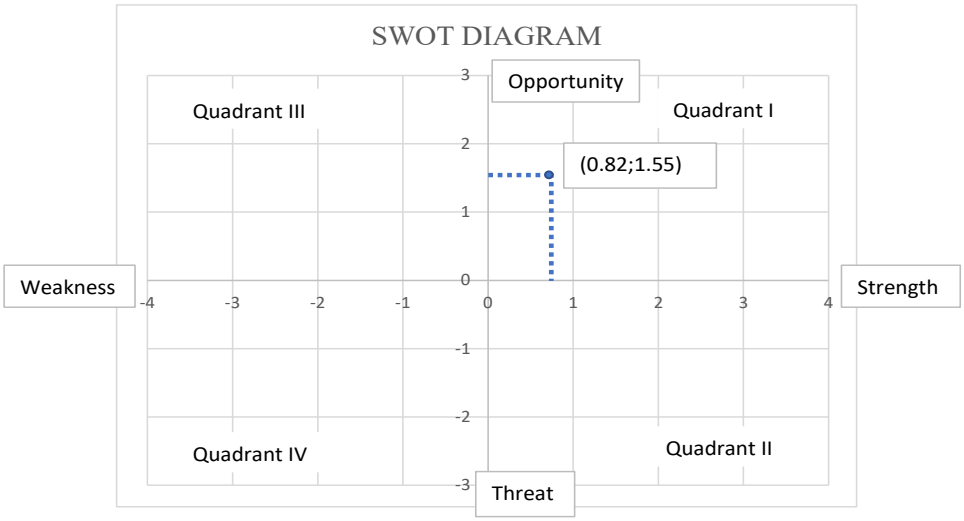

Fig. 2. Position in SWOT diagram.

Based on Table 3, the total IFAS score is 0.82 and EFAS is 1.55, this position is in Quadrant I in the SWOT diagram (Figure 2), which indicates a condition where strengths and opportunities are higher than weaknesses and threats. High Strength (S) (1.79) indicates that GLNP has many positive assets that can be utilized, such as rich biodiversity, local community support, and traditional knowledge. This creates a strong foundation for the development of effective management strategies. Very high Opportunity (O) (2.06) indicates that there are many opportunities for development, such as increasing interest in ecotourism, global support for conservation, and potential for international cooperation. These opportunities can be utilized to improve conservation efforts and sustainable resource management in the GLNP buffer zone.

The relatively low Weakness (W) (0.97) indicates that GLNP has few significant inhibiting factors in its management. Likewise, the very low Threat (T) (0.51) indicates that external pressures on this region may not be as severe as in other regions. This provides room for the development and implementation of more innovative strategies.

Based on the position in Quadrant I, several strategies that can be implemented include: optimizing strengths, exploring opportunities, community-based initiatives, and creating supportive policies. Utilizing existing strengths, such as biodiversity and community support, to increase the attractiveness of ecotourism and NTFP products. Developing programs that utilize opportunities, such as increasing ecotourism promotion, developing local products, and collaborating with international institutions to obtain funding and technical support.

Encouraging local community involvement in conservation and management programs, and providing training to improve their skills and knowledge in natural resource management. Policy recommendations that strengthen support for local initiatives and provide incentives for communities to participate in sustainable management. By implementing the right strategies, GLNP can maximize existing potential, increase the resilience of buffer areas, and contribute to overall climate change mitigation efforts.

The results of the SWOT analysis and FGD show that the management of nature tourism and non-timber forest products in GLNP needs to adopt a holistic and sustainable approach. Existing strengths and opportunities must be utilized to overcome the challenges facing the region, especially those related to climate change and resource exploitation. The importance of stakeholder participation involving local stakeholders in the management process is key to achieving sustainability [5,6]. Local communities are not only actors in conservation but also strategic partners in maintaining ecosystem sustainability. By educating the community about the importance of biodiversity and the economic benefits of conservation, it is hoped that a higher collective awareness will be created. Community-based conservation initiatives, the implementation of community-based initiatives has proven effective in maintaining the sustainability of the area [5]. Programs that empower local communities, such as training in natural resource management and NTFP product development, can create economic incentives that support conservation [5,6,9,10].

Synergy between conservation and economy a balanced approach between conservation efforts and economic incentives is essential. Responsible ecotourism development can attract tourists and provide income for local communities, while raising awareness of the importance of environmental conservation. Policy recommendations based on the research results, it is recommended that the government and GLNP managers formulate policies that support collaboration between stakeholders, investment in environmental education, and development of market access for NTFP products. These policies will strengthen the resilience of the GLNP buffer zone to the impacts of climate change and strengthen its contribution to overall climate change mitigation. It is hoped that GLNP can continue to function as an effective conservation area, while improving the welfare of local communities and contributing to climate change mitigation efforts.

4 Conclusion

Internal and external strategic factors show great potential for sustainable management. High IFAS and EFAS results indicate that there are significant opportunities to leverage existing strengths to address the challenges faced. The importance of engaging local stakeholders and implementing community-based initiatives is highlighted, as this can encourage more effective and sustainable conservation practices. A balanced approach between conservation and economic incentives is essential to enhance the resilience of GLNP buffer zones to climate change. Thus, this study not only provides strategic recommendations for GLNP management, but also contributes to the broader discourse on climate change mitigation, while supporting sustainable development in the region.

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