Journal of the Community Development in Asia (JCDA)
Vol. 8 No. 3, pp.445-463, September, 2025
E-ISSN: 2654-7279 P-ISSN: 2685-8819
https://ejournal.aibpmjournals.com/index.php/JCDA/index

Community-Based Tourism in the Sustainability Tourism of Open Pit Nam Salu in East Belitung Regency

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ARTICLE INFORMATION

Publication information

Research article

HOW TO CITE
Raya, A. B., Fatonah, S., Qurayma, V. A., Wahyudin, N., & Witjaksono, R. (2025). Community-based tourism in the sustainability tourism of Open Pit Nam Salu in East Belitung Regency. *Journal of the Community Development in Asia*, *8*(3), 445-463.

DOI:
https://doi.org/10.32535/jcda.v8i3.4107

Received: 13 July 2025
Accepted: 16 August 2025
Published: 20 September 2025

ABSTRACT

Community-based tourism (CBT) provides a framework for sustainable tourism by ensuring that development benefits the community while preserving cultural and natural resources. This study aimed to analyze the sustainability of the Open Pit Nam Salu Geosite in East Belitung by applying a CBT framework and examining the direct and indirect effects of group roles, natural capital, and community motivation. The research was conducted in Senyubuk Village using a quantitative approach with 87 respondents selected through cluster sampling. Data were analyzed using SEM-PLS. Results show that group roles had the strongest direct effect on tourism sustainability ($\beta = 0.306$, $p = 0.009$), followed by community motivation ($\beta = 0.269$, $p = 0.014$). Natural capital did not significantly influence sustainability directly, but exerted an indirect effect through community motivation ($\beta = 0.141$, $p = 0.053$). Group roles also contributed indirectly through natural capital and community motivation ($\beta = 0.098$, $p = 0.060$). These findings indicate that CBT at Open Pit Nam Salu has not yet been implemented optimally, as participation remains limited. Strengthening BAPOPNAS's task roles, enhancing community involvement, and transforming natural capital into motivational drivers are key strategies to ensure sustainable post-mining tourism development.

Keywords: Community-Based Tourism; Community Participation; Natural Capital; Sustainable Tourism; Tourism Development

INTRODUCTION

One of the revenue streams for nations and regions is the tourist industry. An area's potential, life demands, and population growth contribute to tourism growth. The development of tourism will create more work opportunities for the local population. Community-based tourism (CBT) is the term used to describe the growth of tourism by including the local community. CBT refers to tourism initiatives that preserve local culture, provide economic benefits to local residents, and actively involve them in managing and carrying out tourism activities. A CBT method is used to manage tourism to make it more sustainable (Dodds et al., 2018). The use of social capital by the community is a crucial part of putting CBT into practice. To develop a type of tourism that meets the community's needs, community involvement is required in planning and management (Freitag & Camargo-Borges, 2024). Tourism in East Belitung Regency is one example where development actively involves the surrounding community. East Belitung Regency has various tourism potentials, such as granite rocks that are hundreds of millions of years old, ancient volcanoes that are underground, and the most extensive tin mineral in Southeast Asia.

The Open Pit Nam Salu Geosite is a significant tourist site in East Belitung Regency that has undergone considerable development. This tourism is based on community involvement, where local residents participate in planning, implementing, and evaluating the tourism activities. The geosite offers educational tours about tin mining history in Senyubuk Village, Kelapa Kampit District. Its management follows a bottom-up approach, with local community organizations actively managing the tourism. These organizations handle daily operations, maintain facilities, design tour packages, and provide tour guides. Among the groups involved are the Geosite Management Organization (BAPOPNAS), the Senyubuk Village Tourism Awareness Group (Pokdarwis), and the Mining Village Nature School (SATAM). In addition, the community around the tourism site also participates in providing supporting facilities such as homestay rentals, food and beverage orders, and souvenir sales. On the other side, this tourist location is alongside tin mines that are still active today.

Indonesia’s abundant tin ore deposits have driven local communities to engage in unconventional mining practices. Mining, which has been carried out for decades, is feared to cause environmental damage and even social problems. The economy of people in the extractive or mining sector is considered less sustainable because it can damage natural resources. The existence of tin mining around tourist sites is a challenge for the community and tourism managers in maintaining the integrity of tourist sites. The development of tin mining is feared to cause tree cutting, which can damage the forest's natural ecosystem. According to Geghamyan and Pavličková (2018), mining activities often lead to environmental degradation, which can negatively impact tourism. For instance, in Armenia, mining has led to water contamination and landscape degradation, reducing the potential for tourism development. In Thailand, unsustainable mining practices have caused environmental and health damage, hindering CBT (Onrak et al., 2020).

Community empowerment efforts through Open Pit Nam Salu Geosite, tourism management activities, are one of the sustainable economic solutions so that humans and nature can work together. The existence of a geosite tourist site provides a new change for the surrounding community, especially in the economic aspect. Economic growth and tourism development have a two-way causality, where tourism stimulates economic growth and vice versa (Dogru & Bulut, 2018). Tourism management can be a more sustainable alternative job and prioritizes aspects of natural sustainability. Thus, active participation from the community in Senyubuk Village is needed to jointly maintain

the integrity of nature and build local tourism so that it can be recognized by the wider community, increase tourist visits, and secure the surrounding community's economy.

This study aims to analyze the sustainability of Open Pit Nam Salu tourism by applying a CBT framework using SEM-PLS to assess both direct and indirect effects of group roles, natural capital, and community motivation. This paper contributes to the development of tourism at the Open Pit Nam Salu Geosite by supporting CBT sustainability. This research contributes to scientific knowledge in two ways. First, the path analysis model used is based on SEM-PLS, an innovation in tourism sustainability research. Unlike previous studies that were descriptive in nature, this quantitative model estimates both the direct effects of group roles on sustainability and the mediating effects through community motivation and natural resource management. Second, the pathways derived from the analysis can explore both direct and indirect impacts on tourism sustainability in East Belitung, which is the main contribution of this paper. The resulting path analysis model can serve as a consideration for stakeholders in achieving sustainability for the Open Pit Nam Salu. By modelling pathways of effects, a path model can help in understanding the sequence and impact of decisions, aiding in the formulation of more effective strategies for sustainable tourism of Open Pit Nam Salu. Strategies for managing the Open Pit Nam Salu Mine Geosite require contributions from community leaders and policymakers.

LITERATURE REVIEW

Community-Based Tourism (CBT)

Through the creation of new jobs, the support of neighborhood groups, and the preservation of the natural and cultural heritage, tourism serves as one of the development techniques to enhance people's lives. Both material and non-material aspects of people's life satisfaction can benefit from the growth of the tourism industry, claim Woo et al. (2015). It demonstrates how the development of tourism enhances the community's general standard of living. As defined by Schott and Nhem (2018), CBT development emphasizes community involvement throughout the planning, execution, monitoring, assessment, and benefit-sharing phases. A tourism strategy known as CBT emphasizes the benefits and participation of local communities in travel. Its objective is to promote social justice, preserve and showcase the region's natural and cultural resources, and improve the quality of life for underprivileged populations (Đurkin & Perić, 2017).

Sustainable Tourism

CBT, which aims to preserve natural and cultural resources while bringing economic advantages to local communities, is frequently associated with sustainable tourist practices. Implementing CBT can lead to sustainable tourism development (Lee & Jan, 2019). Sustainable CBT empowers local communities in all facets of tourism management and emphasizes social, environmental, and cultural sustainability (He et al., 2021). A holistic approach to tourism, sustainable tourism seeks to strike a balance between social, economic, and environmental goals. According to Folgado-Fernández et al. (2024), sustainable tourism can offer considerable economic gains for local communities while protecting cultural traditions and the natural environment. For example, tourism can be a tool for heritage cities to foster economic progress and preserve their cultural identity.

Group Role

In addition to the degree of community cohesion, the number of official and informal leaders in the community is crucial to the growth of sustainable CBT in Indonesia (Priatmoko et al., 2021). In order to achieve sustainable tourism, stakeholder

collaboration is crucial (Tseng et al., 2018). To foster trust among diverse stakeholders, a continuous development process must encourage stakeholder participation (McComb et al., 2016). By helping to create tourism options and benefiting from the advancements and changes that tourism brings, local communities play a critical role in promoting sustainable tourism. Their attitudes and involvement significantly impact the achievement of environmental, social, and economic goals (Sobczak, 2024). Governments support sustainable tourism by supplying essential infrastructure and establishing regulations. They also collaborate with communities and businesses to ensure shared objectives and visions focused on environmental conservation (Handayani & Lazuardi, 2022).

Community Motivation

Community motivation is a multifaceted concept that encompasses various factors driving individuals to participate and contribute to community activities. CBT is a sustainable tourism model that emphasizes the active participation and empowerment of local communities. Several factors influence community motivation to engage in CBT activities. The possibility of financial profit is a key incentive for community involvement in CBT. Communities tend to participate more actively when they recognize clear economic advantages, like new employment opportunities and revenue from tourism-related activities (Mai et al., 2023). Showing tangible benefits at the beginning of the project can build trust and motivate community members to participate (Pimid et al., 2024). Providing training and capacity-building programs helps communities develop the necessary skills to manage tourism projects effectively. Ensuring that all community members have a voice in the decision-making process fosters a sense of ownership and commitment to the tourism initiative (Rodrigues & Prideaux, 2018).

Hypotheses Development

The following are the proposed hypotheses for this investigation:

H1: Group roles have a direct effect on the sustainability of Open Pit Nam Salu tourism.
H2: Community motivation has a direct effect on the sustainability of Open Pit Nam Salu tourism.
H3: Natural capital culture has a direct effect on the sustainability of Open Pit Nam Salu tourism.
H4: Group roles, through community motivation, have an indirect effect on the sustainability of Open Pit Nam Salu tourism.
H5: Natural capital, through community motivation, has an indirect effect on the sustainability of Open Pit Nam Salu tourism.
H6: Group roles, through natural capital, have an indirect effect on the sustainability of Open Pit Nam Salu tourism.

Research Framework

Based on the proposed hypothesis, the research model can be presented in Figure 1.

Figure 1. Research Model

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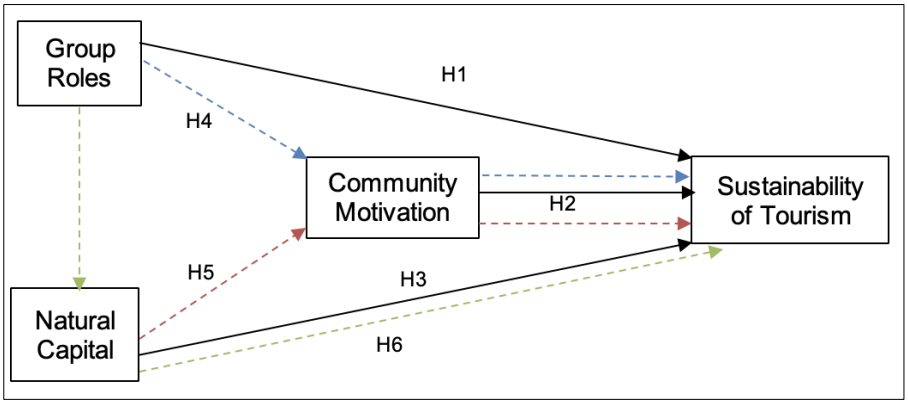

RESEARCH METHOD

A quantitative methodology was used to conduct this study. Both primary and secondary data types were employed in this study. The Senyubuk Village community was observed and interviewed to get primary data. Documents from BAPOPNAS, Pokdarwis Senyubuk Village, Senyubuk Village Government, and research-related periodicals were used to gather secondary data. Quantitative descriptive research is the methodology employed. Senyubuk Village in Kelapa Kampit District, East Belitung Regency, was chosen as the study site. Cluster sampling is the method employed during the sampling phase. The sample from each hamlet was selected using cluster sampling. Within the Senyubuk villages were five distinct hamlets: Java, Selindang, Kelapa Kampit, Merdeka, and Pelataran. In every hamlet, we took respondents proportionally. Java Hamlet had 10 respondents, Selindang Hamlet had 23 respondents, Kelapa Kampit Hamlet had 10 respondents, Merdeka Hamlet had 19 respondents, and Pelataran Hamlet had 22 respondents. Among the 87 respondents were interviewed. Interviews were conducted with 87 of the respondents. In November 2023, the data was collected.

The data was collected using a structured questionnaire with a 5-point Likert scale. The latent variables were Group Roles, Natural Capital, Motivation, and Sustainability of Open Pit Nam Salu Tourism. Individual roles, maintenance roles, and task roles reflected the group roles. Natural capital was reflected by its natural potential in the form of biodiversity, hundred-year-old rocks, beautiful natural landscapes, and other natural resources that attract tourists. The positive reinforcement and negative reinforcement reflected the motivation. In addition, the culture, environment, management, and social economy reflected the sustainability of Open Pit Nam Salu Tourism. All the manifest variables had a significant reflection on the latent variables.

Partial Least Squares (PLS) testing was used to examine the data to determine the components with a direct and indirect impact. Both endogenous and exogenous latent variables and indicator variables are needed for the PLS-SEM model. The structural model, which consists of an outer and inner model, is the only part of the PLS-SEM model. Finding the connection between latent and manifest variables is the goal of outer model analysis (Nasution et al., 2020). Cronbach's alpha, composite reliability, and average variance extracted (AVE) values were examined in the analysis. Reliability is satisfactory if Cronbach's alpha and composite reliability coefficient values surpass 0.7 (Muchsini et al., 2022). Convergent and discriminant validity are used to measure the model's validity. The link or correlation between latent variables and constructs is measured by convergent validity. The AVE value can be used to get the convergent validity value. The model's validity under test is unaffected if the AVE value for each construct is more than 0.5 (Nasution et al., 2020). The degree to which a construct is distinct from other constructs is known as discriminant validity. The Fornell-Larcker criteria are one method that can be applied. The square root value of the AVE is

examined and measured using the Fornell-Larcker criterion. It can be claimed that the construct has discriminant validity if it is greater than the value of the latent variable in the same column (Muchsini et al., 2022). In addition, discriminant validity can be measured through Heterotrait-Monotrait Ratio (HTMT) values and cross-loading. An HTMT value of less than 0.9 indicates that the data is valid. The PLS fit model is measured through Standardized Root Mean Square Residual (SRMR), R^2, and F^2 values of the tourism sustainability variables.

RESULTS

Based on the research that has been conducted, the level of achievement of tourism sustainability variables and the role of groups in tourism management are obtained. The achievement level of Open Pit Nam Salu tourism sustainability and the role of groups in tourism management can be seen in Table 1.

Table 1. Achievement Level of Tourism Sustainability and Group Roles in Open Pit Nam Salu

No.	Variable Items	Achievement (%)	Description
Tourism Sustainability			
1	Management	62.28%	Agree
2	Socio-Economic	73.28%	Agree
3	Culture	73.27%	Agree
4	Environment	78.61%	Agree
Group Roles			
1	Maintenance	61.61%	Role
2	Taks	51.55%	Neutral
3	Individual	59.58%	Neutral

Table 1 shows that the highest achievement of tourism sustainability indicators is in the environmental aspect, with a percentage of 78.61% (agree). In other words, the development of the Open Pit Nam Salu tourism has paid attention to environmental aspects. Tourism development must consider socially inclusive and environmentally friendly aspects (Yanes et al., 2019). The lowest tourism sustainability indicator is sustainable management, with a percentage of 62.28% (agree). Open Pit Nam Salu already has a tourism management body called Open Pit Nam Salu BAPOPNAS. BAPOPNAS members come from stakeholders such as environmentalists, universities, the village government, the general public, and village youth. According to Lee and Hsieh (2016), the involvement and collaboration of various stakeholders are essential in planning sustainable tourism development. However, community involvement in tourism management is still a small portion. The reason is that the Open Pit Nam Salu tourism attraction is still segmented, limiting tourists, so it has yet to provide an economic impact that the entire community can feel.

Table 1 also shows that the highest aspect of the group's role is maintenance, with a percentage of 61.61% (role). Implementing the task and individual roles by BAPOPNAS in managing the Open Pit Nam Salu tourism is in the neutral category. The lowest group role aspect is the task role, with a percentage of 51.55% (neutral). It shows that BAPOPNAS needs to be maximized in carrying out the tasks of managing tourism. BAPOPNAS has not been optimal in implementing CBT development because there has not been much community involvement in tourism management. Segmented tourist attractions create limitations on tourist visits. On the other hand, the former mining area prevents the development of tourist attractions for security reasons. BAPOPNAS can only empower a small part of the community according to the number of tourist visits.

The novelty of the research is the development model of CBT in the context of the sustainability of Open Pit Nam Salu tourism through optimizing the role of the group, namely BAPOPNAS. The development model was obtained through SEM PLS analysis. The results of the SEM PLS test are used to determine the direct and indirect effects that occur in the group role variables, natural capital, and community motivation on the tourism sustainability variables of Open Pit Nam Salu. The magnitude of direct and indirect effects can be used to formulate a more optimal tourism development strategy for Open Pit Nam Salu to achieve tourism sustainability. Model development regarding the determinants of factors related to CBT in the sustainability of Open Pit Nam Salu tourism can be seen in Figure 2.

Figure 2. SEM-PLS Model on CBT in the Sustainability of Open Pit Nam Salu Tourism in East Belitung Regency

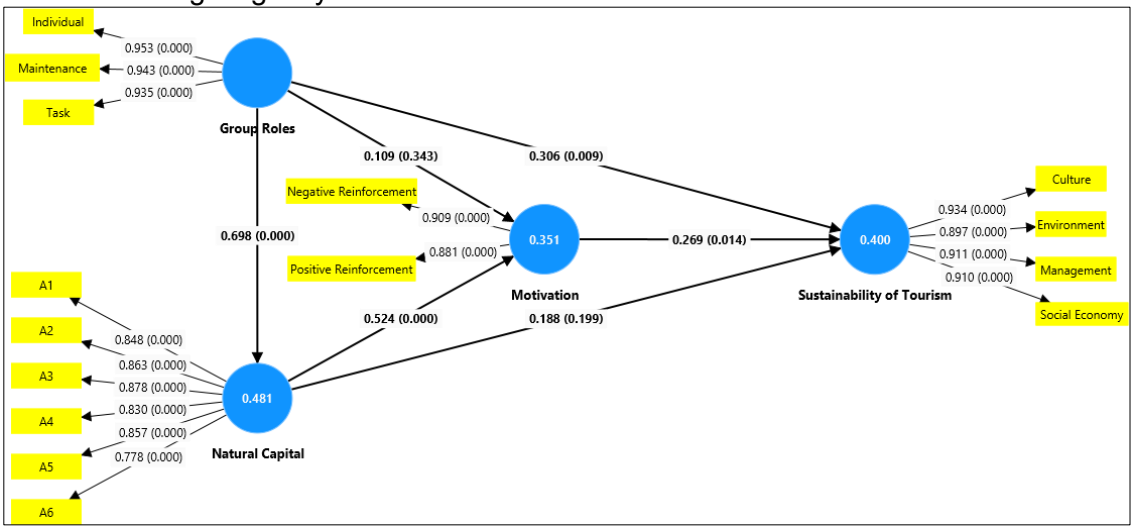

Figure 2 indicates that the corrected R-squared variable for tourist sustainability is 0.400. It demonstrates how community motivation and the function of organizations impact the development of Open Pit Nam Salu tourism. In this instance, the sustainability of Open Pit Nam Salu tourism is affected by 40% due to the community's desire to participate in the tourism management process and the presence of BAPOPNAS as a group that organizes tourism management. However, a natural capital of 0.351 impacted collective motivation. People's desire to participate in the administration of Open Pit Nam Salu tourism may be influenced by their perceptions of the natural potential that can be used to generate tourism.

To ascertain the validity and reliability of the model, an external model analysis has been conducted using the PLS model shown in Figure 2. The validity and reliability of the indicator in the variable being employed are determined by the outer loading value, which is displayed in Table 2.

Table 2. Outer Loading

Indicator	Outer Loadings
A1 <- Natural Capital	0.848
A2 <- Natural Capital	0.863
A3 <- Natural Capital	0.878
A4 <- Natural Capital	0.830
A5 <- Natural Capital	0.857
A6 <- Natural Capital	0.778
Culture <- Sustainability of Tourism	0.934

Environment <- Sustainability of Tourism	0.897
Individual <- Group Roles	0.953
Maintenance <- Group Roles	0.943
Management <- Sustainability of Tourism	0.911
Negative Reinforcement <- Motivation	0.909
Positive Reinforcement <- Motivation	0.881
Social Economy <- Sustainability of Tourism	0.910
Task <- Group Roles	0.935

Table 2 shows that the outer loading value of all indicators, both in the variables of natural capital, group roles, motivation, and sustainability of tourism, is more than 0.7. It indicates that all indicators used in the PLS model are valid. The indicators used on each variable can represent the variable being measured. In addition, the outer model analysis carried out on the PLS model is seen from Cronbach's alpha values, composite reliability, and AVE in Table 3.

Table 3. Outer Model Analysis

Variable	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
Tourism Sustainability	0.933	0.935	0.833
Group Roles	0.939	0.943	0.891
Natural Capital	0.918	0.919	0.710
Motivation	0.753	0.762	0.802

Cronbach's alpha and composite reliability scores are more than 0.7, as Table 3 demonstrates. It means that every variable is considered trustworthy. It shows that every variable exhibits reasonable reliability, indicating that the measurement tools regularly yield reliable and stable data. Additionally, demonstrates that every AVE value is greater than 0.5, indicating the validity of every construct. Because of this, the measuring model is valid and dependable, guaranteeing that the constructs appropriately represent the underlying theoretical ideas and are appropriate for further research. Table 4 displays the AVE value and the square of the construct-to-construct association.

Table 4. AVE Values and Fornell-Lacker Criterion of Discriminant Validity

	Tourism Sustainability	Group Roles	Natural Capital	Motivation
Tourism Sustainability	0.913			
Group Roles	0.565	0.944		
Natural Capital	0.563	0.698	0.843	
Motivation	0.527	0.475	0.600	0.895

Each construct's AVE value is higher than the square value of its connection with other constructs, as Table 4 demonstrates. For instance, the tourist sustainability construct's AVE value of 0.913 is higher than its correlation value with other constructs, which range from 0.5 to 0.6. These other constructs include group roles, natural capital, and community motivation. As a result, each construct is unique and may quantify the phenomenon based on its conditions. HTMT ratios and cross-loading can be used to test discriminant validity in addition to the Fornell-Lacker Criterion. Table 5 displays the value of the HTMT ratio.

Table 5. HTMT Ratio of Discriminant Validity

	Group Roles	Motivation	Natural Capital	Sustainability of Tourism

Group Roles				
Motivation	0.561			
Natural Capital	0.752	0.719		
Sustainability of Tourism	0.599	0.626	0.606	

If the HTMT value for a construct is less than 0.9, the evaluation of HTMT values for constructs satisfies discriminant validity standards (Hair et al., 2019). Every construct in the PLS model has an HTMT value less than 0.9, as Table 5 demonstrates. It shows that every construct in the research model has strong discriminant validity, meaning that each can be easily distinguished from the others. Consequently, the measuring model is legitimate and appropriate for additional research since the discriminant validity of the investigated constructs satisfies the predetermined standards. Additionally, cross-loading in Table 6 was used to assess discriminant validity.

Table 6. Cross-Loading Value for Discriminant Validity

	Group Roles	Motivation	Natural Capital	Sustainability of Tourism
A1 (Natural Capital)	0.610	0.411	0.848	0.480
A2 (Natural Capital)	0.559	0.496	0.863	0.539
A3 (Natural Capital)	0.610	0.485	0.878	0.485
A4 (Natural Capital)	0.636	0.535	0.830	0.413
A5 (Natural Capital)	0.589	0.559	0.857	0.482
A6 (Natural Capital)	0.524	0.545	0.778	0.449
Culture (Sustainability of Tourism)	0.545	0.471	0.508	0.934
Environment (Sustainability of Tourism)	0.541	0.451	0.562	0.897
Management (Sustainability of Tourism)	0.522	0.512	0.550	0.911
Social Economy (Sustainability of Tourism)	0.451	0.492	0.428	0.910
Individual (Group Roles)	0.953	0.492	0.663	0.603
Maintenance (Group Roles)	0.943	0.443	0.678	0.505
Task (Group Roles)	0.935	0.406	0.635	0.487
Negative Reinforcement (Motivation)	0.449	0.909	0.566	0.505
Positive Reinforcement (Motivation)	0.399	0.881	0.506	0.435

Table 6 shows the cross-loading values, which demonstrate that the evaluation of discriminant validity at the item level has been satisfactorily met. Each measurement item shows a stronger or higher correlation with the variable it is intended to measure compared to other variables. In other words, each item represents its respective construct, ensuring that the measurement can accurately distinguish between constructs at the item level. This condition confirms that the measurement instruments used are valid in capturing the characteristics of each variable and support the reliability of the research analysis results.

Moreover, inner model analysis determines the effect relationships between latent variables. Table 7 shows the total effect of latent variables on Open Pit Nam Salu tourism sustainability.

Table 7. Total Effect of Latent Variables on Open Pit Nam Salu Tourism Sustainability

No.	Line	β	t	p	Say.	Dec.
Group Roles						
1	Group Roles → Tourism Sustainability (H1)	0.306	2.605	0.009	*	Accepted
2	Group Roles → Natural Capital → Motivation → Tourism Sustainability (H6)	0.098	1.884	0.060	*	Accepted
	Total (A)	0.404				Accepted
Natural Capital						
1	Natural Capital → Motivation → Tourism Sustainability (H5)	0.141	1.935	0.053	*	Accepted
	Total (B)	0.141				Accepted
Motivation						
1	Motivation → Tourism Sustainability (H2)	0.269	2.459	0.014	*	Accepted
	Total (C)	0.269				
Total Effect (A + B + C)		0.814				Accepted

Table 7 shows that group roles have a significant direct effect on tourism sustainability (β = 0.306, p = 0.009), and also contribute indirectly through natural capital and motivation (β = 0.098, p = 0.060). The total effect of group roles on sustainable tourism is 0.404, making it the strongest predictor in the model (supporting H1 and H6). Community motivation also demonstrated a significant direct influence on sustainability (β = 0.269, p = 0.014), confirming H2. In contrast, the direct effect of natural capital on sustainability was not significant, so H3 was not supported. Similarly, the proposed indirect effect of group roles through community motivation (H4) was not supported. However, natural capital exerted an indirect influence through motivation (β = 0.141, p = 0.053), thereby supporting H5 at the 10% significance level. Taken together, the combined total effect of group roles, natural capital, and community motivation on tourism sustainability is 0.814, indicating a strong overall influence of these three factors. Thus, four hypotheses were supported (H1, H2, H5, H6), while two (H3 and H4) were not. In addition to the internal model analysis, the model fit analysis was also carried out in Table 8.

Table 8. Model Fit Analysis Results

No.	Measurement	Value
1	R^2 of Tourism Sustainability	0.400
2	Q^2 of Tourism Sustainability	0.298
3	SRMR	0.058

Based on Table 8, the Q^2 value of 0.400, which is included in the category, is quite good in explaining the model well. Q^2 value establishes the predictive relevance of the endogenous construct. The Q^2 value in this PLS model is 0.298, where more than 0. A Q^2 predict value of more than 0 indicates the model has predictive relevance (Hair et al., 2019). In that case, the PLS-SEM models offer better predictive performance. An SRMR value of less than 0.08 indicates that the PLS model fits.

DISCUSSION

Sustainability Achievement Level of Open Pit Nam Salu Tourism

Adopting strategies that balance social, economic, and environmental factors is necessary to realize sustainable tourism. Tourism that considers its entire economic, social, and environmental implications for the benefit of present and future generations

is referred to as sustainable tourism by the UNWTO (Jovanović et al., 2024). Sustainable tourism applies to all types of tourism, including mass tourism and other types. To achieve this, destinations must implement sustainable management practices by establishing clear management structures, involving multiple stakeholders, and effectively addressing pressures and changes. They should also ensure social and economic sustainability by delivering economic benefits, fostering community welfare, and generating positive social impacts. Additionally, cultural sustainability is crucial, requiring the protection of local heritage and cultural sites. Finally, environmental sustainability must be prioritized through nature conservation, responsible resource management, and proper handling of waste and emissions arising from tourism activities.

Table 1 shows that the level of tourism sustainability achievement is in the high category, with the highest achievement in environmental aspects. The development of Open Pit Nam Salu tourism, a former mining area, is one of the movements that aims to change the livelihoods of East Belitung people who tend to be conservative as tin miners. These livelihoods are considered to damage the environment, which future generations will feel. The attractions presented by Open Pit Nam Salu tourism are also about natural aspects, so tourism development considers environmental aspects to avoid damaging the rocks and plants that become tourism objects. In addition, managing the tourism environment is also the shared responsibility of both managers and tourists. Vandalism committed by tourists or residents on the rocks at the geosite reduces the beauty of the tourist attractions. According to Filimonau et al. (2022), environmental knowledge is essential in encouraging sustainable tourism.

On the other hand, the lowest achievement of tourism sustainability was in the aspect of sustainable management. It is because there are still a few people involved in tourism management. According to Jaafar et al. (2015), the involvement of the local community, especially the younger generation, supports and increases the sense of community ownership of tourism. On the other hand, the diverse membership of BAPOPNAS allows Open Pit Nam Salu tourism development to be aligned with various parties, such as the village government. The leadership possessed by the village government can also be utilized to increase community involvement in tourism management. Participatory leadership of the village government can be done to improve community contributions by providing suggestions and input for tourism management. In addition, achievement-oriented village government leadership can be used to determine tourism development targets within the community so that good cooperation can arise between the two. The target can be encouraging tourism promotion to increase the number of tourist visitors and encourage the preservation of nature (Qurayma et al., 2024).

The development of CBT must involve the participation of BAPOPNAS, the coordinating body for tourism management in the area. As a management organization, BAPOPNAS plays a key role in overseeing the tourism activities. According to Benne and Sheats (2007), group roles are classified into maintenance, task, and individual roles. Table 1 indicates that BAPOPNAS performs best in maintenance roles, reflecting its function in managing the tourist area. BAPOPNAS encourages community cooperation in developing tourism, maintaining cleanliness and infrastructure, and fostering teamwork. During community meetings, BAPOPNAS also emphasizes environmental protection by discouraging illegal mining activities to promote sustainable tourism, which supports local economic growth (León-Gómez et al., 2021).

On the other hand, the role of groups in the task and individual aspects are in the neutral category. BAPOPNAS, as the coordinator of Open Pit Nam Salu tourism management, needs to carry out several alternative tourism developments so that the existence of the geosite has a significant impact on people's lives. Tourism promotion must be intensified

so that many tourists are interested in visiting the Open Pit Nam Salu. According to Hatipoglu et al. (2016), lack of tourism promotion, inappropriate use of tourism development permits, and coordination issues are obstacles to sustainable tourism development. Digital marketing, such as social media, significantly affects tourism development (Kuzior et al., 2021).

The Open Pit Nam Salu tourism development process takes a long time. Along the way, CBT management needs to be reorganized. Community involvement in managing tourist areas and welcoming tourists can be rotated between villages in the Kelapa Kampit District. It is intended for all communities to feel involved in managing Open Pit Nam Salu tourism. Joint business groups (KUB) to facilitate the needs of tourists, such as meal packages and souvenirs, can also be formed, so that involvement is not only on behalf of each individual. In addition, the community can also be involved in providing homestays for tourist lodging. The provision of homestays can involve many families in rural areas. KC (2021) also said that a homestay is a form of CBT initiative that involves tourists in their host families to gain experience of the social culture and local natural resources.

The Effect of Group Roles on Tourism Sustainability (H1, H4, H6)
Results show that group roles ($\beta = 0.306$, $p < 0.01$) have the strongest effect on tourism sustainability. This supports prior studies emphasizing the role of local organizations in CBT (Indrayanti et al., 2020). Practically, this means BAPOPNAS should strengthen its task roles to maximize impact.

BAPOPNAS is a community group that recognized the tourism potential of a former mining site initially seen by locals as unusable land. The group independently initiated tourism management efforts until the site became part of the UNESCO Global Geopark network. Because membership in BAPOPNAS is voluntary, members are highly motivated to promote tourism development. The community plays a crucial role as an active participant, with their involvement seen as a key driver in strengthening tourism growth (Indrayanti et al., 2020). This active participation motivates BAPOPNAS to sustain the area's tourism in the long term.

Open Pit Nam Salu Geosite is a tourist attraction that is distinctive from other geosites in Belitung. The tourist attractions offered are former mining areas full of history, and the types of rocks make tourists visit for vacation and learning. It forms the segmentation of tourists visiting Open Pit Nam Salu. On the other hand, the condition of the area, which is a former mining area, is a separate consideration for developing more common attractions that many people can enjoy for safety reasons. Every tourism development that is carried out needs to consider the safety of tourists. On the other hand, not everyone can understand the proper management of geosite tourism. BAPOPNAS understands and wants to learn about tourism management and development suitable for the geosite.

Table 7 shows that the group, in this case BAPOPNAS, plays a role in the development of Open Pit Nam Salu tourism directly or indirectly. While its direct effect is strong (H1), the proposed indirect effect through community motivation (H4) was not significant. This indicates that although BAPOPNAS contributes to sustainability, its influence does not yet operate by significantly motivating the wider community. One explanation is that BAPOPNAS membership remains limited and is still dominated by youth, so its activities have not yet generated broad motivational spillovers. This finding differs from Strzelecka et al. (2017), who argue that empowerment and motivation often mediate organizational impact on sustainability. For Nam Salu, the implication is that BAPOPNAS must expand

its inclusivity, involve more households, and design activities that directly engage residents if it wishes to strengthen this motivational pathway.

In contrast, the indirect pathway through natural capital (H6) was weakly significant ($\beta = 0.098$, $p < 0.10$). This suggests that BAPOPNAS contributes to sustainability by managing and promoting natural capital in ways that indirectly motivate community participation. For instance, repackaging natural capital into attractive programs, events, or educational activities can transform resources into motivational drivers. Based on Table 7, it is known that packaging tourism more inclusively has the potential to increase community motivation to participate in the management of Open Pit Nam Salu tourism. Comparative studies of similar tourist attractions can also be carried out to add ideas to the development of tourism. Furthermore, promotion through mass media is one of the efforts that can be made to attract tourists. A learning program in the Open Pit Nam Salu Geosite area is one example of how cooperation with the government might boost Open Pit Nam Salu tourism. Massive tourism advertising is necessary to increase visitor numbers. Aprilani et al. (2021) claim that social media marketing can engage the community and improve tourism's reputation.

BAPOPNAS uses SATAM to teach Senyubuk Village kids to be mindful of the geosite's natural potential. One initiative anticipated to continue the sustainability of tourism in the future is the call to protect the environment, refrain from illicit mining, and refrain from damaging the geosite's rocks. BAPOPNAS is the organization in charge of promoting Open Pit Nam Salu tourism. The role of people who care and want to participate in tourism management efforts is important. It is because it is challenging to change everyone, but focus on those who care first and become role models for the wider community. The public's view of Open Pit Nam Salu tourism affects the implementation of CBT. The increasing sense of public pride in their potential can affect the sustainability of tourism (Amin et al., 2023).

The Importance of Community Participation (H2)

Table 7 shows that the group role carried out by BAPOPNAS has the highest effect on the sustainability of Open Pit Nam Salu tourism. The current membership of BAPOPNAS is limited, and the majority are still in the category of school children, making community involvement in the management of Open Pit Nam Salu necessary. When tourism management is only carried out by BAPOPNAS, which relies on a few people, it will impact future tourism managers' regeneration. Therefore, community participation in managing the Open Pit Nam Salu tourism is essential. CBT is tourism management that focuses on community involvement in every aspect. CBT ensures the community receives direct benefits from the tourism industry (Strydom et al., 2019).

Community involvement in tourism management will aid tourism development and help the community feel like it belongs. As the community participates in tourism management, BAPOPNAS will no longer be involved in technical issues. BAPOPNAS can concentrate on the Open Pit Nam Salu development master plan. At the same time, the community manages technical issues, such as tour guides, organizing parking areas, ticketing, etc. On the other hand, involving the community in Open Pit Nam Salu tourism management activities takes work. The unstable condition of Open Pit Nam Salu tourism in terms of tourist visits has made the community less involved in tourism management. Evidence that involvement in tourism management will encourage the improvement of community welfare is something that the community needs. Economic success in sustainable tourism involving the community has been found to depend on excellent communication (Pulido-Fernández et al., 2015). Furthermore, community engagement is a means of promoting the growth of sustainable tourism (Wondirad & Ewnetu, 2019). Key stakeholders must guarantee coordination for implementing policies and programs,

and local communities must be included in the development process (Hanafi et al., 2025).

The Role of Natural Capital and Community Motivation (H3, H5)
Natural capital indirectly influences sustainability through community motivation ($\beta = 0.141$, $p < 0.10$). Although this effect is weaker compared to the role of groups, the pathway demonstrates that community motivation becomes stronger when natural resources are perceived as valuable, accessible, and well-managed. As emphasized by Sgroi (2020), natural capital provides the foundation for long-term tourism resilience, while Strzelecka et al. (2017) argue that empowerment functions as the bridge between resource availability and continuous community involvement.

Interestingly, the direct effect of natural capital on sustainability (H3) was not supported in this study. Despite the high geological and historical value of the Nam Salu site, natural capital on its own does not significantly influence sustainability outcomes (Table 7). This finding diverges from prior work, such as Sgroi (2020), who positions natural capital as a cornerstone of sustainability. The lack of direct significance may be attributed to limited accessibility, safety issues, and weak infrastructure, which prevent the community and tourists from fully enjoying and benefiting from the site. Thus, natural capital remains an untapped resource unless it is actively managed and transformed into experiences that engage and motivate stakeholders.

Several practical strategies can be employed to transform natural capital into a driver of motivation. Developing geotrails, organizing storytelling sessions, and hosting heritage-based events are examples of initiatives that can simultaneously attract visitors and inspire community pride. BAPOPNAS, in collaboration with the village government, could also introduce supportive infrastructure such as eco-friendly transportation options—for example, electric cars to transport tourists to historical mining sites. Alongside these infrastructural developments, interactive programs such as youth-led geological mini-trainings or heritage-based storytelling activities would allow younger generations to directly engage with and promote the site's unique value. Furthermore, integrating households into the tourism economy through homestay services and culinary initiatives would not only improve hospitality standards but also generate direct economic incentives. In this way, natural capital serves not only as a physical attraction but also as a catalyst that motivates communities to take part in sustaining tourism.

Women, in particular, could contribute by offering traditional culinary experiences within homestays, which would provide cultural enrichment for visitors while generating additional income for families. Currently, the quantity of available homestays is still limited, and the quality requires improvement. To address this, households in Senyubuk Village need structured training in hospitality so they can provide comfortable accommodations for tourists who wish to experience a slower lifestyle in the former mining settlement. Such efforts will gradually shift community mindsets, reinforcing the idea that Open Pit Nam Salu is not only a relic of mining history but also a living space for cultural exchange and sustainable livelihoods. According to Strzelecka et al. (2017), empowerment—particularly through increased motivation—is a vital driver of sustainable tourism development. In this study, community motivation is shown to directly and positively affect tourism sustainability, as reflected in Table 7. This suggests that enhancing motivation through natural capital management can build enthusiasm and improve the community's overall capacity to engage in tourism management.

At the organizational level, BAPOPNAS plays a significant role in linking natural capital to sustainable tourism. Table 7 further indicates that the group's role influences sustainability through the dual channels of natural capital and community motivation, with

an effect size of 0.098. This finding highlights the potential of BAPOPNAS to raise community motivation by managing the natural capital of Open Pit Nam Salu as a tourism asset. The group possesses both technical and theoretical knowledge about the former mining area, which can be harnessed to transform it into an attractive and educational destination. As Sgroi (2020) argues, the relationship between natural resources and sustainable tourism is essential for fostering resilience and long-term viability. By managing natural capital effectively, BAPOPNAS can increase community motivation and, consequently, participation in tourism management. Over time, such motivation will directly influence the geosite's sustainability, ensuring its transformation into a prospective and profitable tourism site. Mamirkulova et al. (2020) also emphasize that communities are central to creating innovative tourism development strategies and play a crucial role in shaping sustainable tourism policies and infrastructure. Thus, the synergy between natural capital, community motivation, and group leadership represents a strategic pathway for sustaining the future of Open Pit Nam Salu tourism.

CONCLUSION

This study aimed to analyze the sustainability of the Open Pit Nam Salu Geosite through a CBT framework, using a context-specific SEM-PLS pathway model. The objective was to quantify both the direct and indirect effects of group roles on the sustainability of Open Pit Nam Salu tourism, with community motivation and natural capital examined as mediating variables.

The results provide several important insights. First, the role of groups, represented by BAPOPNAS, was found to have the strongest direct effect on sustainability (H1). This underscores the importance of local organizations in coordinating tourism development, although increasing the breadth of influence remains necessary because community participation outside BAPOPNAS is still limited. Second, community motivation also showed a significant direct influence on sustainability (H2), highlighting the critical role of local enthusiasm and empowerment in sustaining tourism. Third, the direct effect of natural capital on sustainability (H3) was not supported, suggesting that despite its geological and historical value, natural capital cannot by itself ensure sustainability without proper management, accessibility, and community engagement.

Fourth, the hypothesized indirect pathway in which group roles affect sustainability through community motivation (H4) was also not supported. This indicates that BAPOPNAS's influence has not yet translated into a strong motivational effect on the wider community, likely due to its limited and youth-dominated membership. Fifth, natural capital was shown to have an indirect effect on sustainability through community motivation (H5), albeit weak, suggesting that motivation increases when natural capital is actively transformed into accessible and educational experiences. Sixth, group roles indirectly influenced sustainability through natural capital and community motivation (H6), which is also weak but significant, indicating that BAPOPNAS contributes by managing natural capital in ways that gradually encourage community participation.

Taken together, these findings demonstrate that while CBT principles are being implemented, they are not yet optimal. Tourism development at Open Pit Nam Salu still requires stronger task roles from BAPOPNAS, broader participation of households and communities, and better utilization of natural capital as a motivational driver. Practical strategies include rotating community involvement in management tasks, strengthening homestay and culinary services, organizing heritage-based events, and expanding collaborations with stakeholders to diversify attractions and improve safety.

Ultimately, sustainability at Open Pit Nam Salu depends on integrating organizational leadership, community participation, and natural capital management. If these three elements are strengthened in synergy, the site can evolve beyond being a former mining pit into an edu-geosite rich in biodiversity, geological value, and cultural heritage. Such a transformation would not only motivate citizens to contribute but also generate economic benefits and position Open Pit Nam Salu as a model of sustainable post-mining tourism in East Belitung Regency.

ACKNOWLEDGMENT
Thank you to the Graduate School of UGM for providing research grants to the researchers and the Universitas Bangka Belitung for the well-executed research collaboration. Thank you to the Senyubuk Village Government, BAPOPNAS, Senyubuk Village Tourism Awareness Group, and Mining Village Nature School (SATAM) for their assistance and support in research data collection activities. Thank you to all those who have participated in supporting the smooth running of this research.

DECLARATION OF CONFLICTING INTERESTS
The authors have declared no potential conflicts of interest.

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