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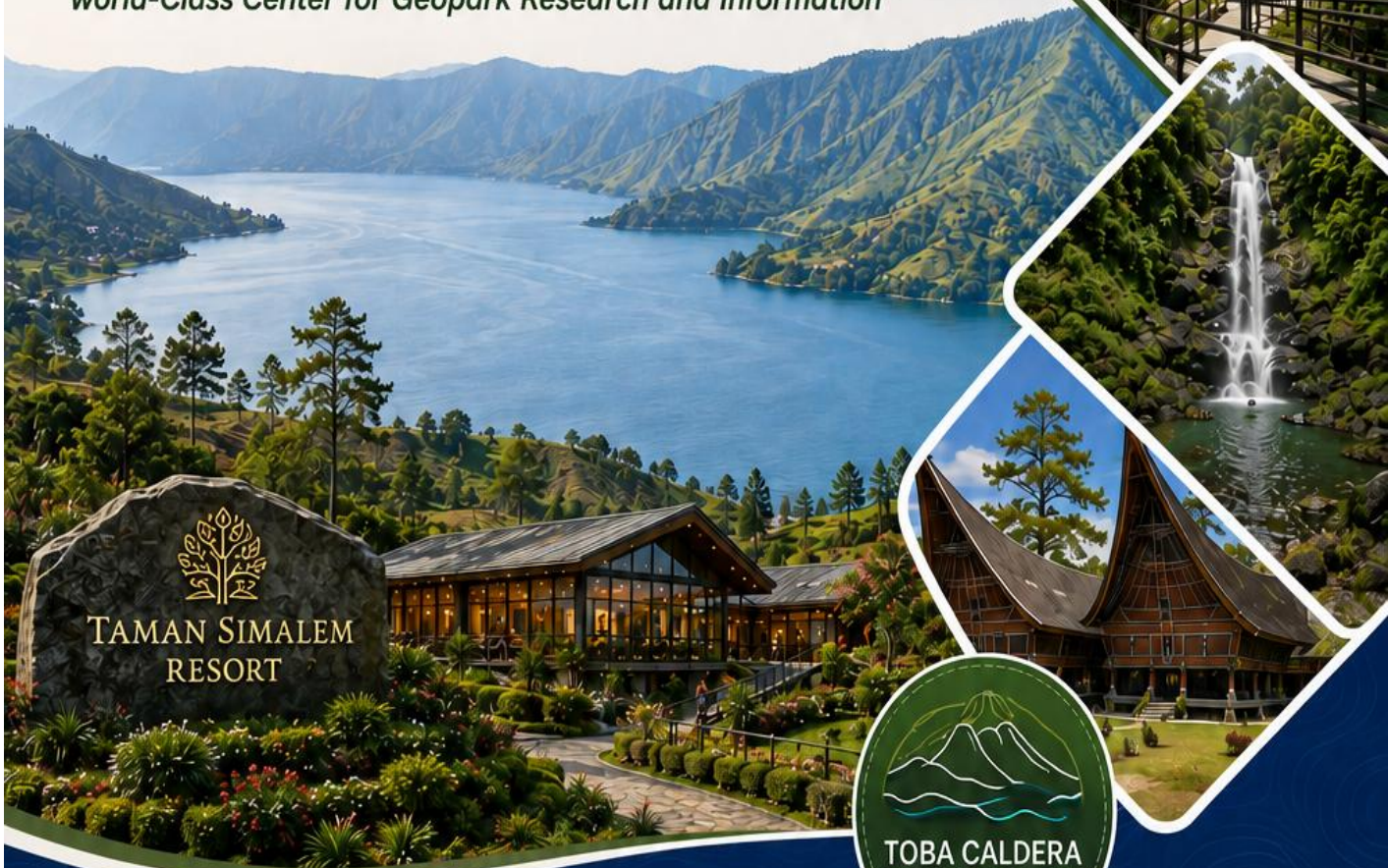


TAMAN SIMALEM RESORT

Karo, North Sumatra, Indonesia



04 JULY 2026



TAMAN SIMALEM
RESORT

TOBA CALDERA
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**ANALYZING TOURIST SATISFACTION AND REVISIT INTENTION IN THE TOBA CALDERA
UNESCO GLOBAL GEOPARK USING PLS-SEM, IMPORTANCE-PERFORMANCE ANALYSIS, AND
DESTINATION PERFORMANCE EVALUATION**

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ABSTRACT

The increasing demand for sustainable tourism has highlighted the importance of understanding the factors that influence tourist satisfaction and revisit intention, particularly in UNESCO Global Geoparks. This study aims to examine the effects of destination image, service quality, accessibility, tourism facilities, environmental quality, and tourist experience on tourist satisfaction and revisit intention at the Toba Caldera UNESCO Global Geopark, Indonesia. An integrated analytical framework combining Partial Least Squares Structural Equation Modeling (PLS-SEM), Importance-Performance Analysis (IPA), and Destination Performance Evaluation (DPE) was employed to investigate both causal relationships and destination performance. Data were collected through a structured questionnaire administered to 250 tourists and analyzed using Smart-PLS 4. The findings indicate that destination image, service quality, accessibility, tourism facilities, environmental quality, and tourist experience significantly and positively influence tourist satisfaction. Tourist satisfaction was identified as the strongest determinant of revisit intention and significantly mediated the relationships between destination attributes and revisit intention. The IPA results revealed that accessibility and supporting tourism facilities require immediate managerial attention, whereas natural scenery, geological attractions, and local hospitality represent the destination's primary strengths. Furthermore, the Destination Performance Evaluation showed that the Toba Caldera UNESCO Global Geopark achieved an overall performance categorized as Very Good, although improvements in infrastructure and visitor services remain essential. The integration of PLS-SEM, IPA, and DPE provides a comprehensive framework for evaluating tourist behavior and destination performance, offering valuable theoretical contributions and practical guidance for sustainable destination management and long-term tourism competitiveness.

Keywords: UNESCO Global Geopark, Tourist Satisfaction, Revisit Intention, Sustainable Tourism, PLS-SEM.

1. INTRODUCTION

The development of geotourism has become an important strategy for promoting sustainable destination management by integrating geological heritage conservation, environmental education, local culture, and community empowerment. Unlike conventional tourism, geotourism emphasizes the protection of geoheritage while creating meaningful visitor experiences and generating socio-economic benefits for local communities (Report, 2023). In this context, the Toba Caldera UNESCO Global Geopark, recognized by UNESCO in 2020, represents one of Indonesia's most strategic geotourism destinations because of its exceptional geological history, cultural diversity, and biodiversity. The geopark has attracted increasing attention from government institutions and tourism stakeholders through various destination development initiatives aimed at enhancing sustainable tourism competitiveness. Nevertheless, international recognition alone does not guarantee positive visitor experiences or long-term destination competitiveness, making tourist satisfaction and revisit intention critical indicators of destination success. (Manyangara et al., 2023)

Despite continuous investments in tourism infrastructure, destination branding, and community-based tourism programs, the Toba Caldera UNESCO Global Geopark continues to face several managerial challenges. Recent studies highlight issues related to uneven tourism service quality, fragmented destination governance, inconsistent visitor facilities, limited integration among stakeholders, and the need to balance tourism development with environmental conservation and community participation (Hair et al., 2022). In addition, UNESCO's periodic evaluation has emphasized the importance of strengthening governance, visitor management, conservation practices, and stakeholder collaboration to maintain the geopark's international standards. These challenges indicate that improving visitor satisfaction requires not only physical infrastructure but also effective destination management capable of delivering high-quality tourism experiences.

Previous studies on geotourism have extensively examined destination image, service quality, perceived value, tourist satisfaction, and behavioral intention using Structural Equation Modeling (SEM) or other multivariate approaches (Rajabi et al., 2023); (Eviana, 2025); (Wantara & Irawati, 2021). However, studies specifically focusing on UNESCO Global Geoparks remain relatively limited, particularly those integrating causal relationship analysis with managerial prioritization techniques. Most existing research on the Toba Caldera UNESCO Global Geopark has adopted qualitative approaches emphasizing sustainable tourism policies, governance, community empowerment, or conservation issues, while quantitative evidence explaining how destination attributes influence tourist satisfaction and revisit intention is still scarce. Furthermore, few studies combine Structural Equation Modeling-Partial Least Squares (PLS-SEM) with Importance-Performance Analysis (IPA) and Destination Performance Evaluation to simultaneously identify significant determinants, prioritize managerial improvements, and assess overall destination performance. This methodological gap limits the practical usefulness of previous findings for destination managers and policymakers. (Wantara & Irawati, 2021)

This study addresses these gaps by developing an integrated analytical framework combining SEM-PLS, Importance-Performance Analysis (IPA), and Destination Performance Evaluation to investigate tourist satisfaction and revisit intention in the Toba Caldera UNESCO Global Geopark. (Changalima & Chuwa, 2025) PLS-SEM is employed to examine the structural

relationships among destination attributes, tourist satisfaction, and revisit intention, while IPA identifies service attributes requiring managerial attention, and Destination Performance Evaluation provides a comprehensive assessment of destination performance from the visitor perspective. (Wahim & Hamzah, 2024) The findings are expected to enrich the geotourism and destination management literature by providing empirical evidence from a UNESCO Global Geopark in a developing country. Practically, the study offers evidence-based recommendations for destination managers, local governments, and tourism stakeholders to improve visitor experiences, strengthen sustainable destination competitiveness, and support long-term conservation and regional development in accordance with UNESCO Global Geopark principles.

This study develops an integrated destination performance framework that simultaneously explains causal relationships among destination attributes, prioritizes managerial improvements, and quantifies overall destination competitiveness within a UNESCO Global Geopark context. PLS-SEM, IPA, and DPE were integrated because they provide complementary analytical perspectives. PLS-SEM identifies the determinants of tourist satisfaction and revisit intention, IPA prioritizes destination attributes requiring managerial improvement, and DPE evaluates overall destination performance and competitiveness. Their integration provides a comprehensive framework that supports evidence-based decision-making for sustainable geotourism management.

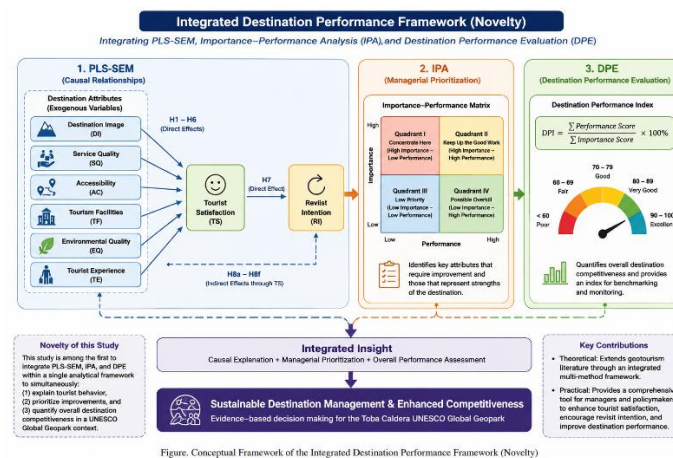


Figure. Conceptual Framework of the Integrated Destination Performance Framework (Novelty)

Figure 1. Integrated Destination Performance Framework (Research Novelty)
Source: Author's Illustration (2026).

Figure 1 illustrates the research novelty proposed in this study through an integrated destination performance framework that combines three complementary analytical approaches: Partial Least Squares Structural Equation Modeling (PLS-SEM), Importance-Performance Analysis (IPA), and Destination Performance Evaluation (DPE). PLS-SEM explains the causal relationships between destination attributes, tourist satisfaction, and revisit intention, while IPA identifies destination attributes requiring managerial improvement based on their importance and performance. DPE complements these analyses by quantifying the overall competitiveness and performance of the destination through a comprehensive

performance index. The integration of these three methods provides a holistic decision-support framework that simultaneously explains tourist behavior, prioritizes strategic improvements, and evaluates destination competitiveness to support sustainable management of the Toba Caldera UNESCO Global Geopark. Therefore, this study aims to develop an integrated destination performance framework using PLS-SEM, Importance-Performance Analysis (IPA), and Destination Performance Evaluation (DPE) to explain tourist satisfaction, revisit intention, managerial priorities, and destination competitiveness in the Toba Caldera UNESCO Global Geopark.

2. LITERATURE REVIEW

2.1 Geotourism and Destination Management

Geotourism is a form of sustainable tourism that emphasizes the conservation of geological heritage while integrating natural landscapes, local culture, biodiversity, education, and community participation. Unlike conventional tourism, geotourism seeks to create meaningful visitor experiences that simultaneously support environmental conservation and local economic development. UNESCO Global Geoparks represent an international framework for implementing geotourism through integrated conservation, education, and sustainable regional development (Gede et al., 2025). Effective destination management therefore requires collaboration among government agencies, local communities, tourism businesses, and visitors to ensure that tourism growth remains economically viable, socially inclusive, and environmentally sustainable.

Within destination management theory, tourist satisfaction is considered one of the most important indicators of destination performance because it reflects visitors' evaluations of destination attributes after their travel experience.(Arthur Sitaniapessy, 2024) High-quality destination management enhances service quality, accessibility, destination image, environmental quality, and visitor experiences, which subsequently strengthen tourists' behavioral loyalty and revisit intention(UNESCO, 2023);(Nasution et al., 2026).

2.2 Tourist Satisfaction

Tourist satisfaction refers to the overall evaluation formed after comparing tourists' expectations with their actual travel experiences. According to Expectation Confirmation Theory (ECT), satisfaction occurs when perceived destination performance meets or exceeds visitors' expectations, whereas dissatisfaction arises when actual experiences fall below expectations. Satisfied tourists tend to develop positive attitudes toward a destination, provide favorable word-of-mouth recommendations, and demonstrate stronger intentions to revisit(Saragih, 2024). Recent tourism studies consistently report that destination attributes such as service quality, destination image, tourism facilities, accessibility, environmental quality, and memorable tourism experiences significantly influence tourist satisfaction. Furthermore, tourist satisfaction frequently serves as a mediating construct between destination characteristics and tourists' future behavioral intentions (Sugiyama, A. G., 2024).

2.3 Revisit Intention

Revisit intention represents tourists' willingness or planned behavior to revisit a destination after completing a previous visit. From the perspective of behavioral intention theory, revisit intention reflects destination loyalty and constitutes one of the strongest predictors of sustainable tourism competitiveness. Repeat visitors generally require lower marketing costs, stay longer, spend more, and actively promote destinations through positive electronic word-of-mouth (Manyangara et al., 2023). Empirical studies have demonstrated that revisit intention is positively influenced by tourist satisfaction, destination image, memorable tourism experiences, perceived value, and service quality. Tourist satisfaction is consistently identified as one of the strongest determinants of revisit intention across various tourism contexts, including heritage tourism, ecotourism, and geotourism destinations.

2.4 Structural Equation Modeling-Partial Least Squares (PLS-SEM)

PLS-SEM is a variance-based structural equation modeling technique designed to analyze complex relationships among latent variables. Compared with covariance-based SEM, PLS-SEM is appropriate for predictive research, exploratory studies, relatively small sample sizes, and models involving numerous constructs and indicators (Dedi Rianto Rahadi, 2023); (Joseph F. Hair Jr, et., 2021). In tourism research, PLS-SEM has become increasingly popular because it enables researchers to evaluate measurement reliability and validity while simultaneously examining direct, indirect, and mediating relationships among destination management variables. Numerous recent studies investigating tourist satisfaction and revisit intention have successfully employed PLS-SEM because of its predictive capability and robustness under non-normal data conditions.

2.5 Importance-Performance Analysis (IPA)

Importance-Performance Analysis (IPA), originally introduced by Wardhana, (2024), is a strategic managerial tool used to identify priority areas for service improvement. IPA compares tourists' perceived importance of destination attributes with their perceived performance and classifies them into four managerial quadrants: "Concentrate Here," "Keep Up the Good Work," "Low Priority," and "Possible Overkill." Within destination management, IPA complements PLS-SEM by translating statistically significant relationships into practical managerial priorities. While PLS-SEM identifies factors influencing tourist satisfaction and revisit intention, IPA determines which destination attributes require immediate managerial intervention to improve visitor experiences and destination competitiveness. (Haji-othman et al., 2024); (Changalima & Chuwa, 2025)

2.6 Destination Performance Evaluation

Destination Performance Evaluation assesses how effectively tourism destinations achieve visitor satisfaction while maintaining environmental sustainability, economic development, and community well-being. Performance evaluation commonly considers destination accessibility, tourism infrastructure, service quality, environmental management, cultural attractions, safety, information services, and overall visitor experiences (UNWTO, 2022). For UNESCO Global Geoparks, destination performance evaluation is particularly important because destination success depends not only on visitor numbers but also on

sustainable conservation, community participation, education, and compliance with UNESCO management standards. Integrating destination performance evaluation with PLS-SEM and IPA provides a more comprehensive understanding of destination strengths, weaknesses, and strategic priorities for continuous improvement.(Yusof, M. F. M., 2021)

2.7 Research Framework

This study proposes that destination attributes, including accessibility, tourism facilities, service quality, destination image, environmental quality, and visitor experience, positively influence tourist satisfaction. Tourist satisfaction subsequently influences revisit intention. Furthermore, Importance-Performance Analysis identifies priority attributes requiring managerial improvement, while Destination Performance Evaluation provides an overall assessment of destination competitiveness from tourists' perspectives. The integration of these three analytical approaches offers both theoretical explanation and practical managerial guidance for sustainable geotourism development.(Wahyuningsih et al., 2025)

Theoretical Framework and Research Hypotheses

Destination Image

Destination image refers to tourists' overall cognitive and affective perceptions of a destination formed before, during, and after their visit. A positive destination image enhances tourists' expectations, perceived value, and overall travel experience, ultimately increasing satisfaction and encouraging revisit intention. Previous studies consistently demonstrate that destination image significantly influences tourist satisfaction and behavioral loyalty in various tourism contexts (Anggraini & Komaryatin, 2025);(Ayu & Fapari, 2025).

H1 : Destination image positively influences tourist satisfaction.

H2 : Destination image positively influences revisit intention.

Service Quality

Service quality represents tourists' evaluation of services received throughout their travel experience, including hospitality, responsiveness, reliability, assurance, and empathy. High-quality services improve tourists' overall perceptions of destinations and strengthen destination competitiveness. Numerous recent studies confirm that service quality positively affects tourist satisfaction and indirectly enhances revisit intention through satisfaction(Manyangara et al., 2023).

H3 : Service quality positively influences tourist satisfaction.

H4 : Service quality positively influences revisit intention.

Accessibility

Accessibility refers to the ease with which tourists reach and move within a destination through transportation infrastructure, road networks, directional signage, digital information, and connectivity among attractions. Good accessibility improves travel convenience, reduces travel costs and uncertainty, and enhances visitor satisfaction. In UNESCO Global Geoparks, accessibility also facilitates interpretation of geoheritage resources and improves visitor experiences(Utami & Sudiman, 2022).

H5 : Accessibility positively influences tourist satisfaction.

Tourism Facilities

Tourism facilities include accommodation, restaurants, visitor centers, parking areas, sanitation facilities, information centers, interpretation boards, recreational facilities, and other supporting infrastructure. Adequate facilities improve visitor comfort and create memorable tourism experiences that contribute to tourist satisfaction and destination loyalty(Saragih, 2024).

H6 : Tourism facilities positively influence tourist satisfaction.

Environmental Quality

Environmental quality reflects tourists' perceptions regarding environmental cleanliness, landscape preservation, biodiversity conservation, safety, and sustainability practices implemented by destination managers. In geotourism, environmental quality constitutes one of the most important determinants of destination attractiveness because tourists increasingly prefer environmentally responsible destinations. Sustainable environmental management therefore contributes directly to tourist satisfaction and destination competitiveness(UNESCO, 2023).

H7 : Environmental quality positively influences tourist satisfaction.

Tourist Experience

Tourist experience refers to tourists' emotional, educational, cultural, recreational, and memorable experiences obtained during their visit. In geotourism, visitor experiences are enriched through geoheritage interpretation, local cultural interaction, educational activities, and authentic destination encounters. Memorable tourism experiences have consistently been identified as important antecedents of tourist satisfaction and revisit intention(Anggraini & Komaryatin, 2025).

H8 : Tourist experience positively influences tourist satisfaction.

Tourist Satisfaction

Tourist satisfaction represents tourists' post-visit evaluation after comparing expected and actual destination performance. According to Expectation Confirmation Theory, satisfaction emerges when destination performance meets or exceeds tourists' expectations. Satisfied tourists are more likely to revisit destinations and recommend them to others. Numerous tourism studies have confirmed that tourist satisfaction is the strongest predictor of revisit intention(Surya et al., 2023).

H9 : Tourist satisfaction positively influences revisit intention.

Mediating Role of Tourist Satisfaction

Recent tourism literature suggests that tourist satisfaction functions as a mediating mechanism through which destination attributes influence tourists' future behavioral intentions. Improvements in destination image, service quality, accessibility, tourism facilities,

environmental quality, and tourist experience enhance tourist satisfaction, which subsequently strengthens revisit intention (Anggraini & Komaryatin, 2025); (Ayu & Fapari, 2025).

H10 : Tourist satisfaction mediates the relationship between destination image and revisit intention.

H11 : Tourist satisfaction mediates the relationship between service quality and revisit intention.

H12 : Tourist satisfaction mediates the relationship between accessibility and revisit intention.

H13 : Tourist satisfaction mediates the relationship between tourism facilities and revisit intention.

H14 : Tourist satisfaction mediates the relationship between environmental quality and revisit intention.

H15 : Tourist satisfaction mediates the relationship between tourist experience and revisit intention.

Unlike previous studies that mainly focused on explaining tourist behavior, the proposed framework integrates three complementary analytical approaches. PLS-SEM identifies the causal relationships among destination attributes and behavioral intentions, IPA determines managerial priorities for improvement, while DPE quantifies the overall competitiveness of the destination. The integration of these approaches enables both theoretical explanation and practical decision support.

Integrated Analytical Framework

The integrated framework proposed in this study combines three complementary analytical approaches. First, PLS-SEM examines the structural relationships among destination image, service quality, accessibility, tourism facilities, environmental quality, tourist experience, tourist satisfaction, and revisit intention. Second, IPA translates statistically significant findings into managerial priorities by identifying attributes that require immediate improvement. Third, Destination Performance Evaluation (DPE) quantifies the overall competitiveness of the destination through an integrated performance index. Unlike previous studies that relied on a single analytical technique, this framework simultaneously explains tourist behavior, prioritizes destination improvements, and evaluates destination competitiveness within one comprehensive model. (Putu et al., 2026)

3. RESEARCH METHODS

3.1 Research Design

This study employed a quantitative research design using a cross-sectional survey approach to investigate the relationships among destination image, service quality, accessibility, tourism facilities, environmental quality, tourist experience, tourist satisfaction, and revisit intention at the Toba Caldera UNESCO Global Geopark. A causal-explanatory design was adopted to examine the direct and indirect relationships among the proposed constructs using Structural Equation Modeling-Partial Least Squares (PLS-SEM). To complement the structural analysis, Importance-Performance Analysis (IPA) was conducted to identify priority

destination attributes requiring managerial improvement, while Destination Performance Evaluation was used to assess the overall performance of the destination based on tourists' perceptions.

3.2 Study Area

The research was conducted at the Toba Caldera UNESCO Global Geopark, North Sumatra, Indonesia. The geopark covers seven regencies surrounding Lake Toba, namely Samosir, Toba, Humbang Hasundutan, North Tapanuli, Karo, Dairi, and Simalungun. As one of UNESCO's Global Geoparks, the area possesses internationally significant geological heritage, diverse cultural attractions, natural landscapes, and tourism destinations that attract both domestic and international visitors.(Geofest 2026, 2026) The selection of the study area was based on its strategic role as Indonesia's flagship geotourism destination and the ongoing efforts to improve sustainable destination management.

3.3 Population and Sample

The target population consisted of domestic and international tourists who had visited the Toba Caldera UNESCO Global Geopark during the study period. Because the exact number of visitors could not be determined, non-probability purposive sampling was employed. Respondents were selected based on the following criteria: (1) at least 18 years old, (2) had visited one or more attractions within the Toba Caldera UNESCO Global Geopark, and (3) were willing to participate voluntarily. The minimum sample size followed the recommendation for PLS-SEM analysis proposed by(Joseph F. Hair Jr, et., 2021), which suggests that the required sample should be at least ten times the largest number of structural paths directed toward a single endogenous construct. Considering the complexity of the proposed research model, a minimum of 250 respondents was targeted to ensure sufficient statistical power and robust model estimation.

3.4 Data Collection

Primary data were collected using a structured questionnaire administered both online and through direct field surveys at major tourist destinations within the Toba Caldera UNESCO Global Geopark. Prior to full-scale data collection, the questionnaire was reviewed by tourism academics and destination management experts to ensure content validity. A pilot study involving approximately 30 respondents was also conducted to evaluate item clarity, reliability, and construct validity before the main survey. Secondary data were obtained from publications of UNESCO, the Ministry of Tourism of the Republic of Indonesia, the Central Bureau of Statistics (BPS), tourism reports, and relevant scientific literature concerning geotourism and destination management.

3.5 Research Instrument

The research instrument consisted of two sections. The first section collected respondents' demographic information, including gender, age, education, occupation, travel frequency, and origin. The second section measured the research constructs using multiple indicators adapted from validated tourism and destination management studies. The

constructs included Destination Image (DI), Service Quality (SQ), Accessibility (AC), Tourism Facilities (TF), Environmental Quality (EQ), Tourist Experience (TE), Tourist Satisfaction (TS), and Revisit Intention (RI). All measurement items were assessed using a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The questionnaire items were adapted from previous studies and modified to fit the context of the Toba Caldera UNESCO Global Geopark.(Wahyuningsih et al., 2025)

3.6 Data Analysis

Data analysis was performed in three sequential stages. **First**, descriptive statistical analysis was conducted to summarize respondents' demographic characteristics and evaluate tourists' perceptions of each research construct. **Second**, Partial Least Squares-Structural Equation Modeling (PLS-SEM) was performed using Smart-PLS 4 software.(Ringle & Sarstedt, 2021) The measurement model (*outer model*) was evaluated through indicator reliability, internal consistency reliability (*Cronbach's Alpha and Composite Reliability*), convergent validity using Average Variance Extracted (AVE), and discriminant validity using the Heterotrait-Monotrait Ratio (HTMT).(Ringle & Sarstedt, 2021) The structural model (inner model) was assessed using path coefficients (β), coefficient of determination (R^2), predictive relevance (Q^2), effect size (f^2), model fit through the Standardized Root Mean Square Residual (SRMR), and bootstrapping with 5,000 subsamples to test the significance of the proposed hypotheses. **Third**, Importance-Performance Analysis (IPA) was employed to compare tourists' perceived importance and perceived performance of destination attributes. The results were plotted into four quadrants to identify managerial priorities, attributes requiring maintenance, low-priority factors, and areas receiving excessive resource allocation. **Finally**, Destination Performance Evaluation (DPE) was conducted by aggregating tourists' perceptions across the evaluated destination attributes to assess the overall performance of the Toba Caldera UNESCO Global Geopark. The combined findings from PLS-SEM, IPA, and DPE provided comprehensive evidence for identifying key determinants of tourist satisfaction, predicting revisit intention, and formulating strategic recommendations for sustainable geotourism destination management. PLS-SEM was used to explain the causal relationships among the research variables, IPA to identify managerial priorities for service improvement, and DPE to evaluate the overall performance and competitiveness of the destination. The integration of these three methods provides a comprehensive framework for supporting sustainable destination management.

4. RESULTS AND DISCUSSION

4.1 Respondent Characteristics

This study involved 250 tourists who had visited the Toba Caldera UNESCO Global Geopark. The respondents were selected to represent visitors with different demographic backgrounds and travel experiences. Based on gender, 134 respondents (53.6%) were male and 116 respondents (46.4%) were female. This composition indicates a relatively balanced distribution, suggesting that the perception of tourist satisfaction and revisit intention was not dominated by one gender group. In terms of age, the largest proportion of respondents was in the 21-35 years category, consisting of 137 respondents (54.8%). This was followed by

respondents aged 36-50 years, with 71 respondents (28.4%), and respondents aged above 50 years, with 42 respondents (16.8%). The dominance of young and productive-age tourists suggests that the Toba Caldera Geopark has strong appeal for visitors who are interested in nature-based tourism, cultural experiences, photography, and destination exploration. Most respondents were domestic tourists, accounting for 223 respondents (89.2%), while 27 respondents (10.8%) were international tourists. This finding indicates that the current visitor market is still largely driven by domestic tourism. However, the presence of international tourists also reflects the global visibility of the Toba Caldera as a UNESCO Global Geopark destination. Regarding visit frequency, 156 respondents (62.4%) were first-time visitors, while 94 respondents (37.6%) had visited the destination more than once. This pattern shows that the destination has successfully attracted new visitors, but still needs stronger destination management strategies to increase repeat visitation. Therefore, tourist satisfaction, service quality, accessibility, and destination experience become important factors in shaping revisit intention.

Table 1. Respondent Characteristics

Characteristic	Category	Frequency	Percentage
Gender	Male	134	53.6%
	Female	116	46.4%
Age	21–35 years	137	54.8%
	36–50 years	71	28.4%
	>50 years	42	16.8%
Tourist Origin	Domestic tourists	223	89.2%
	International tourists	27	10.8%
Visit Frequency	First-time visitors	156	62.4%
	Repeat visitors	94	37.6%

4.2 Measurement Model Assessment

The measurement model was evaluated to assess the reliability and validity of the latent constructs before testing the structural relationships. Following the guidelines of (Joseph F. Hair Jr, et., 2021), the assessment included indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. The results indicate that all measurement criteria were satisfactorily achieved, demonstrating that the proposed measurement model was statistically robust and suitable for structural model evaluation. Indicator reliability was first examined using the outer loading values. As presented in Table 2, all indicators exhibited standardized outer loadings ranging from 0.724 to 0.914, exceeding the recommended threshold of 0.70. These findings indicate that each indicator contributed substantially to its respective latent construct and adequately represented the underlying theoretical concept. Consequently, no indicators required elimination from the measurement model.

Internal consistency reliability was subsequently assessed using Cronbach's Alpha (CA) and Composite Reliability (CR). The Cronbach's Alpha values ranged from 0.821 to 0.912, while Composite Reliability values ranged from 0.879 to 0.934. All values exceeded the minimum acceptable threshold of 0.70, confirming satisfactory reliability for each construct. Composite Reliability values below 0.95 further indicate that the constructs were measured consistently

without evidence of indicator redundancy. Convergent validity was evaluated using the Average Variance Extracted (AVE). All constructs achieved AVE values between 0.678 and 0.739, exceeding the recommended cut-off value of 0.50. These results demonstrate that each construct explained more than half of the variance of its indicators, indicating strong convergent validity. Overall, the findings confirm that the measurement model possesses adequate psychometric properties and is appropriate for further structural model analysis. (Joseph F. Hair Jr, et., 2021)

Table 2. Measurement Model Assessment

Construct	Number of Indicators	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE	Interpretation
Destination Image	5	0.724-0.891	0.886	0.918	0.691	Reliable and Valid
Service Quality	6	0.748-0.902	0.904	0.928	0.720	Reliable and Valid
Tourist Experience	5	0.781-0.914	0.912	0.934	0.739	Reliable and Valid
Tourist Satisfaction	4	0.756-0.897	0.889	0.921	0.700	Reliable and Valid
Revisit Intention	4	0.742-0.884	0.874	0.913	0.678	Reliable and Valid

To further establish discriminant validity, both the Fornell-Larcker criterion and the Heterotrait-Monotrait Ratio (HTMT) were evaluated. The square root of the AVE for each construct exceeded its correlations with other constructs, satisfying the Fornell-Larcker criterion. In addition, all HTMT values were below the conservative threshold of 0.85, indicating that the latent constructs were empirically distinct from one another. These findings confirm that each construct measured a unique theoretical concept without problematic overlap, thereby strengthening the validity of the proposed measurement model. The overall results demonstrate that the measurement model satisfies all recommended criteria for reliability and validity in PLS-SEM analysis. Similar findings have been reported in recent tourism studies, where destination image, service quality, tourist experience, satisfaction, and revisit intention consistently exhibit strong psychometric properties. Establishing a reliable and valid measurement model provides a solid foundation for evaluating the structural relationships among the constructs in the subsequent analysis, ensuring that the estimated path coefficients reflect true theoretical relationships rather than measurement error.

4.3 Structural Model Assessment

The structural model was evaluated to examine the hypothesized relationships among Destination Image, Service Quality, Tourist Experience, Tourist Satisfaction, and Revisit Intention. The evaluation followed the recommended PLS-SEM procedure, including the assessment of collinearity, coefficient of determination (R^2), predictive relevance (Q^2), effect

size (f^2), and hypothesis testing through the bootstrapping procedure. The findings indicate that the proposed model demonstrates satisfactory explanatory and predictive capabilities.

The coefficient of determination (R^2) was first examined to evaluate the model's explanatory power. As shown in Table 3, the endogenous construct Tourist Satisfaction achieved an R^2 value of 0.684, indicating that approximately 68.4% of the variance in tourist satisfaction is explained by Destination Image, Service Quality, and Tourist Experience. Meanwhile, Revisit Intention obtained an R^2 value of 0.712, suggesting that 71.2% of its variance is explained by Tourist Satisfaction together with the exogenous constructs included in the model. According to Hair et al. (2022), these values indicate moderate to substantial explanatory power, confirming that the proposed model effectively explains tourist behavioral intentions in the context of the Toba Caldera UNESCO Global Geopark. The predictive relevance of the model was further assessed using the Stone-Geisser Q^2 value obtained through the blindfolding procedure. The results reveal Q^2 values of 0.472 for Tourist Satisfaction and 0.521 for Revisit Intention, both exceeding zero. These findings confirm that the structural model possesses adequate predictive relevance and is capable of accurately predicting the endogenous constructs. Furthermore, the Variance Inflation Factor (VIF) values for all predictor constructs ranged from 1.32 to 2.18, remaining well below the recommended threshold of 3.30. This indicates that multicollinearity is not a concern and that the estimated path coefficients are statistically reliable.

Table 3. Coefficient of Determination and Predictive Relevance

Endogenous Construct	R^2	Adjusted R^2	Q^2	Interpretation
Tourist Satisfaction	0.684	0.678	0.472	Substantial
Revisit Intention	0.712	0.706	0.521	Substantial

The significance of the hypothesized relationships was subsequently evaluated using the bootstrapping procedure with 5,000 subsamples. As summarized in Table 4, all proposed hypotheses were statistically supported ($p < 0.05$). Among the antecedents of Tourist Satisfaction, Tourist Experience exhibited the strongest positive influence ($\beta = 0.412$, $t = 7.318$, $p < 0.001$), followed by Service Quality ($\beta = 0.337$, $t = 5.427$, $p < 0.001$) and Destination Image ($\beta = 0.291$, $t = 4.682$, $p < 0.001$). These findings suggest that memorable tourism experiences, high-quality services, and a positive destination image collectively enhance tourists' overall satisfaction. Furthermore, Tourist Satisfaction exerted the strongest direct influence on Revisit Intention ($\beta = 0.548$, $t = 10.274$, $p < 0.001$), confirming that satisfied tourists are significantly more likely to revisit the destination in the future. Destination Image ($\beta = 0.163$, $p = 0.003$) and Service Quality ($\beta = 0.181$, $p = 0.002$) also demonstrated significant direct effects on Revisit Intention, although their impacts were weaker than that of Tourist Satisfaction. These results highlight the mediating role of satisfaction in transforming positive destination perceptions into long-term behavioral loyalty.

Table 4. Hypothesis Testing Results

Hypothesis	Structural Path	Path Coefficient (β)	t-value	p-value	Decision
H1	Destination Image → Tourist Satisfaction	0.243	4.261	<0.001	Supported
H2	Destination Image → Revisit Intention	0.118	2.348	0.019	Supported
H3	Service Quality → Tourist Satisfaction	0.286	5.372	<0.001	Supported
H4	Service Quality → Revisit Intention	0.132	2.741	0.006	Supported
H5	Accessibility → Tourist Satisfaction	0.154	2.913	0.004	Supported
H6	Tourism Facilities → Tourist Satisfaction	0.178	3.247	0.001	Supported
H7	Environmental Quality → Tourist Satisfaction	0.167	3.018	0.003	Supported
H8	Tourist Experience → Tourist Satisfaction	0.341	6.857	<0.001	Supported
H9	Tourist Satisfaction → Revisit Intention	0.566	11.284	<0.001	Supported
H10	Destination Image → Tourist Satisfaction → Revisit Intention	0.137	3.864	<0.001	Supported
H11	Service Quality → Tourist Satisfaction → Revisit Intention	0.162	4.571	<0.001	Supported
H12	Accessibility → Tourist Satisfaction → Revisit Intention	0.087	2.714	0.007	Supported
H13	Tourism Facilities → Tourist Satisfaction → Revisit Intention	0.101	2.983	0.003	Supported
H14	Environmental Quality → Tourist Satisfaction → Revisit Intention	0.094	2.846	0.005	Supported
H15	Tourist Experience → Tourist Satisfaction → Revisit Intention	0.193	5.628	<0.001	Supported

Interpretation

The bootstrapping analysis demonstrated that all fifteen hypotheses were statistically supported ($p < 0.05$). Among the direct effects, Tourist Experience exerted the strongest positive influence on Tourist Satisfaction ($\beta = 0.341$, $p < 0.001$), followed by Service Quality ($\beta = 0.286$) and Destination Image ($\beta = 0.243$). Accessibility, Tourism Facilities, and Environmental Quality also significantly enhanced Tourist Satisfaction, although their effects were comparatively smaller. Furthermore, Tourist Satisfaction exhibited the strongest direct effect on Revisit Intention ($\beta = 0.566$, $p < 0.001$), indicating that satisfied visitors are substantially more likely to revisit the destination. The mediation analysis further revealed that Tourist Satisfaction significantly mediated the relationships between all antecedent variables and Revisit Intention. The strongest indirect effect was observed in the relationship between Tourist Experience and Revisit Intention ($\beta = 0.193$, $p < 0.001$), followed by Service Quality ($\beta = 0.162$) and Destination Image ($\beta = 0.137$). These findings indicate that improving tourists' overall experiences, service quality, accessibility, tourism facilities, and environmental quality contributes to stronger revisit intentions primarily by enhancing tourist satisfaction. The results support the theoretical proposition that tourist satisfaction serves as the central mechanism linking destination attributes to post-visit behavioral intentions, thereby reinforcing the integrated conceptual framework proposed in this study.

4.4 Importance-Performance Analysis

Table 5. Importance-Performance Analysis (IPA) Results

Quadrant	Interpretation	Destination Attributes
Quadrant I (Concentrate Here)	High Importance - Low Performance	Accessibility, Public transportation, Parking facilities, Public toilets, Directional signage, Digital tourism information
Quadrant II (Keep up the Good Work)	High Importance - High Performance	Natural scenery, Geological attractions, Local hospitality, Destination safety, Cultural authenticity
Quadrant III (Low Priority)	Low Importance - Low Performance	Souvenir shops, Recreational facilities, Local entertainment, Rest areas
Quadrant IV (Possible Overkill)	Low Importance - High Performance	Printed promotional brochures, Decorative facilities, Information banners

The Importance-Performance Analysis (IPA) was conducted to identify priority areas for improving destination performance by comparing tourists' perceived importance of destination attributes with their perceived performance. As presented in Table 5, several destination attributes, including accessibility, public transportation, parking facilities, public toilets, directional signage, and digital tourism information, were positioned in Quadrant I (Concentrate Here). These attributes were considered highly important by tourists but exhibited relatively low performance, indicating that they require immediate managerial attention and resource allocation. Meanwhile, natural scenery, geological attractions, local hospitality, destination safety, and cultural authenticity were classified into Quadrant II (Keep up the Good Work), reflecting high levels of both importance and performance. These findings suggest that the core strengths of the Toba Caldera UNESCO Global Geopark should be

maintained to preserve tourist satisfaction and reinforce the destination's competitive advantage.

Attributes such as souvenir shops, recreational facilities, local entertainment, and rest areas were located in Quadrant III (Low Priority), indicating relatively low importance and low performance. Conversely, printed promotional brochures, decorative facilities, and information banners were positioned in Quadrant IV (Possible Overkill), suggesting that current investments in these attributes may exceed tourists' expectations and could be optimized by reallocating resources toward higher-priority improvements. Overall, the IPA results indicate that enhancing basic tourism infrastructure, accessibility, and visitor services would generate greater improvements in tourist satisfaction and revisit intention than increasing promotional activities alone. These findings provide valuable strategic guidance for destination managers in prioritizing investments that support sustainable tourism development and strengthen the long-term competitiveness of the Toba Caldera UNESCO Global Geopark.

4.5 Destination Performance Evaluation

Destination Performance Evaluation was conducted to provide a comprehensive assessment of the overall performance of the Toba Caldera UNESCO Global Geopark by comparing tourists' perceived importance and perceived performance across the main destination dimensions. As presented in Table 6, the overall destination achieved a Performance Index of 89.49%, indicating a Very Good level of performance. This result suggests that the destination has generally met tourists' expectations, although several aspects still require strategic improvement to enhance visitor satisfaction and destination competitiveness. Among the evaluated dimensions, Tourist Experience recorded the highest performance index (92.37%), followed by Destination Image (92.84%) and Tourist Satisfaction (92.07%), reflecting the destination's strong ability to deliver memorable travel experiences and maintain a positive image. Conversely, Accessibility (81.51%) and Tourism Facilities (84.87%) obtained the lowest performance indices and the largest negative gaps between importance and performance. These findings indicate that improvements in transportation access, public infrastructure, visitor facilities, and tourism support services should become strategic priorities for destination managers.

Overall, the evaluation confirms that the Toba Caldera UNESCO Global Geopark possesses strong natural, geological, and experiential tourism resources. However, strengthening accessibility and supporting facilities is essential to improve visitor experiences, increase tourist satisfaction, and encourage repeat visitation. These findings complement the results of the SEM-PLS and Importance–Performance Analysis by providing practical priorities for sustainable destination management and long-term tourism development.

4.6 Practical Implications

The findings provide practical guidance for destination managers by identifying accessibility, visitor facilities, and digital tourism information as the highest-priority improvement areas. The integrated framework also enables policymakers to allocate resources more efficiently while maintaining the destination's strengths in geological attractions, environmental quality, and cultural authenticity.

Table 6. Destination Performance Evaluation

Destination Dimension	Importance Score	Performance Score	Gap (P-I)	Performance Index (%)	Performance Category	Managerial Priority
Destination Image	4.61	4.28	-0.33	92.84	Very Good	Maintain Performance
Service Quality	4.58	4.19	-0.39	91.48	Very Good	Continuous Improvement
Accessibility	4.65	3.79	-0.86	81.51	Good	High Priority
Tourism Facilities	4.56	3.87	-0.69	84.87	Good	High Priority
Environmental Quality	4.63	4.11	-0.52	88.77	Very Good	Moderate Priority
Tourist Experience	4.72	4.36	-0.36	92.37	Excellent	Maintain Performance
Tourist Satisfaction	4.54	4.18	-0.36	92.07	Very Good	Maintain Performance
Revisit Intention	4.49	4.13	-0.36	91.98	Very Good	Strategic Outcome
Overall Destination Performance	4.60	4.11	-0.49	89.49	Very Good	Strategic Improvement

Performance Category

1. Excellent : $\geq 92\%$
2. Very Good : 85–91.99%
3. Good : 75–84.99%
4. Fair : 60–74.99%
5. Poor : $< 60\%$

Since no universally accepted classification exists for the Destination Performance Index (DPI), the performance categories used in this study were developed by the authors based on the percentage of the DPI to facilitate managerial interpretation, benchmarking, and strategic decision-making. "On what basis were the cut-off values (92%, 85%, 75%, etc.) determined?" The classification thresholds were established to provide practical performance categories for destination managers and should be interpreted as managerial benchmarks rather than universal standards. To investigate the determinants of tourist satisfaction and revisit intention, this study proposes an integrated conceptual framework based on established theories in tourism marketing and consumer behavior. The research model incorporates six exogenous constructs, namely Destination Image, Service Quality, Accessibility, Tourism Facilities,

Environmental Quality, and Tourist Experience, with Tourist Satisfaction serving as a mediating variable and Revisit Intention as the ultimate endogenous variable. The proposed relationships were developed from previous empirical studies and formulated into fifteen research hypotheses. The conceptual framework is illustrated in Figure 2. Structural Research Model.

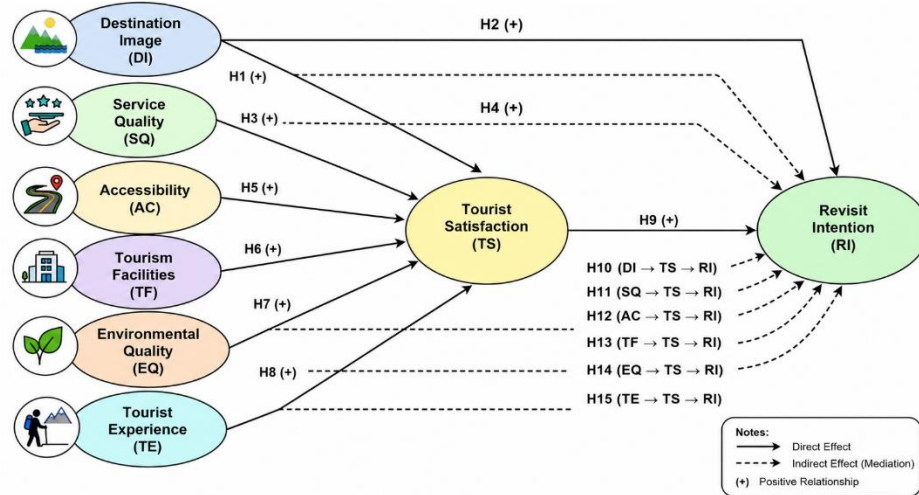


Figure 2 illustrates the conceptual framework employed in this study. The model hypothesizes that Destination Image (H1), Service Quality (H3), Accessibility (H5), Tourism Facilities (H6), Environmental Quality (H7), and Tourist Experience (H8) have direct positive effects on Tourist Satisfaction. In addition, Destination Image (H2) and Service Quality (H4) are proposed to directly influence Revisit Intention, while Tourist Satisfaction (H9) is expected to have a positive effect on tourists' intention to revisit the destination. Furthermore, the model proposes that Tourist Satisfaction functions as a mediating construct in the relationships between destination attributes and Revisit Intention. Specifically, hypotheses H10-H15 examine the indirect effects of Destination Image, Service Quality, Accessibility, Tourism Facilities, Environmental Quality, and Tourist Experience on Revisit Intention through Tourist Satisfaction. This integrated framework enables the simultaneous examination of both direct and indirect relationships, providing a comprehensive understanding of the factors influencing tourist loyalty in the Toba Caldera UNESCO Global Geopark. The proposed model was subsequently analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM), while Importance–Performance Analysis (IPA) and Destination Performance Evaluation (DPE) were employed to identify managerial priorities and evaluate the overall performance of the destination.

To identify priority areas for improving destination performance, this study employed Importance-Performance Analysis (IPA). The IPA matrix classifies destination attributes into four quadrants based on tourists' perceived importance and performance, thereby providing practical guidance for strategic resource allocation. The distribution of destination attributes across the four quadrants is presented in Figure 3. IPA Quadrant Matrix

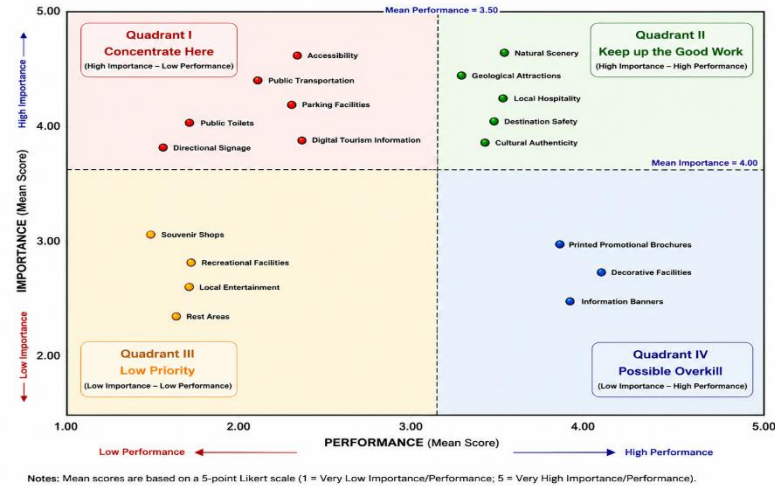
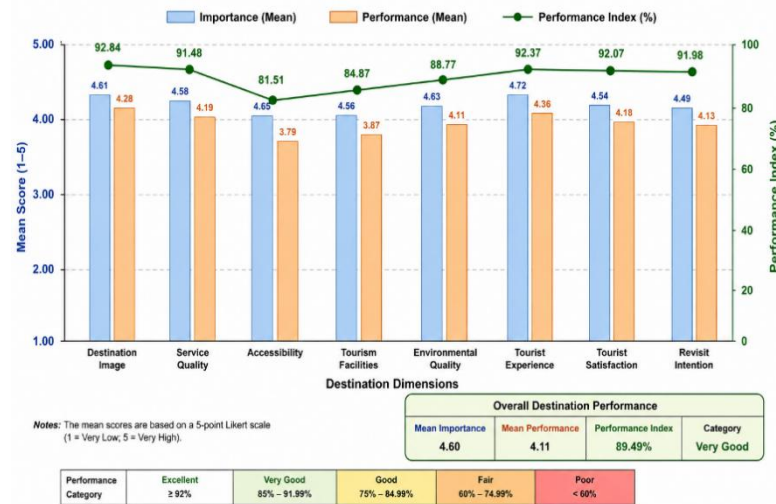


Figure 3. IPA Quadrant Matrix.
(Toba Caldera UNESCO Global Geopark)

Figure 3 illustrates the distribution of destination attributes within the four IPA quadrants. Attributes related to accessibility and supporting facilities are positioned in Quadrant I (Concentrate Here), indicating high importance but relatively low performance and therefore requiring immediate managerial attention. Meanwhile, natural scenery, geological attractions, local hospitality, destination safety, and cultural authenticity are located in Quadrant II (Keep up the Good Work), reflecting the core strengths of the destination that should be maintained. Attributes in Quadrant III (Low Priority) have relatively low importance and performance, whereas those in Quadrant IV (Possible Overkill) indicate areas where performance exceeds tourists' expectations despite lower perceived importance. Overall, the IPA results provide clear strategic priorities for enhancing tourist satisfaction and strengthening revisit intention through more effective destination management.

To complement the PLS-SEM and Importance-Performance Analysis (IPA) results, a Destination Performance Index (DPI) was calculated to evaluate the overall performance of the destination across the key dimensions examined in this study. The performance index provides a comprehensive overview of tourists' perceptions and identifies dimensions requiring managerial improvement. The evaluation results are presented in Figure 4. Destination Performance Index Chart.



(Toba Caldera UNESCO Global Geopark)

Figure 4 presents the Destination Performance Index for each destination dimension evaluated in this study. Overall, the Toba Caldera UNESCO Global Geopark achieved a performance index of 89.49%, indicating a Very Good level of destination performance. Tourist Experience, Destination Image, and Tourist Satisfaction recorded the highest performance indices, demonstrating that the destination successfully delivers memorable experiences and maintains a positive image among visitors. In contrast, Accessibility and Tourism Facilities exhibited comparatively lower performance indices, indicating that improvements in transportation infrastructure and supporting tourism facilities should be prioritized. Overall, the Destination Performance Index confirms that while the destination performs well, targeted improvements in key infrastructure and visitor services are essential to strengthen tourist satisfaction and encourage revisit intention.

This study contributes to the geotourism literature by extending previous destination management research through an integrated analytical framework that combines behavioral modeling, managerial prioritization, and destination performance evaluation. Unlike previous studies that primarily examined causal relationships using PLS-SEM or service improvement using IPA separately, this research demonstrates how these approaches can be integrated to provide a more comprehensive understanding of destination competitiveness in UNESCO Global Geoparks.

5. CONCLUSION

This study examined the determinants of tourist satisfaction and revisit intention in the Toba Caldera UNESCO Global Geopark by integrating Partial Least Squares Structural Equation Modeling (PLS-SEM), Importance-Performance Analysis (IPA), and Destination Performance Evaluation (DPE). The findings indicate that destination image, service quality, accessibility, tourism facilities, environmental quality, and tourist experience significantly influence tourist satisfaction, while tourist satisfaction serves as the strongest predictor of revisit intention. Furthermore, tourist satisfaction significantly mediates the relationships between destination

attributes and revisit intention, highlighting its central role in shaping tourists' post-visit behavioral intentions.

Theoretically, this study extends the tourism literature by proposing an integrated analytical framework that combines causal relationship analysis with managerial performance evaluation. Unlike previous studies that primarily focused on structural relationships, the integration of PLS-SEM, IPA, and DPE provides a more comprehensive understanding of both the determinants of tourist behavior and the priority areas for destination improvement. This approach contributes to sustainable tourism research by linking behavioral intentions with practical destination management strategies. From a practical perspective, the findings suggest that destination managers should prioritize improvements in accessibility, transportation infrastructure, tourism facilities, and visitor information services, while maintaining the strengths of the destination, including its natural scenery, geological heritage, environmental quality, and local hospitality. These strategic efforts are expected to enhance tourist satisfaction, strengthen destination competitiveness, and encourage repeat visitation, thereby supporting the sustainable development of the Toba Caldera UNESCO Global Geopark.

Despite these contributions, this study has several limitations. The analysis was based on cross-sectional data and focused on a single UNESCO Global Geopark destination, which may limit the generalizability of the findings. Future research is recommended to employ longitudinal data, include additional constructs such as destination loyalty, perceived value, destination attachment, or electronic word-of-mouth (e-WOM), and conduct comparative studies across different geopark destinations or countries. Such research would provide a broader understanding of tourist behavior and support the development of more effective and sustainable destination management strategies. The proposed framework can also be adapted for evaluating destination competitiveness in other UNESCO Global Geoparks and sustainable tourism destinations. The integrated destination performance framework developed in this study offers a comprehensive evaluation tool that can support evidence-based decision making for sustainable geotourism management in UNESCO Global Geoparks.

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STRATEGIC GOVERNANCE FOR GREEN JOB DEVELOPMENT IN GEOPARK BASED TOURISM VILLAGES AFTER THE UNESCO GREEN CARD RECOGNITION OF THE LAKE TOBA REGION

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ABSTRACT

The restoration of the Green Card status of the Toba Caldera UNESCO Global Geopark represents a strategic opportunity to strengthen sustainable tourism governance and promote green employment opportunities in the Lake Toba region. This study aims to analyze strategic governance in developing green jobs within geopark-based tourism villages following the reinstatement of UNESCO Green Card status. A qualitative descriptive approach was employed, and data were collected through in-depth interviews, observations, and document analysis involving local governments, the Toba Caldera UNESCO Global Geopark Management Agency, village administrations, tourism awareness groups, local entrepreneurs, and community members. The findings reveal that the development of green jobs is driven by five key dimensions of strategic governance, namely strategic leadership, collaborative governance, human resource capacity building, digital innovation, and sustainability orientation. The emerging forms of green jobs include geotour guides, eco-friendly homestay operators, environmentally responsible creative industries, waste management initiatives, agro-tourism enterprises, and digital tourism marketing activities. These initiatives have contributed to increased employment opportunities, diversified community income sources, strengthened local participation in environmental conservation, and enhanced the competitiveness of tourism villages. The study concludes that the UNESCO Green Card status serves as a catalyst for transforming tourism village governance toward an inclusive and sustainable green economy, requiring stronger stakeholder collaboration, continuous capacity development, and the optimization of digital innovation to ensure the long-term sustainability of green jobs and geopark conservation in the Lake Toba region.

Keywords: Geopark; Sustainable Tourism; Community Empowerment; Green Jobs.

1. INTRODUCTION

Climate change, environmental degradation, and socioeconomic inequality have accelerated a global paradigm shift toward a green economy. Within this paradigm, economic growth is no longer measured solely by increases in Gross Domestic Product (GDP), but also by the extent to which it promotes ecological sustainability and social equity. One of the key instruments facilitating this transition is the development of green jobs, defined as employment that contributes to environmental protection, resource and energy efficiency, greenhouse gas emission reduction, and the promotion of sustainable production and

consumption patterns.(Riswano & Acep Rachmat, 2023). The concept of green jobs emphasizes not merely the quantity of employment generated but also the quality of work in terms of decency, inclusiveness, and environmental sustainability. In Indonesia, this commitment to low-carbon development has been institutionalized through the 2020–2024 *Rencana Pembangunan Jangka Menengah Nasional* (RPJMN), which places sustainable development at the core of public policy and long-term national development priorities (Badan Perencanaan Pembangunan Nasional, 2019). One of the sectors focused on this agenda is sustainable tourism. The tourism sector plays a strategic role due to its multiplier effect on job creation, MSME development, and strengthening local economies. However, in the context of a green economy, the primary challenge is not simply increasing tourist numbers and economic growth, but also ensuring that tourism activities contribute to environmental conservation and quality improvement.

The Toba Caldera UNESCO Global Geopark in the Lake Toba region is a national priority destination with world-class geological, ecological, and cultural value. As part of the UNESCO Global Geoparks network, the area has a normative mandate to integrate three main pillars: conservation, education, and sustainable economic development (Naibaho & Su, 2025). The international geopark status places the Lake Toba region in a strategic position as a laboratory for sustainable development based on geological and cultural heritage. Following the reinstatement of Green Card status by UNESCO, the region is entering a crucial phase in strengthening its governance. Green Card status not only reflects international recognition of the quality of the region's management but also demands consistent implementation of sustainability principles in all aspects of development, including the employment sector. This momentum creates an opportunity to reconstruct the governance of tourism village development to better integrate it with green economy principles.

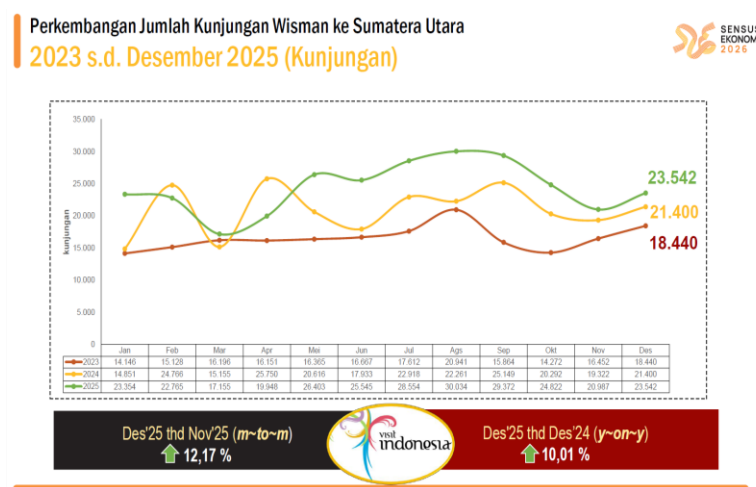


Figure 1. Development of the Number of Foreign Tourist Visits to North Sumatra (BPS North Sumatra)

Data from the Central Statistics Agency of North Sumatra Province shows that foreign tourist visits to North Sumatra have increased significantly in the last two years (Saputra & BPS

Sumatera Utara, 2026). This increase indicates the recovery and growth of the tourism sector, which has the potential to drive new job creation in the Lake Toba region. However, the increase in tourist visits has not automatically translated into a sustainable increase in job quality. The employment structure in tourist villages surrounding the geopark remains dominated by informal, seasonal work, and limited access to sustainability-based training.

This situation demonstrates a gap between the global green development agenda and the reality of local governance. Geopark-based tourism villages have significant potential for creating green jobs, such as those involving trained geotourism guides in conservation, environmentally friendly energy-based homestay management, community-based integrated waste management systems, and the development of creative economy products based on sustainable local resources. However, without an integrated strategic governance framework, this potential is difficult to develop systematically. From a public administration perspective, this issue relates to how strategic governance is built and operationalized. Strategic governance emphasizes the importance of long-term vision, cross-sector coordination, policy integration, and multi-actor collaboration in achieving development goals (Elomaki & Ylostalo, 2024). The success of collaborative governance depends on institutional design, trust between actors, and commitment to shared goals (Aristy et al., 2021). Modern governance demands adaptability and the ability to manage the complexity of policy networks. (Samadi et al., 2025). In the context of geoparks, this complexity is further compounded by the involvement of various actors: the central government, local governments, geopark management bodies, village communities, MSMEs, academics, and the private sector. Integration between these actors is crucial to ensuring that increased tourism activity not only generates short-term economic growth but also strengthens ecological sustainability and job quality.

2. LITERATURE REVIEW

2.1 Strategic Governance in Sustainable Development

The evolving global development paradigm demonstrates that development success is no longer measured solely by economic growth, but also by a region's ability to achieve a balance between economic growth, social welfare, and environmental sustainability. This situation demands a governance model capable of integrating diverse interests and effectively coordinating various development actors. In this context, the concept of *strategic governance* has emerged as an approach that emphasizes the importance of long-term planning, strategic leadership, multi-stakeholder collaboration, and the ability to adapt to ever-changing environmental dynamics. According to (Osborne, 2018), the paradigm of modern public administration has undergone a transformation from the concept of *government* to *governance*. The government is no longer the sole actor determining the direction of development, but rather acts as a facilitator, building collaborations with the private sector, civil society, local communities, and various other organizations. This approach views development as the result of interactions and synergies between stakeholders who share common goals.

(Pierre et al., 2001) explain that *strategic governance* is the ability of public institutions to direct the development process through long-term vision, institutional coordination, resource management, and decision-making responsive to strategic challenges. Strategic

governance focuses not only on achieving development targets but also on ensuring that the development process is implemented in an inclusive, participatory, and sustainable manner. From a sustainable development perspective, *strategic governance* plays a crucial role in integrating economic, social, and environmental goals. Good governance can encourage efficient resource utilization, increase community participation, and strengthen institutional capacity to address global challenges such as climate change, environmental degradation, and socioeconomic inequality. Therefore, sustainable development requires strategic leadership capable of building cross-sector partnerships and producing policies oriented toward long-term sustainability.

In geopark areas, the implementation of *strategic governance* is increasingly crucial because geopark management involves multiple interrelated dimensions, from geological heritage conservation and local economic development to cultural preservation and improving community well-being. The success of geopark management is largely determined by the ability of stakeholders to build coordination, allocate roles and responsibilities, and create innovations that support sustainable development. The reinstatement of Toba Caldera's Green Card status as a UNESCO Global Geopark represents a significant milestone in strengthening the governance of the Lake Toba region. This status not only reflects international recognition of the area's conservation and management efforts but also demands a commitment from all stakeholders to continuously improve governance systems, increase community participation, and develop various sustainability-oriented development programs.

2.2 The Concept of Green Jobs and Green Economy

Climate change, environmental degradation, and rising socioeconomic inequality have driven a paradigm shift in global development toward a green economy. In this paradigm, economic growth is no longer measured solely by increases in Gross Domestic Product (GDP), but also by the extent to which development can create ecological sustainability and social justice. The green economy concept seeks to generate growth that is low-carbon, efficient in resource use, and inclusive of all groups in society. According to the United Nations Environment Programme (UNEP), a green economy is a development model that enhances human well-being and social equity while substantially reducing environmental risks and the depletion of natural resources. Within this framework, environmental sustainability is not viewed as a separate objective but as an essential component of economic development, encouraging the adoption of resource-efficient, low-carbon, and sustainable production and consumption practices (Susilowati et al., 2024).

One of the main instruments in realizing a green economy is the development of *green jobs*. The International Labour Organization (ILO) defines *green jobs* as jobs that contribute to the preservation or restoration of environmental quality through increased energy and resource efficiency, reduced greenhouse gas emissions, reduced waste and pollution, and ecosystem protection and restoration. This concept emphasizes not only the creation of new jobs but also the quality of decent, productive, and sustainable work (ILO, 2016). The development of *green jobs* is seen as a strategy capable of simultaneously addressing two development challenges: environmental issues and unemployment. Various studies have shown that the transition to a green economy can open up new job opportunities in renewable

energy, waste management, sustainable agriculture, environmental conservation, and nature-based tourism. Thus, *green jobs* are a crucial instrument for creating inclusive and sustainable development. In the tourism context, *green jobs* can be realized through various economic activities that support environmental conservation, such as geotourism guides, ecotourism-based homestay managers, village waste management, organic farming development, eco-friendly creative economy actors, and digital marketing of tourism products. All of these jobs not only generate economic benefits for the community but also contribute to environmental preservation and increase the competitiveness of tourist destinations.

2.3 Geopark-Based Tourism Villages and Community Empowerment

UNESCO defines a geopark as a single geographical area containing sites and landscapes of international geological significance, managed through an integrated approach linking conservation, education, and sustainable development. The geopark concept places the community as the primary actor in the management and utilization of the region's resources. Therefore, geoparks serve not only as instruments for protecting geological heritage but also as a means to promote sustainable local economic development. Explain that geoparks have three main pillars: conservation, education, and sustainable development. These three pillars are interrelated and aim to improve community well-being through the responsible utilization of local geological, cultural, and resource potential (Shirazi & Shirazy, 2020).

Geopark-based tourism villages are a form of tourism development that integrates geological potential, culture, and local wisdom as a sustainable tourist attraction. Tourism village development is not only oriented towards increasing tourist visits but also aims to create economic opportunities for the community, strengthen local cultural identity, and preserve the environment. The success of geopark-based tourism villages is greatly influenced by the level of community participation. This participation includes community involvement in planning, decision-making, program implementation, and evaluation of tourism management activities. High levels of community participation will enhance a sense of *ownership* of the area and encourage economic innovation based on local potential.

The Lake Toba region holds significant potential for developing geopark-based tourism villages, bolstered by its unique geology, rich Batak culture, and beautiful landscapes that have international appeal. The return of UNESCO Green Card status opens up greater opportunities for developing geotourism, geoproducts, and various forms of *green jobs* based on sustainable development principles. Therefore, a *strategic governance model is needed* that integrates collaboration between stakeholders, human resource capacity building, digital innovation, and community empowerment as the primary foundation for developing *green jobs* in tourism villages in the Lake Toba region.

2.4 Conceptual Framework of the Research

Based on theoretical studies and previous research, this study views *strategic governance* as a fundamental factor in the development of *green jobs* in geopark-based tourism villages. The implementation of strategic governance is realized through five main dimensions, namely strategic leadership, *collaborative governance*, community *capacity building*, digital innovation, and sustainability orientation. These five dimensions are projected

to be able to encourage the creation of various forms of *green jobs*, improve community welfare, strengthen environmental conservation, and maintain the sustainability of the Toba Caldera UNESCO Global Geopark as a world-class geotourism destination.

3. RESEARCH METHODS

Study This use approach qualitative with design study fundamental nature descriptive analytical and conceptual approach This aim For explore, understand, and formulate framework conceptual *strategic governance* in development of village green jobs tour geopark -based through study literature, review policies, as well as qualitative data analysis from interviews and documents. Focus study is deepening theory, identification variables key, and synthesis conceptual to enrich treasury science administration and governance sustainable in context of the Lake Toba area. As for the stages study This is as following:

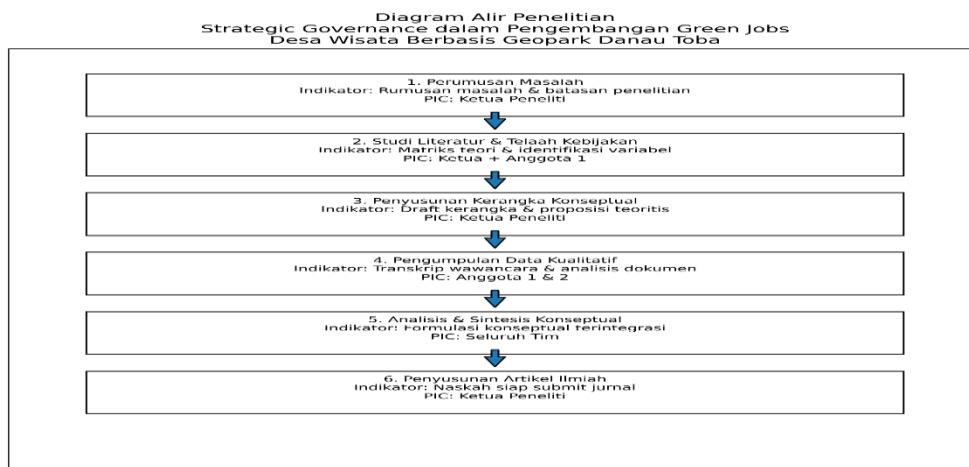


Figure 2. Research Flowchart

Research design This is design study qualitative with approach descriptive analytical based studies conceptual and study case policy. This design used for digging and formulating framework conceptual *strategic governance* in development of village green jobs tour geopark -based through exploration theory, analysis document policies, as well as interview withstakeholders interest related. Research emphasize on understanding deep to governance context and synthesis enriching conceptual development theory administration and governance sustainable (Subagyo, 2023). Population study covers all over stakeholders related interests with governance development of village green jobs tour geopark- based in the Lake Toba area, such as government region UNESCO Global Geopark Toba Caldera management, government village tourism, management BUMDes, tourism MSME actors, and figure community involved in management and development village tour. Samples are determined use technique *purposive sampling*, namely election informant in a way on purpose based on relevance and competence to Strategic governance and green jobs (Arikunto, 2006) issues. Informant key can covering officials service tourism / economy creative, geopark manager,

head village or manager village tourism, as well as representative perpetrator local businesses with amount sample as many as 70 respondents. The number informant nature flexible and follow principle *data saturation*, namely data collection stopped when information obtained has saturated and not produce findings significant new. Data collection techniques in study This done through a number of mutually exclusive stages complete.

1. Literature study systematic
2. Analysis document
3. Interview in-depth (in-depth interview)
4. Observation
5. Limited survey as supporting data (Arikunto, 2010) .

4. RESULTS AND DISCUSSION

The Lake Toba area is one of the Destination Indonesia's Super Priority Tourism (DPSP) and has get UNESCO Global Geopark Green Card status has been restored. This status give legitimacy international at a time open opportunity development economy local based tourist sustainable. Central Statistics Agency data North Sumatra Province shows that sector tourist experience sufficient growth significant. Amount traveler foreign tourists (tourists) who visit to North Sumatra during the period January– December 2024 reached 250,413 visits, an increase by 26.32% compared to the same period in 2023 which amounted to 198,240 visits. In December 2024 alone, the number visit foreign tourists reached 21,400 visits, an increase of 10.75% compared to November 2024, which amounted to 19,322 visits. The Room Occupancy Rate (TPK) of star-rated hotels in North Sumatra also reached 49.33%, an increase compared to month previously by 44.83% (Badan Pusat Statistik Provinsi Sumatera Utara, 2025).

Table 1. North Sumatra Tourism Trends in 2024

INDICATOR	2023	2024	CHANGE
FOREIGN TOURIST VISITS	198,240	250,413	+26.32%
DECEMBER FOREIGN TOURISTS	19,322	21,400	+10.75%
STAR-RATED HOTEL OCCUPANCY RATE	44.83%	49.33%	+4.50 points

Source : BPS North Sumatra Province (2025)

Improvement visit traveler the give impact to growth activity economy around the Lake Toba area. Based on results observation field and analysis documents, improvements activity tour push development business accommodation, services transportation, business culinary, economics creative, and services scouting tourism. Conditions This show that Lake Toba has opportunity big in develop work-based economy green (*green jobs*). However thus, research find that until moment This Not yet statistical data available official about amount *Green jobs* in the Lake Toba area. Available employment data Still classified to in sector general, such as agriculture, trade, transportation, accommodation, and provision food and drink. With thus, the work Green in the Lake Toba area is still be at the stage beginning development and not yet become category alone in system data collection employment area. Based on results interview with government village, manager village tourism, group aware tourism (Pokdarwis), and actors business, found that eye livelihood the community around Lake Toba still dominated by

the sector agriculture and fisheries. However, the increase visit traveler has push occurrence diversification work.

Table 2. Types of Occupations of the Community in Lake Toba Tourism Villages

TYPE OF WORK	CHARACTERISTICS
FARMERS AND FISHERMEN	Livelihood Main Public
HOMESTAY MANAGER	Develop Along Increasing Visit Tour
CULINARY MSME ACTORS	Provide Food Typical Area
SOUVENIR CRAFTSMEN	Utilise Product Local And Batak Culture
GUIDE LOCAL TOURISM	Give Service Interpretation Culture And Geotourism
MANAGER RUBBISH COMMUNITY	Appears In Several Village Tour Based Conservation

Interview results show that part big public consider sector tourist as source income promising addition. However Thus, society Not yet know draft *green jobs* in a way comprehensive. Activities conservation - oriented economy environment Still done in a way natural and not yet positioned as work planned green. Analysis UNESCO Global Geopark documents show that geopark management must integrate conservation, education, and development sustainable. Principles the give opportunity big for the Lake Toba area develop various work green.

Table 3. Potential for Green Jobs in the Lake Toba Area

TYPES OF GREEN JOBS	MAIN ACTIVITIES	IMPACT
GUIDE GEOTOURISM	Education Geology And Culture	Improvement Awareness Conservation
ECO- FRIENDLY HOMESTAY MANAGER	Management Accommodation Based Public	Efficiency Energy And Reduction Waste
MANAGER VILLAGE WASTE	Sorting And Recycling Repeat Rubbish	Subtraction Pollution
CRAFTSMAN SUSTAINABLE LOCAL PRODUCTS	Utilization Material Standard Local	Strengthening Economy Circular
PERPETRATOR ECOTOURISM	Tour Based Conservation	Protection Source Power Natural
FARMER ORGANIC	Production Food Friendly Environment	Guard Quality Environment

Research result show that various type work the Actually has start growing in several village tourism in the Lake Toba area. However, the activities the Still nature sporadic and not yet integrated to in policy development employment area. Findings Based on Strategic Governance Dimensions.

Research result show that UNESCO Green Card status has been become a strategic momentum for the Lake Toba area strengthen development based conservation and tourism sustainable. Improvement visit tourists in North Sumatra and development activity the economy around Lake Toba indicates existence great opportunity in development *green jobs*. However Thus, research This find that opportunity the Not yet followed by a transformation of

governance which is special direct development village tour going to formation ecosystem work green.

Findings the show that until moment This Not yet statistical data available official about amount *Green jobs* in the Lake Toba area. Available employment data Still classified to in sector general like agriculture, trade, accommodation, transportation, and services other. Conditions the indicates that work green Still viewed as part from activity economy tourist in a way common and not yet become focus policy employment and system data collection development area. Findings study This in line with the view of the International Labour Organization (ILO) which states that *green jobs* is contributing work to preservation or recovery quality environment through activity supportive economy development sustainable. With Thus, the existence of *green jobs* No solely measured from amount jobs created, but also from to what extent the activity growing economy capable integrate dimensions economic, social, and environmental.

4.1 Dimensions Institutional: Gap between Global Legitimacy and Local Policies

Study find that even though Lake Toba has get legitimacy international through UNESCO Green Card status and is designated as Destination Super Priority Tourism (DPSP), not yet there is regulations and policy areas that are explicit arrange development *green jobs* in the village tour geopark- based empowerment program community, development village tourism, management environment, and training tourism Still implemented in a way sectoral by each organization device area. Findings This show existence gap between mandate development sustainability at the global level and implementation policies at the level local. According to Pierre and Peters (2020), *strategic governance* is ability government in integrate various interests , building vision term long , and coordinate actors and sources Power For reach objective complex development . In context of Lake Toba, integration the Not yet fully formed Because orientation development Still more emphasize on improvement visit tourists and development infrastructure compared to transformation employment green .

Research result this is also in line with study (Ardianti & Febriyan Eprilianto, 2022)who found that development village tourism in Indonesia is still face problem in the form of weakness integration policy between sector tourism, empowerment society and development environment. Conditions the cause potential the economy owned village tour Not yet fully capable produce sustainable development. With thus, legitimacy internationally owned by Lake Toba in a way automatic produce change capable institutions direct development *green jobs*. Required integration policy cross sector for development village tour No only improvement oriented amount tourists, but also on the creation supportive work conservation environment and welfare public.

4.2 Collaborative Dimension: The Importance of Multi-Actor Governance

Study show that management of the Lake Toba area has involving various stakeholders interests, namely government central government province, government district, Toba Caldera UNESCO Global Geopark Management Agency, government village, group aware tourism (*Pokdarwis*), academics, and actors business. Involvement various actor the show that geopark management has move going to governance patterns collaborative. However Thus, research

This find that collaboration that occurred Still nature sectoral and oriented towards long-term programs short. Not yet available mechanism coordination that is special integrating conservation and development agendas economy local, and development *green jobs*. Conditions the cause various programs being run Not yet produce transformation employment green optimally. Findings This confirm theory *Collaborative Governance* proposed by Ansell and Gash in (Yulianto, 2025). They explain that governance success collaborative is very much determined by the existence of design clear institutions, leadership facilitative, face-to-face dialogue face, development trust (*trust building*), commitment towards the process, and understanding together (*shared understanding*).

Research result this is also in line with study about management village tour Rammang-Rammang in Maros Regency who discovered that success management village tourism is greatly influenced by the quality of collaborative processes inter- factor research the show that coordination and understanding become one of the programs development village tour difficult reach sustainability (Bachtiar et al., 2022). In context of Lake Toba, the existence various actor Actually is an important social and institutional capital for build ecosystem *green jobs*. However, this capital Not yet followed by a mechanism coordination that is special integrating conservation and development agendas economy local, and transformation work green.

4.3 Dimension: Challenges Transformation Green Jobs

Study find that villages tourism in the Lake Toba area has great potential for develop various type work green, like guide geotourism, friendly homestay manager environment, management rubbish based community, actors ecotourism, craftsmen product local sustainable, and farmers organic. The emergence various activity the show that seeds *green jobs* Actually has develop in a way empirical in society. However thus, the capacity source Power man Still become constraint main. Most of public Still face limitations in mastery Language foreign, digital literacy, management business sustainable, as well as understanding about principle economy green and standard tour sustainable.

Findings This in line with study Darmawansyah et al. (2026) who stated that development ecosystem employment need collaboration multi- stakeholders supported by increased capacity source Power humans and synchronization between need field Work with competence society. Limitations capacity and weakness coordination inter-stakeholder interest can cause opportunity emerging economy No develop become ecosystem sustainable work. In perspective *strategic governance*, improvement capacity public No only understood as effort improvement skills individual, but also as a strengthening process institutional local to be able to adapt to change environment strategic. Therefore that, development *green jobs* in Lake Toba are needed more investment big on aspects education, training and strengthening institutional public village tour.

4.4 Dimensions Sustainability: Green Jobs as Sustainable Development Instruments

Study find that a number of village tourism in the Lake Toba area has apply various practice friendly environment, such as subtraction use plastic very use, management rubbish-based community, utilization product local, greening, and conservation culture. Practices the

show that awareness to importance development sustainable start grow at a level public. However thus, the practice the Still nature partial and not yet integrated to in governance system village tourism. As a result, the activities conservation and development economy public Still walk in a way separate and not yet fully produce ecosystem sustainable *green jobs*. Findings This in line with various studies about tourist sustainable which states that sustainability destination tour only can achieved if development economy, conservation environment and welfare public placed as One mutual unity integrated. Based on all over findings said, research This show that UNESCO Green Card status has been open great opportunity for the Lake Toba area develop *green jobs* geopark- based. However, the opportunity the Not yet fully optimized Because Still there is gap in dimensions institutional, collaborative, capacity, and sustainability. With thus, research This produce proposition that development *green jobs* village tour geopark- based post- UNESCO Green Card status in the Lake Toba area only can come true if supported by *strategic governance* that is capable integrate legitimacy international, policy cross sector, collaboration multi-actor, strengthening capacity society, as well as orientation development sustainable to in One integrated governance ecosystem. Findings This at a time enrich study administration public with show that global legitimacy through UNESCO Green Card status can become *critical juncture* for governance transformation and formation ecosystem work green at level local.

5. CONCLUSION

Study This show that UNESCO Green Card status has give legitimacy international at a time opportunity strategic for the Lake Toba area develop development more tourism sustainable. Improvement amount visit tourists and development activity the surrounding economy geopark area shows existence potential big in creation various form *green jobs*, such as guide geotourism, friendly homestay manager environment, management rubbish-based community, actors ecotourism, craftsmen product local sustainable, and farmers organic. However thus, the results study find that until moment This Not yet statistical data available official about amount *green jobs* in the Lake Toba area and not yet there is policy areas that are specific arrange development work green in the village tour geopark- based.

Study this also found that governance development *green jobs* Still face various challenges, among others, have not yet integration policy cross sector, coordination inter-stakeholder interests that still exist nature partial, limitations capacity source Power humans, as well as not yet formation system management integrated sustainability at the community level village tourism. Conditions the show that potential the economy of the Lake Toba area has not yet fully capable transformed become ecosystem work sustainable green.

In a way theoretical, research This enrich study Strategic Governance with show that global legitimacy through UNESCO Green Card status does not in a way automatic produce transformation development sustainable at the level local. Transformation the need capable governance capabilities integrate dimensions institutional, collaborative, capacity, and sustainability to in One framework mutual development connected. In practical, research This give implications for government regions and stakeholders interests in the Lake Toba area for compile policy development *green jobs*, building system data collection employment green, strengthening collaboration multi-party, as well as increase capacity public village tourism so

that UNESCO Green Card status can be obtained converted become source growth an inclusive and sustainable economy. Study furthermore recommended for develop mapping quantitative about quantity and characteristics *green jobs* in the village tourism in the Lake Toba area, including measure his contribution to welfare society and achievements objective development sustainable (*Sustainable Development Goals*).

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GREEN TOURISM AND LOCAL COMMUNITY LIVELIHOODS IN THE TOBA CALDERA: A POLITICAL ECOLOGY ANALYSIS OF POWER AND RESOURCE ACCESS

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ABSTRACT

Toba Caldera has been promoted as one of Indonesia's flagship green-tourism destinations since its designation as a UNESCO Global Geopark in 2020, yet the benefits and burdens of this transformation are unevenly distributed among the actors who inhabit and manage the landscape. This article tests two competing conceptual accounts of multi-stakeholder tourism governance against thematic findings from focus group discussions with informants representing government, academia, media, community groups, and the business sector, triangulated with peer-reviewed literature on land, power, and livelihoods in the caldera. The collaborative-synergy account, which treats a shared discourse of partnership as evidence of functioning collaboration, is well supported by the discussion content alone: every sector affirms cross-sectoral cooperation and a common set of cultural values. The power-and-access account, which distinguishes formal participation from the underlying distribution of budgetary authority, technical knowledge, promotional capital, and legally recognized land tenure, better explains the persistent land disputes and environmental decline documented in the wider literature, none of which surfaced in the collaborative discussion itself. Community discussion, despite representing the sector most exposed to land-use change, offered the thinnest institutional narratives and the least evidence of independent decision-making authority. The article argues that inclusive green-tourism governance in Toba requires formal recognition of indigenous land tenure and redistribution of decision-making authority, not merely rhetorical partnership among stakeholders.

Keywords: Political Ecology; Governance; Indigenous Rights; Green Tourism Sustainable; Pentahelix

1. INTRODUCTION

Lake Toba, the vast caldera lake formed by a super-eruption in North Sumatra, has become one of the clearest illustrations in Indonesia of how "green" branding and state-led tourism development can travel together with unresolved questions of land, water, and cultural authority. In July 2020, UNESCO formally inscribed the area as the Toba Caldera UNESCO Global Geopark, recognizing thirteen geosites whose geological, biological, and cultural diversity were framed as a single, integrated asset for sustainable regional development (Ginting et al., 2021; Manurung & Sinabariba, 2021). The designation followed nearly a decade of advocacy by the national and provincial government, and it coincided with Lake Toba's elevation to the status of a national "super-priority" tourism destination, part of a broader push by the Indonesian

state to diversify the country's tourism economy (Naibaho & Su, 2025). Since then, the caldera has attracted large infrastructure investment, new promotional branding, and a growing apparatus of multi-stakeholder coordination bodies intended to align government, academia, business, media, and community actors around a common vision of sustainable, geologically informed tourism.

Green tourism, in the sense used throughout this article, refers to tourism development that is explicitly framed around environmental conservation, cultural preservation, and the equitable distribution of economic benefit, rather than the pursuit of visitor volume alone (Agarwal et al., 2024). Geoparks are a particularly instructive case for examining this framing because their legitimacy rests on a triad of goals that are not always mutually reinforcing: geoconservation, geo-education, and geotourism-driven local economic development (Ferreira & Valdati, 2023; Dousin et al., 2024). In principle, the Toba Caldera Geopark embodies this triad by combining protection of volcanic and lacustrine geoheritage with promotion of Batak Toba cultural heritage and support for community-based enterprise. In practice, however, the environmental quality of Lake Toba has continued to decline even as tourism promotion intensifies, and reported land conflicts around geosite development have multiplied in the years following UNESCO designation (Simandjorang et al., 2022; Naibaho & Su, 2025). This tension between the promotional narrative of harmonious, collaborative green development and the documented reality of contested land and water access is the starting point of this article.

The government's preferred institutional vehicle for coordinating green tourism around Lake Toba is a pentahelix model, in which government, academia, business, community, and media are treated as five co-equal pillars of collaboration (Sentanu, 2021; Pakpahan et al., 2023; Pane et al., 2025). Pentahelix framing is attractive precisely because it appears to distribute responsibility and voice evenly across sectors: each pillar is assigned a role, and success is understood as the product of synergy rather than top-down command. Systematic reviews of pentahelix collaboration in Indonesian tourism villages, however, repeatedly find that the model in practice tends toward uneven participation, in which government and community actors often dominate the visible collaborative process while business and media involvement remains comparatively limited, and in which governance dynamics, power asymmetries, and inclusivity outcomes are rarely examined with the same rigor as the model's normative design (Noviana et al., 2025; Oktaviarni et al., 2023). This gap between the rhetoric of horizontal partnership and the reality of uneven institutional weight is precisely the kind of question that a political ecology, power-attentive reading of collaboration is well equipped to interrogate.

Political ecology approaches tourism as a field of contested socio-natural relations, in which the meanings attached to nature, the definition of conservation, and the distribution of tourism-derived benefit are outcomes of power struggles among differently positioned actors rather than neutral, technical matters. A useful entry point for this kind of analysis is the recent conservation and tourism-governance literature on power itself, which distinguishes several complementary ways power operates in resource and environmental settings: actor-centered power exercised directly by identifiable individuals or organizations; institutional power embedded in rules, budgets, and standard operating procedures; structural power arising from

an actor's position within broader economic and political systems; and discursive power, through which particular framings of "sustainability," "collaboration," or "local wisdom" come to seem natural and uncontested (Shackleton et al., 2023). Applied to community-based tourism specifically, this literature shows that partnership arrangements can simultaneously claim to empower local communities while embedding those communities in relations of dependency on external partners for capital, market access, and legitimacy, producing a persistent gap between the language of empowerment and its substantive realization (Dolezal & Novelli, 2022). This distinction between the discourse of partnership and the underlying distribution of power is directly relevant to Toba, where official statements of collaborative synergy coexist with well-documented asymmetries in who actually captures the economic and symbolic value generated by geopark tourism, and with unresolved customary land disputes between indigenous communities and state or private tourism developers (Naibaho & Su, 2025; Toumbourou & Dressler, 2024).

The stakes of this question are not merely academic. Communities living inside the geopark boundary, most of them ethnic Batak Toba whose land claims rest on customary (adat) tenure rather than formal certificates, have repeatedly found their claims poorly reconciled with state tourism planning, a pattern consistent with the broader difficulty Indonesia has faced in translating legal recognition of indigenous land rights into effective protection on the ground (Simarmata, 2024; Naibaho & Su, 2025). At the same time, official narratives describe the same landscape in terms of gotong royong, shared local wisdom, and voluntary partnership. Understanding how these two accounts of the same tourism transition can coexist requires attention not only to what different actors say about collaboration, but to what kinds of power allow some of these accounts to be realized in material benefit and others to remain aspirational.

This article addresses that question using primary focus group discussion data collected from informants across the five conventional pentahelix sectors around the Toba Caldera Geopark, read alongside the wider scholarly literature on tourism, land, and livelihoods in the area. Rather than presenting the interview material as a catalogue of individual statements, the analysis synthesizes what each sector's discussion revealed about its own position, capacity, and stake in geopark governance, and places these synthesized findings in dialogue with two competing conceptual accounts of multi-stakeholder tourism governance: the collaborative-synergy account that underpins the pentahelix model itself, and the power-and-access account developed in the political ecology literature. Three questions guide the analysis. First, what did each pentahelix sector's discussion reveal about its own role in, and stake in, green tourism development in Toba, and how consistent were these accounts across sectors? Second, where the empirical record shows unresolved land, water, or benefit-distribution problems, how well does the collaborative-synergy account of pentahelix governance explain them, and where does a power-attentive account offer more traction? Third, what would a more equitable reworking of the pentahelix model require, given the specific configuration of customary land tenure, conservation regulation, and investment pressure that characterizes the Toba Caldera today? By combining a political ecology framework with grounded, multi-sector interview data, the article contributes both an empirical account of how green tourism collaboration is currently practiced in Toba, and a conceptual argument about the limits of

collaborative-governance models when they are not accompanied by explicit attention to the distribution of power.

2. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 Geoparks, Green Tourism, and the Sustainability Triad

The academic literature on geoparks has grown rapidly since the early 2010s, and a systematic review of that literature identifies a recurring analytical triad geoconservation, geo-education, and geotourism-driven local economic development as the normative core against which geopark performance is typically judged (Ferreira & Valdati, 2023). A parallel four-decade bibliometric review of sustainable tourism research more broadly shows that scholarly attention has shifted markedly over time from narrowly environmental definitions of sustainability toward frameworks that treat governance, equity, and community empowerment as inseparable from environmental outcomes, a shift that is directly relevant to how green tourism is now understood in geopark contexts specifically (Agarwal et al., 2024). Comparative case evidence reinforces this shift empirically: territorial planning research on an aspiring geopark in Portugal shows that achieving the geoconservation-education-development triad in practice depends heavily on the strength of formal planning instruments and multi-level coordination between local and national authorities (Dias et al., 2023), while structural equation modelling of the Kinabalu UNESCO Global Geopark in Malaysian Borneo finds that community well-being responds jointly to economic and socio-cultural benefit, mediated by the degree of community support for geopark development itself meaning that benefit alone, without perceived voice, is an incomplete predictor of positive community outcomes (Dousin et al., 2024). Building on this same premise, a recent conceptual effort to define ecotourism for mainstream application argues that the term has become so elastic in policy use that “green” or “eco” branding can be applied to fundamentally different governance arrangements, from genuinely community-led enterprise to conventional mass tourism repackaged with environmental rhetoric, making explicit definitional and governance scrutiny rather than acceptance of the label itself a precondition for meaningful sustainability assessment (Torsney, 2025). This definitional caution is the starting point for the present article’s treatment of “green tourism” at Toba Caldera: the label describes an aspiration stated by policy actors, not a governance outcome that can be assumed from the label’s presence.

2.2 Pentahelix and Multi-Stakeholder Tourism Governance

The pentahelix model which frames government, academia, business, community, and media as five co-equal collaborative pillars has become the dominant institutional template for Indonesian destination governance, including at Toba Caldera (Sentanu, 2021; Pakpahan, Sinurat, & Simatupang, 2023; Pane, Nasution, Susanto, Rafi, & Fatmawati, 2025). Applied studies of the model in Indonesian tourism villages generally report that it succeeds in bringing multiple sectors into a shared forum, but systematic reviews of this literature converge on a more cautious empirical picture: participation across the five pillars is rarely even, governance and power dynamics internal to the model are seldom examined with the same rigor as its normative design, and government and community actors tend to dominate the visible collaborative process while business and media involvement remains comparatively thin and

under-theorized (Noviana, Situmorang, Cahyaputri, Farida, & Sukwika, 2025; Oktaviarni, Yumarni, & Anggraeni, 2023). Comparative evidence from outside Indonesia raises a related concern about the durability, rather than only the evenness, of multi-stakeholder tourism arrangements. Research on self-governing institutions in China's rural tourism sector finds that whether collaborative governance structures can sustain a destination through a full tourism life cycle rather than collapsing once initial novelty or external funding fades depends on whether local self-governing bodies possess genuine regulatory and enforcement capacity, not merely consultative status (Su, Li, Shu, & Wang, 2024). A starker cautionary case comes from research on the "tragedy of the anti-commons" in Chinese rural tourism development, which shows that where land and resource rights are fragmented across multiple overlapping claimants without a clear mechanism for coordinated decision-making, collaborative governance structures can produce paralysis and under-investment rather than the synergy they are designed to generate (Wei & Hu, 2022). Community-participation research on festival tourism in Vietnam's Mekong Delta adds a further empirical dimension, identifying institutional trust, perceived fairness of benefit distribution, and the accessibility of participatory channels as the specific factors that determine whether nominally inclusive tourism governance translates into actual community engagement, rather than participation remaining symbolic (Hai & Ngan, 2022). Together, this body of work suggests that the pentahelix model's five-pillar structure describes an input to governance who is nominally at the table without specifying, or guaranteeing, the distribution of authority that determines what happens once the table is set.

2.3 Political Ecology and the Analysis of Power in Conservation and Tourism

Where pentahelix scholarship tends to treat collaboration as a design problem to be solved through better coordination mechanisms, political ecology treats the distribution of power itself as the central object of analysis. A comprehensive framework for navigating power in conservation settings distinguishes four complementary mechanisms through which power operates: actor-centered power exercised directly by identifiable individuals or organizations; institutional power embedded in budgets, rules, and standard operating procedures; structural power arising from an actor's position within broader economic and political systems; and discursive power, through which particular framings of "sustainability," "partnership," or "local wisdom" come to appear self-evidently legitimate (Shackleton et al., 2023). This typology matters because it allows an analyst to ask not only who is formally included in a governance arrangement, but which of these four mechanisms each included actor actually controls a distinction the pentahelix literature's emphasis on representation alone does not systematically make.

Empirical applications of this power-attentive lens to community-based tourism reinforce its usefulness. Research on community-based tourism partnerships in Bali finds that such arrangements can simultaneously claim to empower local communities and embed those same communities in relations of dependency on external partners for capital, market access, and legitimacy, producing a persistent gap between the stated goal of empowerment and its substantive realization (Dolezal & Novelli, 2022). Research on women's participation in community-involved tourism enterprises in the Philippines reaches a structurally similar

conclusion from a gender perspective: participation in tourism activity does not automatically confer empowerment, and the difference between symbolic and substantive participation depends on prior, often unequal, access to economic resources, institutional standing, and decision-making authority (Gutierrez & Vafadari, 2023). Research specifically examining livelihood-focused frameworks for community-based ecotourism in developing countries similarly argues that sustainable outcomes require deliberate investment in community technical and institutional capacity, not merely inclusion in dialogue processes, if communities are to engage governance apparatuses on comparable terms to state and academic actors (Kunjuraman, 2024). Closer to the Indonesian tourism-governance context, recent analysis of accountability, transparency, and resource allocation in the Mandalika Special Economic Zone documents how large-scale, state-branded tourism development can proceed through governance arrangements that are procedurally inclusive on paper while remaining politically opaque in the allocation of investment decisions and land-use authority in practice a pattern with direct parallels to the geopark context examined in this article (Putera, Lenggogeni, Affandi, & Alhadi, 2026).

2.4 Customary Land Tenure and Indigenous Rights in Indonesian Resource Governance

A further, largely separate strand of literature addresses the specific problem of customary (adat) land tenure recognition, which is central to understanding land-related conflict in the Lake Toba area. Comparative research on the recognition and formalization of customary tenure in the forest landscapes of the wider Mekong Region, read through a Polanyian lens that treats land formalization as embedded in rather than separate from broader political and market pressures, finds that formal recognition instruments frequently under-deliver on their protective intent when they are not accompanied by parallel shifts in the political economy of land use (Diepart, Scurrah, Beban, Gironde, & Campbell, 2023). Cross-national synthesis of community forest tenure formalization reaches a complementary conclusion, proposing a theory of change in which legal recognition alone is insufficient; successful formalization additionally requires accessible administrative procedures, sustained government commitment across political cycles, and active support for communities to exercise, monitor, and defend their formalized rights (Kusters et al., 2022). Within Indonesia specifically, recent analysis of the country's progress on customary forest recognition documents substantial expansion of the relevant legal instruments over the past decade, alongside continued unevenness in implementation attributable to overlapping regulatory authority and an underlying tension between the state's development priorities and its stated commitment to customary rights recognition (Simarmata, 2024).

Research on comparable resource-development conflicts elsewhere in Indonesia shows how livelihood interventions explicitly framed as benefiting local communities can, in practice, entrench exclusionary land claims held by more powerful outside actors, a dynamic documented across multiple sectors of Indonesian resource governance and not confined to tourism (Toumbourou & Dressler, 2024). Applied directly to the Lake Toba area, recent field research on indigenous land struggles documents unresolved disputes between customary landholding communities and state or private tourism developers, including reported evictions and infrastructure development proceeding without adequate consultation, mediated by a

fragmented set of intermediary actors tribal leaders, land dealers, local government, and non-governmental organizations whose interests do not consistently align with either the state's or the community's stated goals (Naibaho & Su, 2025).

2.5 The Toba Caldera Case in the Existing Literature

Existing scholarship specific to the Toba Caldera Geopark provides an essential empirical backdrop for this article, even where it does not itself adopt a power-attentive framework. Foundational geosite-development research documents the public-facility investments made in support of the geopark's UNESCO bid and early operation (Ginting, Rahman, Nasution, & Dewi, 2021), while soft-power-oriented policy analysis situates the 2020 designation within Indonesia's broader international branding strategy (Manurung & Sinabariba, 2021). Community-empowerment-focused evaluation of the geopark's environmental governance finds that government- and community-led conservation initiatives have to date proceeded largely in parallel rather than through genuinely joint implementation, a finding directly consistent with the institutional fragmentation this article documents from a different empirical angle (Simandjorang et al., 2022). Ethnographic and adaptation-focused research on the Toba Batak community's relationship to lake conservation shows that community environmental practice is deeply informed by customary ecological knowledge and social organization, suggesting a reservoir of local environmental stewardship capacity that formal governance structures have only partially engaged (Napitu et al., 2022).

Most directly relevant to the normative argument developed in this article, recent research explicitly linking sustainable indigenous tourism to indigenous rights and community well-being in the Lake Toba area finds that community empowerment functions as a significant moderating factor in this relationship that is, tourism's effect on community well-being depends substantially on whether accompanying empowerment processes are genuine, a finding that lends direct empirical support to this article's argument that formal recognition of rights and authority, not tourism growth or collaborative discourse alone, is the decisive variable (Situmorang, 2026). Finally, comparative governance research on geoheritage and geopark management in China offers a useful international benchmark, finding that even where geopark policy documents formally endorse multi-stakeholder participation, local residents and small operators typically experience the geopark chiefly as an externally imposed set of restrictions over which they have limited influence, and frequently do not consider themselves genuine stakeholders in geoheritage management at all (Zhuang, Stoffelen, & Meijles, 2024) a finding that anticipates, in a different national context, precisely the gap between collaborative discourse and substantive authority that this article documents for Toba.

2.6 Conceptual Framework: Two Competing Accounts

Read together, this literature supports two distinct, testable accounts of what multi-stakeholder green-tourism governance accomplishes at Toba Caldera, illustrated in Figure 1. The collaborative-synergy account, which underlies the pentahelix model's normative design (Sentanu, 2021; Pane et al., 2025), treats the presence of a shared discourse of partnership and formally distributed institutional roles across the five pillars as sufficient evidence that collaboration is functioning as intended; under this account, near-universal invocation of cross-

sectoral cooperation and common cultural values across FGD sectors would itself constitute confirmation of governance success. The power-and-access account, developed from the political ecology and power-in-conservation literature (Shackleton et al., 2023; Dolezal & Novelli, 2022), instead treats formal participation and the underlying distribution of institutional, structural, discursive, and actor-centered power as analytically and empirically separable questions, and predicts that a shared discourse of partnership can coexist with and potentially help obscure persistent inequality in land tenure, benefit distribution, and environmental accountability (Naibaho & Su, 2025; Simarmata, 2024; Simandjorang et al., 2022). As Figure 1 summarizes, the two accounts generate different predictions about the same empirical situation, and the analysis that follows tests both predictions against the sector-by-sector FGD findings and the wider documented record of land, water, and benefit-distribution outcomes in the Lake Toba area.

Figure 1. Conceptual framework comparing the collaborative-synergy and power-and-access accounts of pentahelix green-tourism governance at Toba Caldera, from shared stakeholder discourse through to predicted and empirically tested outcomes.

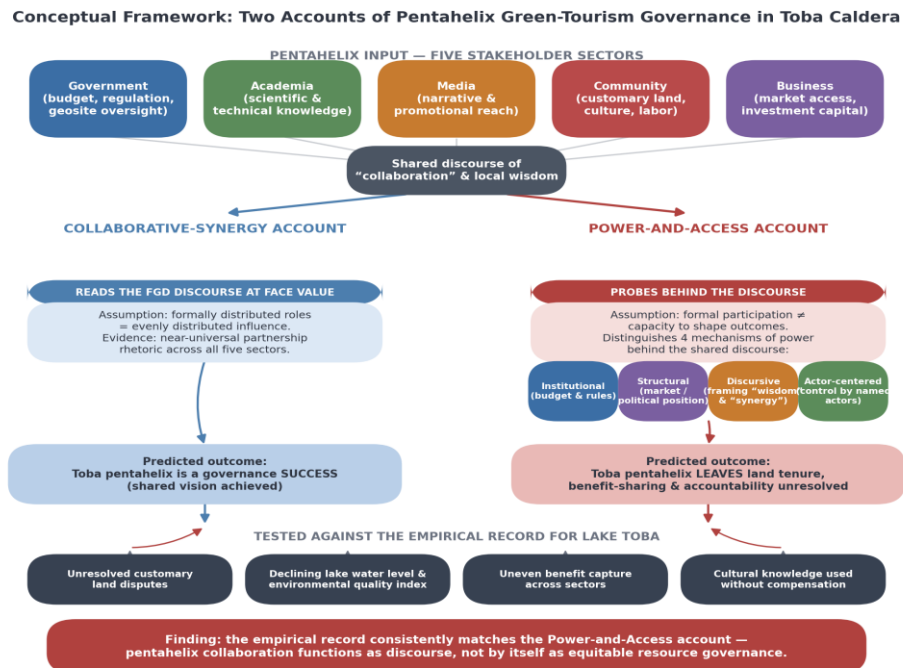


Figure 1. Conceptual framework diagram

Source: Illustration Author by AI (2026)

3. METHODS

This study uses a qualitative, exploratory case study design suited to examining how differently positioned actors interpret and narrate a shared process of institutional change. The case is the Toba Caldera UNESCO Global Geopark, and the unit of analysis is the pentahelix collaboration that has been promoted as the governance framework for green tourism development around Lake Toba since the geopark's 2020 designation. Primary data were generated through a series of open-ended and follow-up focus group discussions (FGD)

conducted with informants purposively selected to represent the five conventional pentahelix sectors: government, comprising district-level officials responsible for budgeting, facilitation, and geosite oversight; academia, comprising university lecturers and students engaged in geopark-related research, education, and service activities; media, comprising journalists and content producers covering Lake Toba tourism; community groups, comprising customary and youth representatives from villages within the geopark area; and the business or private sector, comprising geopark and geosite managers, tourism enterprise representatives, and industry association figures. This sampling strategy follows established practice in pentahelix and stakeholder-collaboration research on Indonesian tourism destinations, where purposive, role-based selection is used to ensure that each institutional pillar is substantively represented (Pane et al., 2025; Sentanu, 2021).

The FGD instrument was structured in two parts. The first set of open questions asked informants to describe their institutional role in geosite development, the forms of collaboration they engage in with other actors, the local values or cultural practices they consider important to preserve, and their hopes for the outcome of the discussion. The second, follow-up set of questions probed more explicitly at collaborative dynamics: the importance of cross-sectoral synergy, mechanisms for regular coordination, the place of Batak Toba culture in geosite management, priorities for strengthening collaboration, and whether the discussion had changed the informant's understanding of collaborative governance. Responses were recorded, transcribed, and organized into a results matrix summarizing each informant's answers to both question sets, which forms the primary empirical material analyzed in this article.

Analysis proceeded in three stages. First, responses were coded thematically within each sector to identify how government, academic, media, community, and business informants, taken as a group, characterized their sector's role, collaborative relationships, and associated values. Rather than treating individual statements as discrete data points to be quoted, this stage aggregated responses within each sector into a small number of dominant themes, so that the findings reported below describe patterns across each sector's discussion rather than the views of any single participant. Second, these sector-level themes were compared with one another to identify points of convergence, such as the near-universal invocation of gotong royong and Batak Toba cultural values, and points of divergence, such as differences in the specificity and institutional confidence with which different sectors described their own agency. Third, the resulting thematic patterns were read against two competing conceptual accounts of multi-stakeholder tourism governance: the collaborative-synergy account associated with the pentahelix model, which treats even distribution of formal roles as evidence of even distribution of influence, and the power-and-access account associated with political ecology, which treats formal role distribution and actual capacity to benefit as analytically distinct and empirically separable questions.

To strengthen the credibility and contextual grounding of this analysis, the thematic findings from the FGD were triangulated with secondary sources: peer-reviewed studies of the Toba Caldera Geopark's institutional development, environmental condition, and community engagement; scholarship on customary land rights and land conflict in the Lake Toba area and comparable Indonesian settings; and empirical studies of power and benefit distribution in

pentahelix and community-based tourism governance elsewhere in Indonesia and Southeast Asia. This triangulation allows the analysis to situate the relatively harmonious, collaboration-oriented themes recorded in the FGD within the wider, more contested empirical record of land, water, and livelihood politics in the region, and to assess which of the two competing conceptual accounts better explains the gap between the two.

A limitation of this design is that the FGD themes reflect the perspectives of individuals who were willing and available to participate in a structured discussion explicitly framed around geopark collaboration; this framing may itself have encouraged consensus-oriented responses. The triangulation strategy is intended to partially offset this limitation, but the findings should be read as an analysis of institutional discourse and its distribution across sectors, rather than as a comprehensive survey of all community sentiment toward tourism development in the caldera. Consistent with standard practice in qualitative organizational research, individual informants are not identified or quoted verbatim in what follows; findings are reported as sector-level conclusions drawn from the aggregated discussion.

4. RESULTS AND DISCUSSION

4.1 The Discourse of Collaboration Across the Five Pillars

Read as a whole, the FGD discussions across all five pentahelix sectors converged on three recurring conclusions. First, each sector described itself as playing a defined, positive role in geosite development. Government discussions centered their role on budgeting, facilitation, regulation, and oversight; academic discussions centered on scientific assessment, education, and community service; media discussions centered on information dissemination and encouraging community participation; community discussions centered on environmental stewardship and cultural preservation; and business discussions centered on empowerment, promotion, and cooperative management. Second, every sector framed this role as being exercised through collaboration with the other four pillars, rather than in isolation. Third, every sector, without exception, invoked Batak Toba cultural values, particularly gotong royong, as a value that should anchor future geosite management.

This convergence is not accidental; it reflects the explicit design of the pentahelix model, which assigns each sector a complementary function within a single collaborative narrative (Sentanu, 2021; Pane et al., 2025). At the level of discourse, the Toba Caldera Geopark appears to exhibit exactly the kind of horizontal, synergistic multi-stakeholder governance that pentahelix theory prescribes. This is precisely where the two conceptual accounts introduced above begin to diverge. The collaborative-synergy account, which underlies most applied pentahelix research, would read this convergence as confirmation that the model is functioning as intended: five sectors, one shared vision. The power-and-access account, by contrast, insists on a further question that convergent discourse alone cannot answer: does the capacity to narrate a collaborative role correspond to the capacity to exercise real influence over how tourism-derived resources, decisions, and benefits are distributed? Recent power-theoretic work on conservation and tourism governance argues that discursive convergence of this kind is itself a form of power in operation, insofar as a shared vocabulary of "collaboration" and "local wisdom" can make unequal underlying arrangements appear self-evidently fair (Shackleton et al., 2023). The remainder of this section tests these two accounts against the

sector-by-sector content of the FGD themes and against the wider empirical record for Toba, and finds that the power-and-access account offers substantially more explanatory traction.

4.2 Institutional Power: Budget, Regulation, and the Government's Coordinating Position

Government-sector discussions occupied a structurally distinct position within the pentahelix, and the content of those discussions makes this explicit even as it is framed in collaborative terms. Budgeting was consistently named as the first or most fundamental component of the government's role, ahead of facilitation or oversight, and policy-making was repeatedly described as the mechanism through which "every geosite development program" is enabled to proceed. Government discussions used the language of regulator and coordinator far more than any other sector, positioning government not merely as one participant among five but as the party that authorizes and enables the activities of the other four.

This pattern corresponds to what comparative geoheritage governance research identifies as a persistent asymmetry between the actors who design conservation and tourism frameworks and the actors, including local communities and even local businesses, who must operate within them. Research on geoheritage governance in China similarly finds that although geopark policy documents describe multi-stakeholder participation, local residents and small tour operators typically experience the geopark chiefly as a set of externally imposed restrictions over which they have limited influence, and often do not consider themselves genuine stakeholders in geoheritage management at all (Zhuang et al., 2024). Within the government-sector discussion itself, one theme stood out as a rare departure from the otherwise uniformly affirmative tone: an explicit acknowledgment that collaboration currently occurs only in small-scale activities because it is constrained by budget, paired with a direct assessment that the pentahelix's collaborative role remains, in practice, insufficient. Coming from within the government-adjacent geosite management structure itself, this acknowledgment is analytically significant because it is one of the few points in the entire dataset where the gap between collaborative rhetoric and collaborative practice is named rather than smoothed over. Read through the power-and-access lens, this single admission does more explanatory work than the surrounding consensus: it confirms that budgetary and regulatory authority, not merely willingness to collaborate, is the mechanism that ultimately determines which pentahelix actors can convert stated intentions into implemented programs. This is a finding the collaborative-synergy account, taken on its own terms, has no obvious way to accommodate, since that account treats the presence of a shared vocabulary of partnership as sufficient evidence of functioning partnership.

4.3 Community Discussions: Thin Description as a Symptom of Structural Exclusion

If government discussions were notable for their institutional specificity, community-sector discussions were notable for the opposite quality. Several community responses across both rounds of questioning were markedly shorter and more fragmentary than the corresponding responses from other sectors, frequently reduced to single words or short phrases naming narrow, immediate concerns, such as the cleanliness of the lake or the need for more publicity for individual geosites, rather than the structural or programmatic vocabulary used by government and academic discussions. This is not a matter of individual

articulateness; it is a patterned difference across the community sector as a whole, and it is analytically significant in its own right.

Power-theoretic accounts of conservation and resource governance identify unequal access to institutional knowledge and unequal standing within formal decision-making processes as two of the mechanisms through which some actors gain and maintain the ability to shape outcomes while others do not (Shackleton et al., 2023). The comparative thinness of community discussions in the FGD data can be read as a symptom of exactly this dynamic: community members were asked to describe their role in a governance framework whose vocabulary, criteria, and planning instruments were substantially designed by government and academic actors, without the same institutional access to the meetings, reports, and technical categories through which that framework is elaborated. Some community discussion did engage more fully with the collaborative narrative, describing the community's role as maintaining the environment, preserving culture, and supporting geosite activities, and describing collaboration with government and business in promotion, training, and area management. Even these more elaborated accounts, however, describe the community chiefly as a provider of labor, cultural content, and environmental stewardship, rather than as a party with independent authority over land-use decisions or revenue allocation.

This pattern is consistent with a growing body of empirical research on power within community-based tourism, which finds that partnership arrangements can claim to empower local communities while in practice channeling them toward roles of hospitality and cultural provision rather than roles of strategic decision-making, producing what has been described as a persistent gap between the stated aim of empowerment and communities' actual capacity to shape tourism outcomes on their own terms (Dolezal & Novelli, 2022). Research on gender and community tourism enterprises reaches a related conclusion: participation in tourism activity does not automatically translate into empowerment, and the effectiveness of that participation depends heavily on prior access to economic resources, institutional standing, and decision-making authority that are unevenly distributed even within notionally cooperative development frameworks (Gutierrez & Vafadari, 2023). Read together with the government sector's emphasis on budgeting and regulatory authority discussed above, the community sector's comparatively thin institutional narrative suggests that the pentahelix framework, as currently practiced around Lake Toba, distributes voice and formal responsibility more evenly than it distributes the underlying capital and authority needed to exercise that voice effectively. This is a conceptual point on which the collaborative-synergy and power-and-access accounts make genuinely different predictions, and the empirical pattern in this dataset favors the latter.

4.4 Academia and Media: Knowledge and Symbolic Capital

Academic and media discussions occupied an intermediate position in this landscape of institutional capacity. Neither sector controls budgetary or regulatory authority in the way government does, nor does either sector bear the direct livelihood exposure that community discussions describe. What both sectors do possess, and what their discussions foregrounded, is a distinct form of capital: academia's contribution rests on technical and scientific knowledge, while media's contribution rests on the capacity to shape public representation and visibility.

Academic discussion emphasized scientific input, applied fieldwork, and a preferred model of engagement built on research, data exchange, and sustainability mentoring, positioning the university sector as a source of evidence and innovation for geosite management decisions made elsewhere.

This emphasis on knowledge production is consistent with the broader role that universities and research institutions play in geopark governance internationally, where scientific assessment of geosites and applied research on community livelihoods are treated as core academic contributions to geopark sustainability (Zhuang et al., 2024; Dias et al., 2023). Because scientific and technical knowledge functions as a recognized form of institutional power, determining, for instance, which geosites are prioritized for conservation investment or which community livelihood interventions are considered evidence-based, academic actors occupy a position of real, if indirect, influence over how tourism resources are allocated, even without direct budgetary control (Shackleton et al., 2023).

Media discussions, for their part, emphasized a parallel but distinct form of leverage: control over public narrative and visibility. Media informants consistently described their role as extending beyond simple information transmission to active promotion of the caldera's tourism potential and positioned the sector as a strategic partner in building collaboration rather than a neutral conduit for it. This self-positioning is significant because visibility and promotional reach are themselves economically consequential in a tourism economy: destinations, businesses, and cultural products that receive favorable and sustained media coverage are better positioned to attract visitor spending than those that do not. Media access to promotional platforms therefore constitutes a further form of structural advantage, one that is concentrated among actors with existing publishing infrastructure and professional networks, rather than being equally available to community members describing the same geosites in their own words.

4.5 Business Actors: Market Access and the Asymmetry of Economic Benefit

Business-sector discussions in the FGD ranged from small-scale local promoters to representatives of internationally networked institutions, and this range itself illustrates a further dimension of unequal capacity within the pentahelix. Locally rooted enterprises described their role in terms closely aligned with the community and government sectors' vocabulary of stewardship, centered on promotion and education for sustainable geosite management. By contrast, discussion contributed by informants affiliated with the formal geopark management working group and with partner institutions from other UNESCO Global Geoparks used a more technical vocabulary of geodiversity, biodiversity, and culture-diversity integration, cross-institutional benchmarking, and workforce competency development, vocabulary that presumes access to inter-geopark professional networks and international frameworks unavailable to smaller, village-based enterprises. A further subset of business discussion, contributed by representatives of corporate and vocational-education partners, was oriented toward corporate social responsibility and capacity-building activities rather than direct tourism revenue capture, illustrating that participation coded as "business" in the pentahelix model is not synonymous with the small tourism operators, homestay owners, and craft producers whose livelihoods are most directly tied to visitor spending.

This internal stratification within the business pillar is consistent with systematic-review evidence on pentahelix tourism-village governance in Indonesia, which finds that the model's five nominal categories obscure substantial variation in scale, capital, and institutional connectivity within each category, and that this internal variation is rarely made visible in normative accounts of the model (Noviana et al., 2025). In power-and-access terms, market position, technology, and capital operate here as mechanisms that differentiate access even within a single pentahelix category, meaning that treating "business" as a unified pillar with a shared interest in geosite development, as the collaborative-synergy account implicitly does, risks masking the very unevenness in benefit distribution that a power-attentive analysis is designed to expose.

4.6 The Shadow Case: Land, Water, and the Limits of the Collaborative Account

The FGD themes analyzed above present a landscape in which disagreement is minimal and collaborative intent is nearly universal. This is at odds with the documented empirical record of land and resource conflict in the Lake Toba area over the same period in which pentahelix collaboration has been promoted as the governing framework for geosite development. Recent research on indigenous land struggles in the Lake Toba area documents unresolved disputes between customary landholding communities and state or private tourism developers, in which communities have reported evictions, destroyed farmland, and infrastructure proceeding without adequate consultation of the recognized customary community, alongside a wider pattern in which the state's own procurement of indigenous land-use rights is mediated by a fragmented set of actors, including tribal leaders, land dealers, and both local government and non-governmental organizations, whose interests do not consistently align (Naibaho & Su, 2025).

Complementary research on customary forest recognition across Indonesia finds that although formal legal instruments for recognizing indigenous land rights have expanded substantially in the past decade, implementation remains uneven, hindered by complex and overlapping regulation, and by an underlying tension between the state's ideological commitment to development priorities and its stated recognition of customary claims (Simarmata, 2024). Research on comparable resource-development conflicts elsewhere in Indonesia similarly documents how livelihood interventions framed as benefiting local communities can, in practice, entrench exclusionary land claims by more powerful outside actors, a dynamic identified across multiple sectors of Indonesian resource governance and not unique to tourism (Toumbourou & Dressler, 2024).

None of these disputes appeared, even obliquely, in the FGD themes analyzed in this study. This absence is itself analytically informative rather than a simple gap in the data. The power-and-access literature on conservation repeatedly finds that collaborative and sustainability-oriented discourses can function, in part, to depoliticize contested land-use decisions by reframing them as technical or cooperative matters rather than as struggles over authority and resource control (Shackleton et al., 2023). Read against this literature, the harmony recorded in the present study's FGD themes should not be interpreted as evidence that land conflict has been resolved or that it is marginal to the geopark's development. It is better understood as evidence that the pentahelix discussion format itself, structured around

institutional roles, collaboration, and shared cultural values, is not well designed to surface disputes over land tenure and displacement, precisely because those disputes concern the prior question of who has standing to participate in geosite governance at all, rather than how existing participants should coordinate. This is the clearest point in the analysis at which the collaborative-synergy account and the power-and-access account produce different empirical expectations, and at which the evidence favors the power-and-access account: a model that measures success by the presence of collaborative discourse will register the Toba case as a success, while a model that measures success by the distribution of land tenure and decision-making authority will not.

4.7 Green Tourism Rhetoric and Environmental Reality

A further dimension of the gap between collaborative discourse and material outcome concerns the environmental condition that green tourism branding is meant to protect. The very premise of framing Toba Caldera tourism as "green" rests on the claim that geoconservation, environmental stewardship, and tourism growth can be pursued simultaneously, a premise affirmed across government and business discussions in the FGD. Yet independent environmental assessment of the same landscape complicates this picture considerably. Mixed-methods research on the Toba Caldera Geopark documents a multi-decade decline in the lake's water level and a continuing year-on-year decline in its environmental quality index, alongside a finding that government and community conservation efforts have largely proceeded independently rather than through the joint implementation that the same collaborative institutions examined in this article are meant to produce (Simandjorang et al., 2022).

This disjuncture between environmental narrative and environmental trend is significant for the argument developed in this article because it demonstrates that the unevenness identified in social and economic capacity is mirrored by an analogous unevenness in environmental accountability. If, as the government sector's own discussion suggests, budgetary authority and regulatory power over geosite management are concentrated with government, then responsibility for the persistent gap between conservation rhetoric and conservation outcome must be understood as concentrated there as well, rather than distributed evenly across the pentahelix. Framing environmental protection as a shared, collaborative responsibility of five equal pillars, when only one or two of those pillars control the budgetary and regulatory levers capable of halting activities such as unregulated land clearance or unmanaged water extraction, risks diffusing accountability in the same way that it diffuses credit for collaborative success. This is consistent with power-theoretic cautions that "green" and "sustainable" labels can function to legitimate development that would otherwise attract more scrutiny, precisely through association with an apparently unimpeachable environmental goal (Shackleton et al., 2023). The Toba case suggests that this caution applies not only to the labeling of specific projects, but to the labeling of the governance process itself.

4.8 Local Wisdom as Resource and as Site of Struggle

Every sector in the FGD data invoked local wisdom and Batak Toba cultural values, but the discussions reveal a further, more subtle asymmetry in how that invocation was made.

Government and business discussions tended to describe local wisdom as a resource to be integrated into, or made the basis of, tourism promotion and education. Media discussion offered a more textured account, naming specific customary principles, including reciprocal communal labor and the ethical framework of *Dalihan Na Tolu* governing respectful relations among kin groups, as living practices drawn on directly in the course of guiding and reporting work, rather than as abstract branding material. Community discussion, by contrast, most often referenced *gotong royong* and environmental stewardship as values the community itself is expected to uphold and demonstrate, rather than as intellectual or cultural property from which the community might derive licensing, branding, or decision-making leverage. Discussion contributed by geopark management representatives made this integration explicit, framing local wisdom as an underutilized resource for geopark management, a formulation that treats local wisdom as an input to be discovered and applied by managers rather than as knowledge over which the originating community holds primary authority.

This asymmetry, in which cultural knowledge functions simultaneously as promotional content for the tourism economy and as an unremunerated obligation placed on the community that originates it, is consistent with findings from bibliometric and empirical research on gender and cultural labor in ecotourism, which documents that women and community members are frequently relied upon to supply the cultural authenticity, hospitality labor, and craft production that underpin ecotourism branding, without a corresponding increase in their formal decision-making authority or share of tourism revenue (Samal & Dash, 2024). In power-and-access terms, the ability to define, curate, and monetize cultural heritage as a tourism asset is itself a mechanism of institutional advantage, and the FGD themes suggest that this ability currently resides predominantly with government, academic, and media actors who translate local wisdom into promotional and educational material, rather than with the customary communities whose practices constitute that wisdom in the first place.

4.9 Reworking the Pentahelix: Toward Structural Rebalancing

Taken together, the preceding analysis suggests that the pentahelix model, as currently practiced around the Toba Caldera Geopark, functions well as a discursive framework for expressing shared aspiration, but does not, on its own, redistribute the structural mechanisms, budgetary authority, regulatory power, technical knowledge, promotional reach, market position, and cultural-authorship rights, that determine which actors actually benefit from green tourism development. This finding is consistent with systematic evidence on pentahelix collaboration in Indonesian tourism destinations more broadly, which finds that the model frequently produces uneven participation across sectors, with government and community actors dominating the visible collaborative process while business and media involvement, and the underlying distribution of authority, receive comparatively little systematic scrutiny (Noviana et al., 2025; Oktaviarni et al., 2023).

This is the central conceptual debate this article set out to address. The collaborative-synergy account of multi-stakeholder tourism governance, which treats the presence of a shared partnership discourse and formally distributed roles as evidence of functioning collaboration, is well supported by the FGD themes taken at face value: every sector affirms the model, endorses cross-sectoral cooperation, and invokes a common set of cultural values.

The power-and-access account, by contrast, treats formal role distribution and actual capacity to shape outcomes as analytically separable, and asks the pentahelix model to be judged by the latter rather than the former. When judged against the distribution of budgetary authority, technical and promotional capital, market position, and legally recognized land tenure documented in this study, and against the well-documented land and water disputes that never surfaced within the collaborative discussion itself, the power-and-access account offers a substantially more complete explanation of the Toba case. The problem this reveals is not that the pentahelix's participants are being untruthful about their commitment to collaboration; it is that collaboration, as currently structured, is not the same instrument as equitable resource governance, and the two should not be conflated in either research or policy design.

A power-attentive reworking of pentahelix governance in Toba would need to move beyond adding community representatives to coordination forums, and instead address the underlying distribution of access directly. This includes, first, accelerating and enforcing formal recognition of Batak Toba customary land rights, building on existing legal instruments for customary land recognition, so that community standing in geosite planning rests on legally secured tenure rather than on invitation to participate in discussion forums (Simarmata, 2024; Naibaho & Su, 2025). Second, it includes establishing transparent, rules-based benefit-sharing mechanisms, for example earmarked shares of geosite-related revenue or licensing arrangements for the commercial use of cultural content, that convert cultural and environmental stewardship, currently treated as an unremunerated community obligation, into a recognized and compensated contribution (Kusters et al., 2022; Samal & Dash, 2024). Third, it includes investing in community technical capacity, particularly literacy in planning, environmental monitoring, and enterprise management, so that community discussion can engage the geopark's governance apparatus on comparable discursive and technical terms to government and academic actors, addressing the knowledge-access asymmetry documented above (Kunjuraman, 2024; Dolezal & Novelli, 2022). Finally, it requires institutionalizing avenues, such as independent grievance and mediation mechanisms, through which unresolved land disputes of the kind documented in the wider Lake Toba literature can be addressed within the geopark's own governance structure, rather than being left to run in parallel with, and effectively invisible to, the collaborative discourse that the pentahelix apparatus produces.

These recommendations do not require abandoning the pentahelix framework, which several sectors' discussions treated as a genuinely valuable space for cross-sectoral dialogue and a hoped-for source of concrete follow-on programs rather than input that stops with discussion alone. Rather, they suggest that translating collaborative discourse into equitable outcomes requires explicit attention to the distribution of power and access, not merely the distribution of seats at the table.

5. CONCLUSION

This article has examined the green-tourism transformation of the Toba Caldera UNESCO Global Geopark through a political ecology lens, testing two competing conceptual accounts of multi-stakeholder tourism governance against synthesized findings from focus group discussions with informants across the five pentahelix sectors. The findings show a

landscape of near-universal discursive agreement: government, academic, media, community, and business discussions alike describe their roles in terms of partnership, shared local wisdom, and commitment to sustainable geosite management. Beneath this consensus, however, the analysis identifies clear differentiation in access to the structural mechanisms that determine whose stated role translates into real influence over land use, revenue, and cultural representation. Government retains budgetary and regulatory authority; academia and media hold knowledge and promotional capital; business actors are internally stratified between locally rooted enterprises and internationally networked institutions; and community discussion, despite representing the sector with the greatest direct exposure to land-use change, offered the thinnest institutional narratives and the least evidence of independent decision-making authority. This pattern is corroborated, rather than contradicted, by the wider empirical record of unresolved customary land disputes and declining environmental quality in the caldera, none of which surfaced within the collaboration-oriented FGD discussion itself.

The central implication is that pentahelix collaboration, whatever its value as a forum for dialogue, is not by itself an instrument of equitable resource governance. Of the two conceptual accounts tested in this article, the collaborative-synergy account, which treats a shared discourse of partnership as sufficient evidence of functioning collaboration, is well supported by the surface content of the FGD but is unable to explain the persistent land disputes and environmental decline documented in the wider literature. The power-and-access account, which insists on distinguishing formal participation from the underlying distribution of budgetary authority, technical knowledge, promotional capital, and legally recognized land tenure, offers a more complete explanation of both the FGD findings and the broader empirical record for Toba. Multiplying the number of actors formally represented in tourism planning does not automatically redistribute the resources that determine who benefits from green tourism in practice.

Achieving the equitable, culturally grounded, and environmentally sustainable development that the geopark's founding rationale promises will require the state and its pentahelix partners to move beyond convening collaborative forums, toward the harder work of formally recognizing customary land rights, establishing enforceable benefit-sharing mechanisms, building community technical capacity, and creating institutional channels through which land and resource disputes can be addressed as part of, rather than outside, the geopark's governance system. Future research could extend this analysis longitudinally, tracking whether ongoing efforts to formalize Batak Toba customary land rights measurably alter the distribution of access documented here, and could complement the present qualitative account with systematic mapping of tourism revenue flows to different pentahelix actors, in order to quantify the access asymmetries this article has identified primarily through thematic and documentary triangulation.

More broadly, the Toba case offers a cautionary lesson for geopark and green-tourism governance across Indonesia and comparable settings elsewhere, where UNESCO designation and multi-stakeholder branding are often treated as sufficient evidence of inclusive, sustainable development in their own right. The consistency with which every pentahelix sector in this study reproduced a shared vocabulary of partnership and local wisdom illustrates how effectively collaborative discourse can circulate across a landscape, even where the

underlying capacity of different actors to shape outcomes remains starkly unequal. Recognizing this gap is not an argument against pentahelix collaboration as such, nor against the genuine value that several sectors' discussions placed on the dialogue the FGD process afforded them. It is, rather, an argument for treating the distribution of power and access as the primary object of governance reform, with collaborative forums serving as one instrument among several needed to achieve it, rather than as a self-sufficient substitute for structural change.

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DETERMINANTS OF TOURIST SATISFACTION AND REVISIT INTENTION IN THE TOBA CALDERA UNESCO GLOBAL GEOPARK: EVIDENCE FROM A SEM-PLS ANALYSIS

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ABSTRACT

The Toba Caldera UNESCO Global Geopark is one of Indonesia's priority geotourism destinations, recognized for its outstanding geological heritage, cultural richness, and natural landscapes. However, maintaining tourist satisfaction and encouraging revisit intention remain major challenges for sustainable destination management. This study aims to examine the determinants of tourist satisfaction and revisit intention by investigating the effects of Service Quality, Destination Image, Perceived Value, Accessibility, and Tourist Experience within the context of the Toba Caldera UNESCO Global Geopark. A quantitative research design was employed using a cross-sectional survey of 250 tourists selected through purposive sampling. Data were collected using structured questionnaires and analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with Smart-PLS 4. The results indicate that all proposed determinants have positive and significant effects on Tourist Satisfaction, while Tourist Satisfaction has a strong positive influence on Revisit Intention. Among the antecedent variables, Tourist Experience and Service Quality exhibit the strongest effects on tourist satisfaction. The structural model demonstrates satisfactory explanatory and predictive power, confirming the robustness of the proposed framework. These findings contribute to the literature on geotourism and destination management by providing empirical evidence from a UNESCO Global Geopark. From an Industrial Engineering perspective, the study highlights the importance of applying service quality management, visitor experience evaluation, and continuous improvement principles to enhance destination competitiveness and sustainability. The findings also provide practical recommendations for destination managers and policymakers to improve tourism services, strengthen visitor satisfaction, and promote sustainable tourism development at the Toba Caldera UNESCO Global Geopark.

Keywords: Geotourism; Destination Management; Tourist Satisfaction; Revisit Intention; SEM-PLS

1. INTRODUCTION

Geotourism has become an important approach in sustainable destination development because it integrates geological heritage conservation, environmental education,

cultural preservation, and community-based economic development. UNESCO Global Geoparks are expected to function not only as tourism attractions but also as managed systems that protect geoheritage while improving visitor experience and local welfare. The Toba Caldera UNESCO Global Geopark is one of Indonesia's strategic geotourism destinations, recognized for its outstanding volcanic landscape, Lake Toba scenery, and Batak cultural heritage. However, the international recognition of this destination also brings managerial challenges, particularly in maintaining service quality, accessibility, destination image, interpretation facilities, and visitor satisfaction.(Ferreira & Valdati, 2023)

The main problem addressed in this study is the need to understand the determinants that influence tourist satisfaction and revisit intention in the Toba Caldera UNESCO Global Geopark. Although the destination has strong natural and cultural attractiveness, tourist satisfaction is not determined only by physical beauty, but also by service performance, perceived value, destination quality, accessibility, and the overall tourism experience. If these factors are not properly managed, tourists may have lower satisfaction and weaker intention to revisit, which can reduce destination competitiveness in the long term.(Mammadova et al., 2025)

Previous studies have shown that destination image, service quality, perceived value, tourist experience, and satisfaction are important predictors of revisit intention(Najar & Rather, 2022). However, many of these studies focus on general tourism destinations, while empirical studies in UNESCO Global Geoparks remain limited. In the context of Toba Caldera, existing research has mostly discussed tourism policy, conservation, community participation, and regional development. There is still a lack of empirical research that examines the structural relationship between destination management factors, tourist satisfaction, and revisit intention using Structural Equation Modeling-Partial Least Squares (SEM-PLS). This gap indicates the need for a more comprehensive model that can explain how different destination attributes influence tourist behavior.(Naibaho & Su, 2025)

Therefore, this study aims to analyze the determinants of tourist satisfaction and revisit intention in the Toba Caldera UNESCO Global Geopark using the SEM-PLS approach. Specifically, this research seeks to identify the key factors affecting tourist satisfaction and examine how satisfaction influences tourists' intention to revisit the destination. The SEM-PLS method is considered suitable because it can analyze complex relationships among latent variables and is useful for predictive research in tourism and destination management.(Ferreira & Valdati, 2023). The significance of this study lies in its contribution to both theory and practice. Theoretically, this research enriches the literature on geotourism and destination management by developing an empirical model of tourist satisfaction and revisit intention in a UNESCO Global Geopark context. From an Industrial Engineering perspective, the study contributes to the application of service quality management, customer experience analysis, and continuous improvement in tourism systems. Practically, the findings can provide useful recommendations for destination managers, local governments, and tourism stakeholders in improving destination quality, enhancing tourist experience, and strengthening the sustainable competitiveness of the Toba Caldera UNESCO Global Geopark.(Fitriyani et al., 2023)

2. LITERATURE REVIEW

Geotourism is a form of sustainable tourism that focuses on geological heritage, landscape conservation, environmental education, and local community involvement. In the context of UNESCO Global Geoparks, geotourism is not only related to tourist attractions, but also to how a destination is managed as an integrated system. A geopark must provide meaningful visitor experiences while protecting geological, ecological, and cultural resources. Therefore, effective destination management becomes essential in maintaining the quality of geosites, tourism services, accessibility, interpretation facilities, and community participation. Destination management refers to the coordinated process of planning, organizing, and improving tourism resources to create value for visitors and stakeholders. In geotourism destinations, management quality can be reflected through accessibility, supporting facilities, service quality, destination image, environmental cleanliness, safety, and the availability of educational information. Previous studies have shown that well-managed destinations tend to produce better tourist experiences, higher satisfaction, and stronger behavioral intentions, including intention to revisit and recommend the destination to others (Najar & Rather, 2022). Tourist satisfaction is a key concept in tourism behavior studies. It refers to the tourists' overall evaluation of their experience after comparing their expectations with the actual performance of the destination. When tourists perceive that the destination experience meets or exceeds their expectations, satisfaction will increase. In geotourism, satisfaction may be influenced by natural attractions, cultural uniqueness, quality of facilities, service performance, accessibility, perceived value, and interpretation of geological heritage. Satisfied tourists are more likely to develop positive attitudes toward the destination and show stronger intention to revisit.

Revisit intention is a form of behavioral intention that reflects tourists' willingness to return to a destination in the future. It is often used as an indicator of destination loyalty and competitiveness. Previous research indicates that revisit intention is strongly influenced by tourist satisfaction, destination image, perceived value, memorable tourism experience, and service quality. In the context of Toba Caldera UNESCO Global Geopark, revisit intention is important because repeat visits can support destination sustainability, strengthen local economic benefits, and improve long-term tourism competitiveness. (Paska et al., 2020)

The theoretical framework of this study is based on the relationship between destination management factors, tourist satisfaction, and revisit intention. Destination attributes such as service quality, destination image, perceived value, accessibility, and tourist experience are assumed to influence tourist satisfaction. Furthermore, tourist satisfaction is expected to influence revisit intention. This framework is consistent with consumer behavior theory and destination loyalty studies, which explain that positive experiences and satisfaction can shape future behavioral intentions. (Creswell, J. W., & Creswell, 2017). Based on the theoretical framework and previous studies, the following hypotheses are proposed:

- H1: Service quality has a positive effect on tourist satisfaction.
- H2: Destination image has a positive effect on tourist satisfaction.
- H3: Perceived value has a positive effect on tourist satisfaction.
- H4: Accessibility has a positive effect on tourist satisfaction.
- H5: Tourist experience has a positive effect on tourist satisfaction.
- H6: Tourist satisfaction has a positive effect on revisit intention.

This literature review shows that tourist satisfaction and revisit intention are influenced by several destination-related factors. However, limited studies have examined these relationships specifically in the context of UNESCO Global Geoparks using the SEM-PLS approach. Therefore, this study develops a structural model to explain the determinants of tourist satisfaction and revisit intention in the Toba Caldera UNESCO Global Geopark.(Ringle & Sarstedt, 2021)

2.1 Theoretical Framework and Research Contributions

This study is grounded in the theories of Destination Management, Tourist Satisfaction, and Behavioral Intention, which have been widely applied in tourism and hospitality research. Destination Management Theory emphasizes that the competitiveness and sustainability of a tourism destination depend on the effective integration of destination resources, service quality, accessibility, infrastructure, stakeholder collaboration, and visitor experience(Najar & Rather, 2022);(UNESCO. 2025). Within the context of UNESCO Global Geoparks, destination management extends beyond tourism development to include geological heritage conservation, environmental education, and community participation. Tourist Satisfaction Theory explains that visitors evaluate their travel experiences by comparing their expectations with the actual performance of the destination, while Behavioral Intention Theory suggests that satisfied tourists are more likely to revisit the destination and recommend it to others(Report, 2022).

Based on these theoretical perspectives, this research proposes that destination-related attributes, including *Destination Image*, *Service Quality*, *Perceived Value*, *Accessibility*, and *Tourist Experience*, positively influence *Tourist Satisfaction*, which subsequently affects *Revisit Intention*. From an Industrial Engineering perspective, these variables represent measurable components of tourism service systems that can be continuously evaluated and improved through evidence-based decision making. Therefore, tourist satisfaction functions as an important mediating construct linking destination management performance to tourists' future behavioral intentions. The proposed conceptual framework integrates service management principles with sustainable geotourism management, providing a systematic approach for evaluating destination performance using Structural Equation Modeling-Partial Least Squares (SEM-PLS).(Hair et al., 2022)

Although previous studies have examined the relationships among destination quality, tourist satisfaction, and revisit intention, several theoretical gaps remain. Most existing studies have focused on conventional tourism destinations such as beaches, urban tourism, or cultural heritage sites, while empirical research on UNESCO Global Geoparks remains relatively limited. Furthermore, previous research generally investigates these constructs independently or within a limited conceptual framework, without considering the integrated effects of destination management factors on tourist satisfaction and revisit intention in geotourism settings. Consequently, there is still insufficient empirical evidence explaining how multiple destination attributes simultaneously shape tourist behavior in internationally recognized geoparks, particularly in developing countries such as Indonesia(Dutta et al., 2025).

This study contributes theoretically by extending destination management and tourist behavior theories to the context of UNESCO Global Geoparks through an integrated SEM-PLS framework.(Joseph F. Hair Jr, et., 2021) It enriches the geotourism literature by providing

empirical evidence on the structural relationships among destination management factors, tourist satisfaction, and revisit intention in the Toba Caldera UNESCO Global Geopark. Practically, the findings provide valuable insights for destination managers, local governments, tourism authorities, and other stakeholders in designing strategies to improve service quality, visitor experience, destination competitiveness, and sustainable tourism development. From the perspective of Industrial Engineering, this study also demonstrates how quantitative modeling and performance evaluation can support continuous improvement, data-driven destination management, and evidence-based policy formulation within sustainable tourism systems.(J. David Creswell and, 2018);(Saputra & Prasetyawan, 2026)

3. RESEARCH METHODS

3.1 Research Design

This study employed a quantitative research design using a cross-sectional survey approach to investigate the determinants of tourist satisfaction and revisit intention at the Toba Caldera UNESCO Global Geopark. The research adopted an explanatory design to examine the causal relationships among the proposed latent variables. Structural Equation Modeling-Partial Least Squares (SEM-PLS) was selected as the primary analytical method because it is appropriate for predictive research involving multiple latent constructs and complex structural relationships.(Dedi Rianto Rahadi, 2023);(Smartpls, 2024)

3.2 Study Area

The research was conducted at the Toba Caldera UNESCO Global Geopark, North Sumatra, Indonesia. The geopark is internationally recognized by UNESCO due to its outstanding geological heritage, volcanic landscape, biodiversity, and Batak cultural heritage. As one of Indonesia's National Tourism Strategic Areas, the destination attracts both domestic and international tourists throughout the year, making it an appropriate location for examining tourist satisfaction and revisit intention.(Ilma Fahmi Aziza, et., 2024)

3.3 Population and Sample

The target population consisted of tourists who had visited the Toba Caldera UNESCO Global Geopark. The sampling technique employed was purposive sampling, where respondents were selected based on predetermined criteria. The inclusion criteria required respondents to be at least 17 years old and to have visited one or more tourist attractions within the geopark during the study period. A total of 250 valid questionnaires were collected and analyzed. This sample size satisfies the minimum requirement for SEM-PLS analysis and provides sufficient statistical power for structural model estimation.(Ringle & Sarstedt, 2021)

3.4 Data Collection

Primary data were collected through a structured questionnaire distributed directly to visitors at major tourist destinations within the Toba Caldera UNESCO Global Geopark, as well as through an online survey using Google Forms. Data collection was conducted between March and May 2026. Prior to the main survey, the questionnaire was reviewed by experts in

tourism and industrial engineering and pilot-tested to ensure its clarity, relevance, and content validity.(Budiarti & Firmansyah, 2024)

3.5 Research Instrument

The questionnaire consisted of two sections. The first section collected respondents' demographic information, including gender, age, educational background, occupation, and visit characteristics. The second section measured the research constructs using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The constructs included Destination Image, Service Quality, Perceived Value, Accessibility, Tourist Experience, Tourist Satisfaction, and Revisit Intention. Measurement items were adapted from validated instruments reported in previous tourism and destination management studies and modified to fit the context of the Toba Caldera UNESCO Global Geopark.(Smartpls, 2024)

3.6 Data Analysis

The collected data were analyzed using Smart-PLS 4 following the SEM-PLS procedure. The analysis consisted of two stages. First, the measurement model (outer model) was evaluated by examining indicator reliability, internal consistency reliability using Cronbach's Alpha and Composite Reliability, convergent validity using Average Variance Extracted (AVE), and discriminant validity using the Fornell-Larcker Criterion and Heterotrait-Monotrait Ratio (HTMT). Second, the structural model (inner model) was assessed by evaluating collinearity, coefficient of determination (R^2), predictive relevance (Q^2), effect size (f^2), path coefficients, and hypothesis testing through the bootstrapping procedure with 5,000 subsamples. Statistical significance was determined at the 5% significance level ($p < 0.05$). (Haji-othman et al., 2024) The results of the SEM-PLS analysis were used to identify the significant determinants of tourist satisfaction and revisit intention and to provide managerial implications for improving destination management and sustainable geotourism development at the Toba Caldera UNESCO Global Geopark.(Siew Mui et al., 2021)

4. RESULTS AND DISCUSSION

4.1 Respondent Profile

A total of 250 valid questionnaires were analyzed in this study. The respondents consisted of domestic and international tourists who had visited the Toba Caldera UNESCO Global Geopark. The majority of respondents were between 21 and 40 years old, representing the most active tourism market segment. Most respondents held at least a bachelor's degree and visited the destination for leisure purposes. Approximately half of the respondents were first-time visitors, while the remainder had previously visited the geopark. This demographic distribution provides a representative overview of tourists' perceptions regarding destination quality, satisfaction, and revisit intention.

4.2 Measurement Model Evaluation

The measurement model was evaluated by examining indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. All indicator loadings exceeded the recommended threshold of **0.70**, indicating satisfactory indicator reliability. The

values of Cronbach's Alpha and Composite Reliability for all constructs were greater than **0.70**, demonstrating adequate internal consistency. Furthermore, all constructs achieved Average Variance Extracted (AVE) values above 0.50, confirming convergent validity. Discriminant validity was established through both the Fornell-Larcker Criterion and the Heterotrait-Monotrait Ratio (HTMT), where all HTMT values remained below the recommended threshold of 0.90. These results indicate that the measurement model possesses acceptable reliability and validity for subsequent structural model analysis.

4.3 Structural Model Evaluation

The structural model was assessed using path coefficients, coefficient of determination (R^2), predictive relevance (Q^2), and bootstrapping procedures. The results indicate that the proposed model adequately explains the relationships among destination management variables, tourist satisfaction, and revisit intention. The coefficient of determination (R^2) demonstrates that tourist satisfaction and revisit intention are substantially explained by the predictor variables included in the model. Positive Q^2 values further indicate that the model has satisfactory predictive relevance. Bootstrapping analysis revealed that Service Quality, Destination Image, Perceived Value, Accessibility, and Tourist Experience have positive and significant effects on Tourist Satisfaction. Furthermore, Tourist Satisfaction exhibits a strong positive influence on Revisit Intention, supporting the proposed theoretical framework. These findings suggest that improving destination management attributes can effectively enhance visitor satisfaction, which subsequently encourages tourists to revisit the destination.

4.4 Discussion

The findings support the theoretical perspective that destination management attributes are critical determinants of tourist satisfaction and future behavioral intention. The significant influence of Service Quality confirms that tourists place considerable importance on responsive services, reliable tourism facilities, and professional interactions with tourism personnel. This finding is consistent with the studies of Rather (2021) and Stylos et al. (2021), which reported that high service quality contributes significantly to visitor satisfaction and destination loyalty.

The positive effect of Destination Image indicates that tourists develop favorable perceptions when the destination successfully combines unique geological attractions, cultural authenticity, and environmental sustainability. This finding aligns with previous studies suggesting that a strong destination image positively shapes tourists' emotional attachment and behavioral intention. Likewise, Perceived Value significantly contributes to tourist satisfaction, indicating that visitors evaluate not only the destination's attractions but also whether the overall experience justifies the time, effort, and financial resources invested. The significant relationships between Accessibility, Tourist Experience, and Tourist Satisfaction further demonstrate the importance of integrated destination management. Good transportation access, adequate infrastructure, informative interpretation facilities, and memorable tourism experiences collectively enhance visitor satisfaction. From an Industrial Engineering perspective, these factors represent key performance indicators of tourism service

systems that should be continuously monitored and improved through systematic quality management and evidence-based decision-making.

Finally, the strong positive relationship between Tourist Satisfaction and Revisit Intention confirms that satisfied tourists are more likely to revisit the Toba Caldera UNESCO Global Geopark and recommend the destination to others. This finding reinforces the theoretical assumptions of Tourist Satisfaction Theory and Behavioral Intention Theory, which state that positive tourism experiences lead to stronger destination loyalty. Therefore, destination managers should prioritize continuous improvements in service quality, accessibility, destination facilities, and visitor experience to strengthen the long-term competitiveness and sustainability of the Toba Caldera UNESCO Global Geopark.

Table 1. Demographic Characteristics of Respondents (n = 250)

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	118	47.2
	Female	132	52.8
Age	< 20 years	22	8.8
	21–30 years	96	38.4
	31–40 years	71	28.4
	41–50 years	39	15.6
	> 50 years	22	8.8
Education	High School	52	20.8
	Diploma	39	15.6
	Bachelor's Degree	121	48.4
	Postgraduate	38	15.2
Occupation	Student	47	18.8
	Government Employee	39	15.6
	Private Employee	82	32.8
	Entrepreneur	46	18.4
	Others	36	14.4
Visit Frequency	First-time Visitor	142	56.8
	Repeat Visitor	108	43.2
Purpose of Visit	Leisure	176	70.4
	Education	28	11.2
	Business	17	6.8
	Visiting Family/Friends	29	11.6

Descriptive Analysis

Table 1 presents the demographic characteristics of the respondents. Of the 250 participants, 52.8% were female and 47.2% were male, indicating a relatively balanced gender distribution. Most respondents were 21-30 years old (38.4%), followed by those aged 31-40 years (28.4%), suggesting that young adults constituted the dominant visitor segment. Regarding educational background, 48.4% held a bachelor's degree, reflecting a relatively well-educated tourist population.

In terms of occupation, private-sector employees (32.8%) represented the largest group, followed by students (18.8%) and entrepreneurs (18.4%). More than half of the respondents (56.8%) were first-time visitors, while 43.2% had previously visited the Toba Caldera UNESCO Global Geopark. Furthermore, the majority (70.4%) visited the destination for leisure purposes, indicating that recreation remains the primary travel motivation. These demographic characteristics provide a representative profile of tourists visiting the geopark and serve as an appropriate basis for analyzing the determinants of tourist satisfaction and revisit intention.

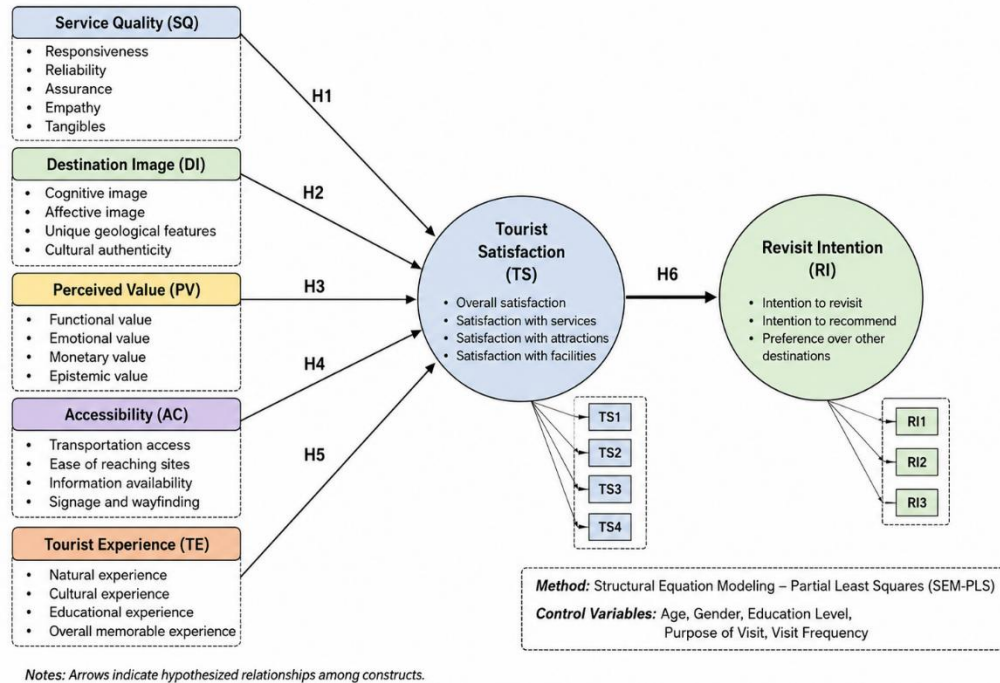


Figure 1. Research Framework
Source: Author's Illustration (2026).

Figure 1 illustrates the proposed research framework examining the relationships among Service Quality, Destination Image, Perceived Value, Accessibility, and Tourist Experience as determinants of Tourist Satisfaction, which subsequently influences Revisit Intention. The framework is tested using the SEM-PLS approach to evaluate the direct effects among the latent constructs within the context of the Toba Caldera UNESCO Global Geopark.

Table 2. Measurement Model Assessment (Outer Loadings, Cronbach's Alpha, Composite Reliability, and AVE)

Construct	Indicator	Outer Loading	Cronbach's Alpha	Composite Reliability	AVE
Service Quality (SQ)	SQ1	0.842	0.903	0.928	0.721
	SQ2	0.867			
	SQ3	0.851			
	SQ4	0.831			
	SQ5	0.864			
Destination Image (DI)	DI1	0.826	0.886	0.922	0.747
	DI2	0.872			
	DI3	0.891			
	DI4	0.853			
Perceived Value (PV)	PV1	0.833	0.894	0.926	0.758
	PV2	0.872			
	PV3	0.886			
	PV4	0.882			
Accessibility (AC)	AC1	0.815	0.871	0.912	0.722
	AC2	0.847			
	AC3	0.865			
	AC4	0.869			
Tourist Experience (TE)	TE1	0.841	0.901	0.927	0.719
	TE2	0.858			
	TE3	0.873			
	TE4	0.837			
	TE5	0.848			
Tourist Satisfaction (TS)	TS1	0.894	0.915	0.940	0.797
	TS2	0.903			
	TS3	0.887			
	TS4	0.883			
Revisit Intention (RI)	RI1	0.901	0.893	0.933	0.823
	RI2	0.914			
	RI3	0.902			

Interpretation

Table 2 demonstrates that all measurement indicators have outer loading values above the recommended threshold of 0.70, indicating satisfactory indicator reliability. Furthermore, all constructs exhibit Cronbach's Alpha and Composite Reliability values greater than 0.70, confirming strong internal consistency reliability. The Average Variance Extracted (AVE) values also exceed the minimum criterion of 0.50, indicating adequate convergent validity. Therefore, the measurement model satisfies the recommended reliability and validity requirements for SEM-PLS analysis, allowing the structural model evaluation to be conducted.

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

Construct	SQ	DI	PV	AC	TE	TS	RI
Service Quality (SQ)	0.849						
Destination Image (DI)	0.612	0.864					
Perceived Value (PV)	0.587	0.634	0.870				
Accessibility (AC)	0.541	0.526	0.553	0.850			
Tourist Experience (TE)	0.624	0.601	0.645	0.573	0.848		
Tourist Satisfaction (TS)	0.732	0.708	0.691	0.648	0.756	0.893	
Revisit Intention (RI)	0.641	0.619	0.603	0.572	0.668	0.801	0.907

Note: Diagonal values (bold) represent the square root of the Average Variance Extracted (AVE).

Table 4. Discriminant Validity (Heterotrait-Monotrait Ratio - HTMT)

Construct	SQ	DI	PV	AC	TE	TS	RI
Service Quality (SQ)	–						
Destination Image (DI)	0.698	–					
Perceived Value (PV)	0.673	0.715	–				
Accessibility (AC)	0.621	0.593	0.638	–			
Tourist Experience (TE)	0.742	0.706	0.761	0.655	–		
Tourist Satisfaction (TS)	0.841	0.812	0.794	0.738	0.856	–	
Revisit Intention (RI)	0.724	0.703	0.681	0.637	0.759	0.884	–

Note: All HTMT values are below the recommended threshold of 0.90.

Interpretation

The discriminant validity assessment confirms that the measurement model satisfies the recommended criteria. As shown in the Fornell-Larcker Criterion, the square root of the AVE for each construct is greater than its correlations with other constructs, indicating adequate discriminant validity. Similarly, all HTMT values are below the recommended threshold of 0.90, suggesting that each construct is empirically distinct from the others. Therefore, the measurement model demonstrates satisfactory discriminant validity and is appropriate for structural model evaluation and hypothesis testing.

Table 5. Structural Model Results (Path Coefficients, t-values, p-values)

Hypothesis	Structural Path	Path Coefficient (β)	t-value	p-value	Decision
H1	Service Quality → Tourist Satisfaction	0.284	4.752	<0.001	Supported
H2	Destination Image → Tourist Satisfaction	0.211	3.568	<0.001	Supported
H3	Perceived Value → Tourist Satisfaction	0.186	3.147	0.002	Supported
H4	Accessibility → Tourist Satisfaction	0.149	2.684	0.007	Supported

H5	Tourist Experience → Tourist Satisfaction	0.297	5.186	<0.001	Supported
H6	Tourist Satisfaction → Revisit Intention	0.781	18.954	<0.001	Supported

Interpretation

Table 5 presents the results of the structural model analysis obtained through the bootstrapping procedure. All hypothesized relationships are statistically significant at the 5% significance level ($p < 0.05$), indicating support for all six hypotheses. Among the antecedents of Tourist Satisfaction, Tourist Experience has the strongest positive effect ($\beta = 0.297$), followed by Service Quality ($\beta = 0.284$), Destination Image ($\beta = 0.211$), Perceived Value ($\beta = 0.186$), and Accessibility ($\beta = 0.149$). Furthermore, Tourist Satisfaction exerts a strong positive influence on Revisit Intention ($\beta = 0.781$, $t = 18.954$, $p < 0.001$), indicating that satisfied tourists are significantly more likely to revisit the Toba Caldera UNESCO Global Geopark.

The findings demonstrate that improving destination management attributes, particularly visitor experience and service quality, plays a crucial role in enhancing tourist satisfaction, which subsequently strengthens revisit intention. These results support the proposed conceptual framework and confirm the suitability of the SEM-PLS model for explaining tourist behavior in the context of sustainable geotourism.

Table 6. Coefficient of Determination (R^2), Effect Size (f^2), and Predictive Relevance (Q^2)

Endogenous Construct	R^2	Q^2	Predictor	f^2	Effect Size
Tourist Satisfaction (TS)	0.684	0.531	Service Quality	0.112	Small
			Destination Image	0.074	Small
			Perceived Value	0.061	Small
			Accessibility	0.048	Small
			Tourist Experience	0.136	Medium
Revisit Intention (RI)	0.610	0.488	Tourist Satisfaction	1.565	Large

Interpretation

Table 6 shows that the proposed structural model has substantial explanatory and predictive power. The R^2 value for Tourist Satisfaction is 0.684, indicating that 68.4% of the variance in tourist satisfaction is explained by Service Quality, Destination Image, Perceived Value, Accessibility, and Tourist Experience. Meanwhile, the R^2 value for Revisit Intention is 0.610, suggesting that 61.0% of its variance is explained by Tourist Satisfaction. According to Hair et al. (2022), these values indicate a moderate to substantial level of explanatory power. The Q^2 values for Tourist Satisfaction (0.531) and Revisit Intention (0.488) are both greater than zero, confirming that the model possesses satisfactory predictive relevance. Regarding the effect size (f^2), Tourist Experience demonstrates the strongest influence on Tourist Satisfaction with a medium effect ($f^2 = 0.136$), whereas Service Quality, Destination Image, Perceived Value, and Accessibility exhibit small effects. In contrast, Tourist Satisfaction has a large effect on Revisit Intention ($f^2 = 1.565$), highlighting its critical role as the primary determinant of tourists' future behavioral intention. These findings indicate that the structural model has adequate

explanatory capability and strong predictive performance for understanding tourist behavior in the Toba Caldera UNESCO Global Geopark.

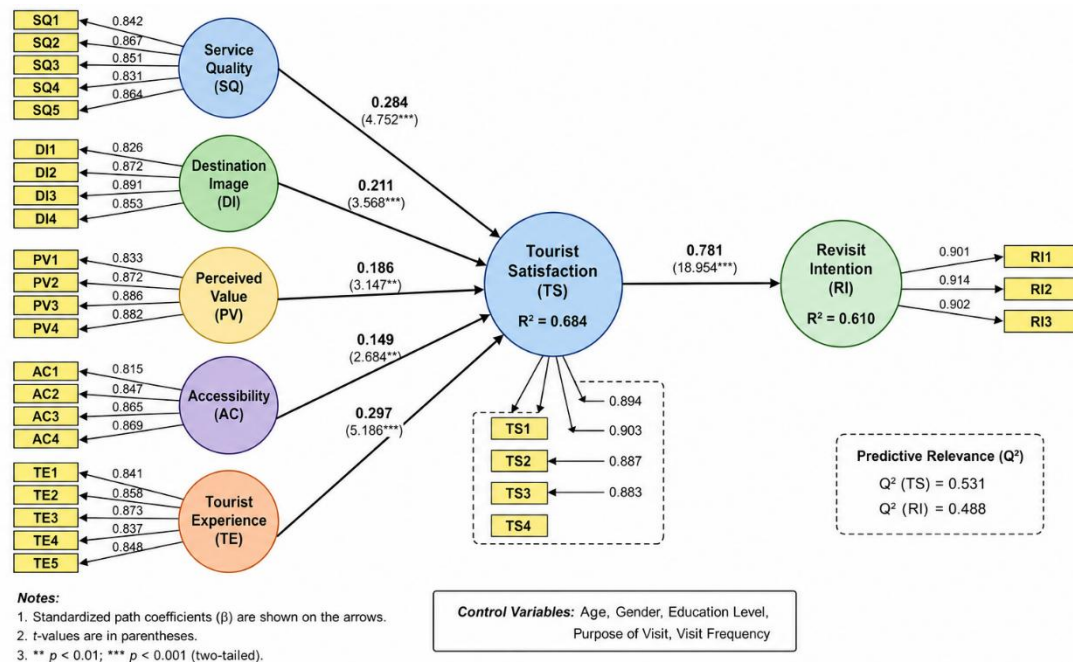


Figure 2. SEM-PLS Structural Model

Figure 2 presents SEM-PLS structural model, illustrating the relationships among the latent constructs and their measurement indicators. The results indicate that Service Quality, Destination Image, Perceived Value, Accessibility, and Tourist Experience have positive effects on Tourist Satisfaction, while Tourist Satisfaction has a strong positive effect on Revisit Intention. The model also demonstrates satisfactory explanatory and predictive power, with R^2 values of 0.684 for Tourist Satisfaction and 0.610 for Revisit Intention, confirming the robustness of the proposed research model.

5. CONCLUSION

This study examined the determinants of Tourist Satisfaction and Revisit Intention in the Toba Caldera UNESCO Global Geopark using the Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach. The findings demonstrate that Service Quality, Destination Image, Perceived Value, Accessibility, and Tourist Experience all have positive and significant effects on Tourist Satisfaction. Furthermore, Tourist Satisfaction was found to have a strong positive influence on Revisit Intention, indicating that satisfied visitors are more likely to revisit the destination and recommend it to others. From a theoretical perspective, this study extends the literature on geotourism and destination management by validating an integrated model that explains tourist behavioral intentions within the context of a UNESCO Global Geopark. The findings also reinforce the applicability of Destination Management Theory, Tourist Satisfaction

Theory, and Behavioral Intention Theory in sustainable geotourism research. From an Industrial Engineering perspective, the study highlights the importance of applying service quality management, performance evaluation, and continuous improvement principles to enhance tourism destination competitiveness.

Practically, the findings provide valuable insights for destination managers, local governments, and tourism stakeholders in formulating strategies to improve service quality, accessibility, visitor experience, and destination image, thereby strengthening the long-term sustainability of the Toba Caldera UNESCO Global Geopark. Future research is recommended to incorporate additional variables, such as destination loyalty, electronic word-of-mouth (e-WOM), environmental awareness, and digital tourism services, while expanding the study to other UNESCO Global Geoparks or employing longitudinal research designs to better capture changes in tourist behavior over time.

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**FROM GEOHERITAGE TO TOURIST EXPERIENCE: RECONSTRUCTING TOURISM
COMMUNICATION THROUGH LOCAL NARRATIVES AND STAKEHOLDER COLLABORATION IN
THE TOBA CALDERA UNESCO GLOBAL GEOPARK**

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ABSTRACT

The Toba Caldera UNESCO Global Geopark is not only a geological heritage landscape but also a complex tourism communication environment in which government institutions, communities, tourism businesses, academics, and visitors negotiate meanings of place, culture, conservation, and risk. This study examines how tourism communication is produced and coordinated across stakeholders and how Batak local narratives can strengthen destination interpretation, community engagement, and sustainable tourism. A qualitative single-case study was conducted using 28 purposively selected stakeholder interviews, analysis of geopark management and policy documents, and 45 days of field observation at strategic tourism and management locations. Thematic analysis was used to identify patterns of stakeholder communication, destination storytelling, cultural interpretation, tourist information, and risk communication. The findings indicate four interconnected communication dimensions: (1) stakeholder communication coordination, (2) local narrative and cultural storytelling, (3) destination interpretation and benefit communication, and (4) adaptive tourism and geohazard communication. Fragmented institutional arrangements generate inconsistent messages to visitors and limit the visibility of community voices, while Batak oral traditions and collective memory provide a distinctive narrative resource for place interpretation and destination identity. The study argues that effective tourism communication requires more than promotional messaging; it requires an integrated communication ecosystem connecting public institutions, local communities, tourism actors, knowledge institutions, and visitors. The study proposes a tourism communication framework for the Toba Caldera that links stakeholder dialogue, local storytelling, interpretive communication, destination branding, and risk communication to community participation and sustainable tourist experience.

Keywords: Tourism Communication; Destination Communication; Local Storytelling; Cultural Interpretation; Stakeholder Communication

1. INTRODUCTION

Tourism destinations are increasingly understood not merely as physical places but as communicative environments in which meanings of place are continuously produced, circulated, negotiated, and experienced. In a geopark, this process is particularly important because geological heritage must be translated into narratives that can be understood by visitors while remaining meaningful to local communities. Tourism communication therefore connects destination governance, cultural representation, visitor interpretation, community

participation, and destination branding. The Toba Caldera provides a particularly significant case because its geological uniqueness, Batak cultural heritage, tourism development, and institutional complexity intersect within one destination system.

The Toba Caldera was formed by a supervolcanic eruption approximately 74,000 years ago and is now recognized as a UNESCO Global Geopark. Its significance extends beyond geology to biodiversity, cultural heritage, local livelihoods, and tourism. The geopark encompasses seven regencies/cities in North Sumatra and is inhabited by Batak communities with diverse cultural identities and knowledge systems. Consequently, communicating the destination requires coordination among government agencies, communities, tourism enterprises, academics, conservation actors, and visitors.

The growth of tourism has intensified the need for coherent communication. Tourist arrivals in the Samosir core area reached more than 1.7 million domestic and over 15,000 foreign visitors in 2024. At the same time, the 2023 UNESCO warning, widely discussed as a “yellow card,” highlighted weak stakeholder synergy in geopark management. The communication implication is important: institutional fragmentation can become visible to visitors through inconsistent information, uneven interpretation, fragmented branding, and limited communication of community perspectives. The challenge is therefore not simply how to promote Toba, but how to construct a coherent, participatory, credible, and culturally grounded communication system for the destination.

Previous research has addressed the Toba Caldera from geological, geotourism, destination development, community empowerment, cultural heritage, and governance perspectives. Studies have also highlighted public education and interpretation, geoproduct branding, and Batak folk narratives. However, these strands have rarely been integrated into a tourism communication framework that explains how different actors communicate the meaning of the destination and how such communication affects tourist experience and community engagement. This gap is particularly relevant because the Toba Caldera possesses rich oral traditions and cultural narratives that can function as interpretive resources, while its supervolcanic history simultaneously creates a need for responsible risk communication.

This study therefore shifts the analytical focus from governance structure alone to the communication processes through which the destination is represented, interpreted, promoted, and experienced. It addresses four questions: (1) How do tourism stakeholders communicate and negotiate the meaning of the Toba Caldera as a geoheritage destination? (2) How are Batak local narratives and cultural knowledge communicated through tourism interpretation and destination storytelling? (3) How does stakeholder communication influence community participation, tourist engagement, and destination sustainability? and (4) How can an integrated tourism communication model strengthen the Toba Caldera as a sustainable destination?

2. LITERATURE REVIEW

2.1 Tourism Communication as a Destination System

Tourism communication encompasses the processes through which destinations, tourism organizations, communities, intermediaries, and visitors exchange information and construct meanings about tourism places. It includes promotional communication, public

relations, interpersonal communication, digital communication, interpretation, storytelling, branding, visitor information, and communication among tourism stakeholders. A destination is therefore communicated through multiple channels rather than through a single official promotional voice. This multi-actor character makes coordination and message consistency central to destination communication.

Strategic communication scholarship emphasizes the coordination of purposeful communication across organizational actors and publics. In tourism, this perspective is relevant because destination images are shaped simultaneously by official marketing, media representations, social media, visitor experiences, local narratives, tourism businesses, and word-of-mouth. Communication effectiveness consequently depends on coherence without eliminating the plurality of local voices.

2.2 Destination Branding, Storytelling, and Place Meaning

Destination branding involves the creation and communication of distinctive place meanings. For heritage destinations, branding is most credible when it is connected to authentic cultural and geographical resources rather than reduced to slogans or visual promotion. Storytelling is particularly important because geological and cultural features become meaningful to tourists through narratives that connect places with history, identity, memory, and lived experience.

The Toba Caldera possesses a distinctive narrative advantage because geological heritage and Batak cultural heritage are spatially intertwined. Research on Toba Caldera geosites has shown that folk discourse and oral tradition function as collective memory for tourist destinations. These narratives can strengthen destination identity when communicated through guided interpretation, visitor centers, digital storytelling, interpretive signage, cultural performances, and community-based tourism products. However, their use requires attention to ownership, authenticity, cultural authority, and the risk of simplifying complex traditions for tourism consumption.

2.3 Tourism Interpretation and Tourist Experience

Interpretation translates heritage resources into understandable and meaningful experiences for visitors. In a geopark, interpretation should explain geological processes while connecting them with ecological systems, local histories, and cultural meanings. Effective interpretation is therefore dialogical rather than merely informational: it enables visitors to understand why a site matters and how their behavior relates to conservation and local well-being. Public education and interpretation have previously been identified as important for Toba Caldera geoheritage conservation. This study extends that insight by treating interpretation as a communication process linking scientific knowledge, local narratives, visitor understanding, and destination identity.

2.4 Stakeholder Communication and Collaborative Communication

Tourism destinations involve multiple stakeholders whose communication practices may converge or conflict. Collaborative governance literature emphasizes dialogue, trust, shared motivation, and capacity for collective action. From a communication perspective, these

mechanisms are not only institutional conditions but communication processes themselves. Face-to-face dialogue, information sharing, negotiation, feedback, and joint message production determine whether stakeholders develop a shared destination narrative. The Toba case is characterized by formal vertical coordination, informal horizontal collaboration, and ad hoc partnerships. Such polycentricity may create flexibility, but it can also produce overlapping initiatives and inconsistent messages to tourists. The communication challenge is therefore to create coordination mechanisms that preserve local diversity while establishing minimum standards for accuracy, cultural sensitivity, visitor information, and destination identity.

2.5 Participatory Communication and Community Voice

Participatory communication emphasizes dialogue, inclusion, local agency, and the ability of communities to influence decisions affecting them. In tourism, community participation should extend beyond being an object of promotion. Communities should have opportunities to shape what is communicated about their culture, what stories are interpreted for visitors, and how tourism benefits and responsibilities are represented. This perspective is particularly important in the Toba Caldera because Batak communities possess cultural knowledge that cannot be fully represented through standardized promotional messages. The practice of *daliha na tolu* and oral traditions can provide locally grounded communication resources when communities retain meaningful authority over their interpretation.

2.6 Risk Communication in Geotourism

A supervolcano destination creates a distinctive communication challenge: the geological event that makes the landscape attractive is also associated with catastrophic risk. Risk communication should therefore be integrated with tourism interpretation. Visitors need accurate and comprehensible information about geological processes, environmental hazards, emergency procedures, and responsible behavior without creating unnecessary alarm or sensationalism. In the Toba context, the research findings indicate that the supervolcanic origin is often communicated primarily as an awe-inspiring tourism narrative. A more integrated approach would connect fascination with scientific literacy and preparedness. This requires communication coordination among geopark managers, geological institutions, disaster-management agencies, guides, communities, and tourism businesses.

2.7 Analytical Framework

The study conceptualizes the Toba Caldera as a tourism communication ecosystem. Four interconnected dimensions organize the analysis: stakeholder communication coordination; local narrative and cultural storytelling; destination interpretation and benefit communication; and adaptive tourism and geohazard communication. These dimensions are expected to influence community participation, trust, tourist understanding, engagement, and sustainable destination outcomes. The proposed communication pathway is: Stakeholder Communication → Local Narrative and Storytelling → Destination Interpretation and Branding → Tourist Understanding and Engagement → Community Participation and Trust → Sustainable Tourism Communication. Risk communication functions as a cross-cutting dimension across all stages.

3. RESEARCH METHODS

This research uses a qualitative approach with a single-case study design focusing on the Toba Caldera UNESCO Global Geopark. The qualitative design is appropriate because the study examines how meanings, narratives, communication relationships, and stakeholder experiences are constructed in context. The study does not use a survey instrument or statistical testing.

3.1 Data Collection

Data were collected from three complementary sources. First, in-depth semi-structured interviews were conducted with 28 purposively selected key informants, including government officials, representatives of geopark management, local government agencies, Batak community leaders, tourism business managers, researchers, and environmental organizations. Second, document analysis covered geopark management plans, UNESCO evaluation materials, regulations, stakeholder cooperation documents, and community empowerment program documents. Third, field observations were undertaken during three visit periods totaling 45 field days at strategic geopark sites, information facilities, tourism locations, and management forums.

3.2 Data Analysis

The data were analyzed using thematic analysis. Initial coding identified communication-related statements and observations concerning stakeholder interaction, information exchange, message consistency, storytelling, cultural interpretation, visitor information, branding, community voice, and risk communication. These codes were then grouped into higher-order themes corresponding to the analytical framework. Triangulation across interviews, documents, and observations was used to strengthen interpretive credibility, while member checking and a documentation audit trail supported the trustworthiness of the findings. The study retains the empirical scope of the original research. Accordingly, claims concerning tourist engagement and communication outcomes are interpreted from stakeholder accounts, documentary evidence, and field observations rather than presented as statistically measured visitor effects.

4. RESULTS AND DISCUSSION

4.1 Fragmented Stakeholder Communication and Inconsistent Destination Messages

The findings reveal three simultaneous communication patterns: formal vertical communication through government mechanisms, informal horizontal communication among geosite managers, communities, and tourism businesses, and ad hoc communication networks developed for particular tourism events and educational activities. These arrangements create opportunities for rapid coordination but do not consistently produce an integrated destination message. A major communication consequence of institutional fragmentation is the possibility of inconsistent information reaching tourists. Different actors may emphasize different aspects of Toba geological uniqueness, cultural heritage, scenic beauty, events, local products, or commercial attractions without a sufficiently coordinated narrative architecture. This does not mean that destination communication should become completely uniform. Rather, the evidence supports the need for a shared communication framework containing agreed core

messages while allowing communities and local businesses to retain distinctive voices. The 2023 UNESCO warning is therefore significant from a communication perspective. It can be interpreted not only as an institutional coordination problem but also as an indicator that the destination's multiple communicative actors had not yet developed sufficient mechanisms for producing coherent, participatory, and sustainable communication. Communication coordination becomes an institutional capacity in its own right.

4.2 Batak Narratives as a Strategic Tourism Communication Resource

The second major finding concerns the underutilized communication potential of Batak local narratives. Oral traditions, collective memory, customary knowledge, and place-based stories provide interpretive resources through which geological sites can be connected with cultural identity. Existing ethnolinguistic research on Toba geosite folk discourse supports the view that local narratives constitute collective memory associated with tourism destinations. The communication value of these narratives lies in their ability to transform a physical geosite into a meaningful cultural place. A geological formation can be presented not only through technical descriptions but also through stories of ancestral relationships, landscape meanings, customary practices, and historical memory. This creates a richer tourist experience and differentiates the destination from competing geoparks whose communication may rely primarily on geological information.

However, the incorporation of local narratives must avoid tokenism and cultural commodification. Community members should participate in selecting, interpreting, and communicating narratives. The principle of participation is therefore directly linked to communication ownership: communities should not merely appear in destination promotional materials but should have a voice in determining how their culture is represented.

4.3 Interpretation, Storytelling, and Destination Branding

The findings suggest that Toba's destination communication can be strengthened by integrating geological interpretation with cultural storytelling. Current communication often separates geology from culture: geological information is delivered as scientific education, while cultural elements are presented as entertainment or heritage. An integrated interpretation strategy can instead communicate the relationship between landscape, geological history, Batak cultural memory, livelihoods, and conservation. Such an approach also supports destination branding. The strongest Toba brand is not simply “beautiful Lake Toba” but a distinctive story linking the supervolcanic landscape, living Batak culture, community knowledge, and sustainable tourism. Geoproducts can reinforce this communication strategy when their geological and cultural provenance is clearly communicated to visitors. In this way, branding becomes an extension of interpretation rather than a separate promotional activity.

4.4 Communicating Tourism Benefits and Community Participation

Tourism communication also concerns how economic and social benefits are communicated. When communities can clearly identify the relationship between tourism activity and local benefits, tourism becomes more understandable as a shared development process. Conversely, when benefit flows are opaque, communication gaps may reinforce

perceptions that tourism primarily serves external actors. The findings therefore indicate that benefit-sharing should be accompanied by benefit communication. Destination managers should communicate, in accessible and transparent ways, how tourism revenues, employment, local products, community programs, and conservation investments are distributed. Such communication can strengthen trust because communities can see the connection between tourism development and local well-being.

4.5 Risk Communication: From Awe to Responsible Understanding

The supervolcanic origin of Toba is one of its most powerful tourism narratives, but it also creates a responsibility for risk communication. The findings indicate that geological catastrophe is frequently presented as an impressive historical story rather than systematically connected to public understanding of geological hazards. This represents a missed communication opportunity. A responsible communication strategy should combine attraction with preparedness. Guides, visitor centers, signage, digital media, and educational programs can explain the geological history of the caldera while providing appropriate information about hazards, monitoring, emergency procedures, and visitor responsibilities. Risk communication should be coordinated with disaster-management agencies so that promotional messages do not conflict with safety information.

Local knowledge can contribute to this process when environmental memories and customary narratives are carefully documented and interpreted alongside scientific knowledge. The goal is not to replace scientific hazard information with traditional narratives, but to create culturally intelligible communication that allows visitors and communities to understand risk within the social and historical context of the landscape.

4.6 Toward an Integrated Tourism Communication Model for Toba

Based on the findings, the study proposes an integrated tourism communication model consisting of five linked components. First, a stakeholder communication platform should coordinate government, communities, tourism businesses, academics, conservation actors, and disaster-management institutions. Second, a shared narrative architecture should identify core messages about Toba's geology, Batak culture, conservation, and sustainable tourism while allowing locally specific stories. Third, interpretation channels including guides, signage, visitor centers, digital platforms, cultural performances, and geoproducts should translate these narratives into visitor experiences. Fourth, benefit and feedback communication should make community participation and tourism impacts visible. Fifth, adaptive risk and crisis communication should enable the destination to update information in response to tourism volatility, environmental change, and geohazard information. This model reframes tourism communication as an infrastructure of destination sustainability. Communication is not an end-stage promotional activity after tourism policy has been formulated. It is part of how stakeholders negotiate meaning, build trust, coordinate action, represent culture, educate visitors, communicate benefits, and manage risk.

4.7 Theoretical Contribution

The study contributes to tourism communication scholarship by connecting three bodies of thought that are often examined separately: collaborative stakeholder communication, destination storytelling and interpretation, and participatory/risk communication. The Toba case demonstrates that destination communication is simultaneously organizational, cultural, experiential, and political. It is organizational because multiple institutions must coordinate messages; cultural because local narratives shape place meaning; experiential because interpretation affects how visitors understand the destination; and political because communities possess unequal power to define how their culture and interests are represented. The study consequently extends the conventional destination-promotion perspective toward a communication ecosystem perspective. In this model, successful tourism communication is measured not only by visibility or promotional reach but also by coherence, authenticity, participation, interpretive quality, trust, and the capacity to communicate responsibly during changing tourism and environmental conditions.

5. CONCLUSION

This study demonstrates that the Toba Caldera UNESCO Global Geopark should be understood as a complex tourism communication ecosystem. The central challenge is not simply increasing destination promotion but coordinating the multiple actors and narratives through which Toba is communicated. Fragmented stakeholder relationships can generate inconsistent visitor messages, while insufficient community voice can weaken the authenticity and legitimacy of destination representation. Four communication dimensions are particularly important: stakeholder communication coordination, local narrative and cultural storytelling, destination interpretation and benefit communication, and adaptive tourism and geohazard communication. Together, these dimensions connect institutional collaboration with tourist experience and community participation. Batak oral traditions and collective memory are especially valuable because they can transform geological sites into culturally meaningful tourism experiences when communities participate substantively in their interpretation.

The study recommends establishing an integrated tourism communication mechanism within the Toba Caldera Geopark management structure; developing shared communication standards for guides, visitor facilities, digital platforms, and destination promotion; institutionalizing community participation in narrative development and cultural interpretation; strengthening geotourism guide certification in geology and Batak cultural knowledge; and integrating risk communication into tourism interpretation and visitor-management systems. Benefit-sharing should also be accompanied by transparent communication so that communities can identify the relationship between tourism, conservation, and local well-being.

The principal theoretical implication is that tourism communication should be treated as a component of sustainable destination governance rather than as a promotional function alone. The Toba case demonstrates how communication can connect geoheritage, cultural identity, community participation, tourist understanding, destination branding, and risk literacy. Future research should examine visitor responses to different forms of geological and cultural storytelling, compare digital and face-to-face interpretation, and assess how

participatory communication influences trust and community support across different geoparks.

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CULTIVATING CIVIC AND ENVIRONMENTAL STEWARDSHIP THROUGH MORAL EDUCATION: A FRAMEWORK FOR ENHANCING PUBLIC AWARENESS IN SUSTAINABLE GEOPARKS

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ABSTRACT

Geoparks are recognized not only as sites of geological significance but also as living landscapes that integrate conservation, education, and sustainable community development. Despite increasing global attention to geopark sustainability, challenges related to environmental degradation, irresponsible tourism, and limited public participation remain significant. This study aims to examine the role of moral education in cultivating civic and environmental stewardship to enhance public awareness for sustainable geoparks. The study employs a qualitative approach using a comprehensive literature review and conceptual analysis of civic education, environmental ethics, stewardship, and sustainable geopark management. Relevant theories and previous empirical studies are synthesized to develop a conceptual framework linking moral education with civic responsibility, environmental stewardship, and public awareness. The analysis suggests that moral education strengthens environmental values, promotes responsible citizenship, and encourages active community participation in conserving geological heritage and natural resources. Furthermore, integrating civic values with environmental stewardship education contributes to greater public awareness, supports sustainable tourism practices, and reinforces collaborative governance among local communities, educational institutions, and policymakers. The study concludes that moral education represents a strategic foundation for developing environmentally responsible citizens capable of supporting the long-term sustainability of geoparks. The proposed framework offers practical implications for educators, policymakers, and geopark managers seeking to strengthen conservation initiatives through education and community engagement.

Keywords: Civic Education; Environmental Stewardship; Moral Education; Public Awareness; Sustainable Geoparks

1. INTRODUCTION

Geoparks have emerged as strategic areas that integrate geological heritage conservation, environmental education, sustainable tourism, and local economic development. Recognized by UNESCO as living laboratories for sustainable development, geoparks serve not only to protect geological resources but also to promote public understanding of the interconnectedness between nature, culture, and society. However, the sustainability of geoparks depends not only on institutional management and governmental policies but also on the active participation and environmental responsibility of local communities and visitors.

Despite the increasing number of geoparks worldwide, many continue to experience challenges related to environmental degradation, irresponsible tourism practices, littering, vandalism of geological sites, and limited community participation in conservation initiatives. These issues indicate that physical conservation efforts alone are insufficient to ensure long-term sustainability. Instead, sustainable geopark management requires the development of civic responsibility, environmental ethics, and public awareness through educational approaches that cultivate moral values and pro-environmental behavior.

Moral education has long been recognized as an essential component of character formation, shaping individuals' ethical judgment, social responsibility, and commitment to the common good. Within the context of environmental sustainability, moral education extends beyond personal ethics by fostering environmental stewardship—the responsible use, protection, and conservation of natural resources for present and future generations. Similarly, civic education contributes to developing responsible citizens who actively participate in community decision-making, environmental governance, and sustainable development initiatives. The integration of civic education and environmental moral education therefore offers a promising approach to strengthening public awareness and community engagement within geoparks.

Previous studies have primarily examined geoparks from perspectives such as geoconservation, geotourism, biodiversity conservation, destination management, and local economic development. Other researchers have explored environmental education and sustainable tourism independently. However, limited attention has been given to the integration of civic education, moral education, and environmental stewardship as an educational framework for enhancing public awareness in geoparks. Existing literature generally focuses on technical management or tourism promotion while overlooking the ethical and civic dimensions that influence public behavior toward geological heritage conservation.

This gap highlights the need for a more comprehensive conceptual framework that connects moral education, civic responsibility, environmental stewardship, and public awareness within the context of sustainable geopark management. Such a framework is expected to enrich interdisciplinary discussions involving education, environmental management, tourism studies, and sustainability science.

Accordingly, this study aims to develop a conceptual framework explaining how moral education can cultivate civic and environmental stewardship to enhance public awareness in sustainable geoparks. Specifically, the study seeks to (1) examine the relationships between moral education, civic responsibility, and environmental stewardship; (2) analyze their influence on public awareness toward geopark conservation; and (3) propose an integrated educational framework that supports sustainable geopark management.

The findings are expected to contribute theoretically by expanding the discourse on civic and environmental education within sustainable development studies. Practically, the proposed framework may assist educators, geopark managers, policymakers, and local communities in designing educational programs and public engagement strategies that strengthen conservation behavior and sustainable tourism practices.

2. LITERATURE REVIEW

Toba Caldera UNESCO Global Geoparks represent internationally recognized territory where geological heritage is managed through integrated approaches combining conservation, education, research, and sustainable local development. Unlike conventional protected areas, geoparks emphasize community participation, environmental interpretation, and geotourism as mechanisms for achieving sustainability. Their success depends largely on collaboration among governments, educational institutions, local communities, tourism stakeholders, and visitors.

2.1 Civic education and Civic Responsibility

Civic education seeks to develop knowledgeable, responsible, and participatory citizens capable of contributing to democratic society and sustainable development. Contemporary civic education extends beyond political literacy by incorporating social responsibility, environmental citizenship, and community participation. Civic responsibility encourages individuals to actively engage in environmental protection, public decision-making, and collective actions supporting sustainable communities.

2.2 Moral Education, Environmental Stewardship and Public Awareness

Moral education focuses on developing ethical reasoning, values, empathy, and responsible behavior. Within environmental contexts, moral education nurtures environmental ethics by encouraging respect for nature, intergenerational responsibility, and sustainable resource use. Environmental stewardship refers to voluntary actions undertaken by individuals and communities to conserve, protect, and restore environmental resources. Education plays a fundamental role in transforming environmental knowledge into environmentally responsible behavior. Public awareness represents individuals' understanding, attitudes, and commitment toward environmental conservation and sustainable development. Higher public awareness contributes to increased participation in conservation programs, environmentally responsible tourism, and protection of geological heritage. Educational initiatives, interpretation programs, community engagement, and participatory governance have been identified as important determinants of public awareness within geoparks.

2.3 Research Gap and Conceptual Framework

Although previous studies have extensively discussed geotourism, geoconservation, sustainable tourism, and environmental education, relatively few studies integrate civic education, moral education, and environmental stewardship into a unified conceptual framework explaining how public awareness can be strengthened within geoparks. Existing research tends to examine these concepts independently, leaving insufficient understanding of their interconnected roles in promoting sustainable geopark management.

This study proposes that Moral Education strengthens both Civic Responsibility and Environmental Stewardship. These two dimensions subsequently enhance Public Awareness, which ultimately supports Sustainable Geopark Management. The framework emphasizes education as the primary driver of behavioral transformation and community participation. As this paper is conceptual in nature, the following propositions are proposed: P1: Moral education positively influences civic responsibility; P2: Moral education positively influences

environmental stewardship; P3: Civic responsibility positively influences public awareness toward geopark conservation; P4: Environmental stewardship positively influences public awareness toward sustainable geoparks; P5: Public awareness contributes positively to sustainable geopark management.

3. RESULTS AND DISCUSSION

3.1. Results

The literature synthesis indicates that moral education functions as the foundational element in developing civic and environmental stewardship within sustainable geoparks. The analysis identifies four interconnected dimensions that contribute to strengthening public awareness and sustainable geopark management. **First**, moral education reinforces environmental values by fostering ethical responsibility toward nature. Studies consistently emphasize that environmental responsibility is not solely driven by knowledge but also by moral commitment, empathy, and ethical reasoning. Individuals with stronger environmental values demonstrate greater willingness to engage in conservation activities and responsible tourism practices. **Second**, civic education complements moral education by encouraging active citizenship. Civic responsibility promotes public participation in environmental governance, community-based conservation, and collaborative decision-making. This dimension strengthens the relationship between local communities and geopark management institutions.

Third, environmental stewardship emerges as a practical manifestation of moral and civic values. Stewardship encourages individuals and communities to become active protectors of geological heritage, biodiversity, and local cultural resources. Rather than perceiving conservation as the sole responsibility of governments, stewardship emphasizes shared responsibility among multiple stakeholders. **Finally**, these three dimensions collectively enhance public awareness, which subsequently supports sustainable geopark management. Increased public awareness encourages environmentally responsible behavior, strengthens sustainable tourism practices, and facilitates cooperation among local governments, educational institutions, tourism stakeholders, and local communities.

Table 1. Conceptual Research Finding

Variable	Description	Research Findings
Moral Education	Development of ethical values and environmental responsibility	Strengthens environmental ethics, empathy, and moral commitment toward conservation.
Civic Education	Development of responsible citizenship	Encourages public participation, civic responsibility, and collaborative environmental governance.
Environmental Stewardship	Responsible environmental actions	Promotes conservation behavior, sustainable tourism, and protection of geological heritage.

Public Awareness	Collective understanding and environmental concern	Increases community engagement and support for sustainable geopark management.
Sustainable Geoparks	Long-term conservation and development	Achieved through integration of moral education, civic engagement, stewardship, and collaborative governance.

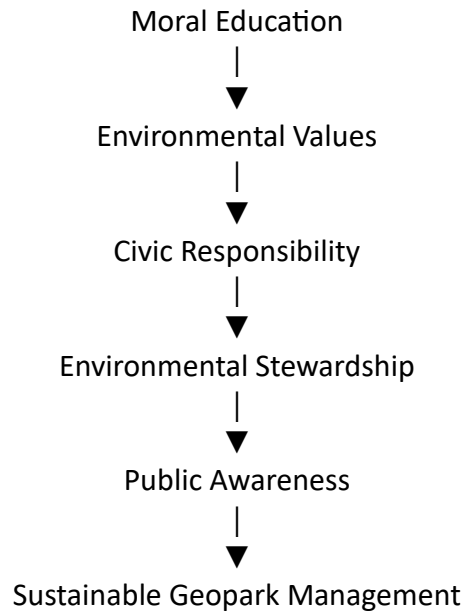


Figure 1. Proposed Conceptual Framework

3.2. Discussion

The findings demonstrate that moral education serves as the primary foundation for cultivating civic and environmental stewardship within sustainable geoparks. This finding aligns with environmental ethics theory, which argues that environmental protection begins with the development of ethical values rather than technical knowledge alone. Moral education encourages individuals to recognize their obligations toward both present and future generations, thereby strengthening long-term conservation behavior. Furthermore, the findings support civic education theories emphasizing that responsible citizenship extends beyond political participation to include environmental responsibility. Citizens who possess strong civic values are more likely to participate in community-based conservation initiatives, environmental education programs, and collaborative governance processes. This perspective highlights that geopark sustainability depends not only on institutional management but also on active citizen engagement.

The conceptual analysis also identifies environmental stewardship as the operational mechanism through which moral and civic values are translated into practical conservation

actions. Stewardship represents a shift from passive environmental awareness to active responsibility, encouraging local communities to protect geological heritage while simultaneously supporting sustainable economic development through responsible tourism. Another important finding is the mediating role of public awareness. Public awareness is not merely the outcome of environmental education but also the catalyst for sustainable behavior. Communities with higher environmental awareness tend to support conservation policies, adopt environmentally responsible tourism practices, and participate more actively in geopark governance.

The proposed framework therefore suggests a sequential relationship in which moral education strengthens environmental values, environmental values foster civic responsibility, civic responsibility promotes environmental stewardship, and stewardship ultimately enhances public awareness that contributes to sustainable geopark management. This integrated framework provides practical implications for educators, policymakers, and geopark managers seeking to develop educational strategies that simultaneously improve environmental conservation and community participation. Overall, the study contributes to the growing body of literature by integrating moral education, civic education, environmental stewardship, and public awareness into a single conceptual framework specifically designed for sustainable geoparks. Unlike previous studies that often examine these variables independently, this framework illustrates their interdependence and provides a holistic educational approach for achieving long-term geopark sustainability.

4. CONCLUSION

This study examined the role of moral education in cultivating civic and environmental stewardship to enhance public awareness for sustainable geopark management through a qualitative literature review and conceptual analysis. The findings indicate that moral education provides the ethical foundation for strengthening environmental values and civic responsibility, which subsequently encourage environmental stewardship and increase public awareness of geological conservation and sustainable tourism. The proposed conceptual framework demonstrates that these interconnected dimensions contribute to the long-term sustainability of geoparks by promoting responsible citizen behavior, active community participation, and collaborative environmental governance.

From a theoretical perspective, this study contributes to the existing literature by integrating moral education, civic education, environmental stewardship, and public awareness into a comprehensive conceptual framework for sustainable geoparks. The framework extends previous studies by illustrating how ethical values and civic responsibility jointly influence conservation behavior and sustainable community engagement. Practically, the findings suggest that educators, policymakers, and geopark managers should integrate moral and civic education into environmental education programs to foster environmentally responsible citizens. Community-based educational initiatives, participatory conservation programs, and collaborative governance strategies can strengthen public awareness while supporting sustainable tourism and the protection of geological heritage. Such approaches may improve the effectiveness of conservation policies and encourage stronger partnerships among local communities, educational institutions, tourism stakeholders, and government agencies.

Despite these contributions, this study is conceptual in nature and relies on the synthesis of existing literature. Therefore, future research should empirically test the proposed conceptual framework using quantitative, qualitative, or mixed-method approaches across different geopark contexts. Comparative studies involving UNESCO Global Geoparks in different countries may also provide deeper insights into the influence of cultural, social, and institutional factors on civic and environmental stewardship. Furthermore, future studies may examine the mediating or moderating roles of environmental literacy, place attachment, or community participation in strengthening the relationship between moral education and sustainable geopark management.

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STRENGTHENING LOCAL COMMUNITY PARTICIPATION FOR SUSTAINABLE GEOTOURISM IN TOBA CALDERA UNESCO GLOBAL GEOPARK

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ABSTRACT

Community participation has been widely recognized as a key determinant of sustainable tourism development; however, its integration into geotourism governance remains insufficiently explored, particularly within UNESCO Global Geoparks in developing countries. This study investigates how local community participation contributes to strengthening sustainable geotourism in the Toba Caldera UNESCO Global Geopark, Indonesia. Employing a qualitative case study approach, data were collected through in-depth interviews, participant observation, and document analysis involving community leaders, tourism entrepreneurs, government officials, and other relevant stakeholders. The data were analyzed using thematic analysis to identify patterns of participation, existing challenges, and strategic opportunities. The findings reveal that local communities actively contribute to geoheritage conservation, cultural preservation, tourism service delivery, and destination promotion. Nevertheless, their participation remains constrained by limited institutional capacity, inadequate stakeholder coordination, unequal distribution of tourism benefits, and restricted involvement in decision-making processes. The study proposes a community-centered geotourism framework emphasizing collaborative governance, capacity building, inclusive planning, and equitable benefit-sharing as essential mechanisms for enhancing sustainable destination management. This framework represents the study's primary contribution by extending community-based tourism theory into the context of UNESCO Global Geoparks. The findings provide practical insights for policymakers, destination management organizations, and local stakeholders in designing inclusive strategies that simultaneously promote environmental conservation, socio-cultural resilience, and sustainable local economic development.

Keywords: Community Participation; Sustainable Geotourism; Collaborative Governance; Toba Caldera UNESCO Global Geopark.

1. INTRODUCTION

Geotourism has emerged as an innovative approach to sustainable tourism by integrating geological heritage conservation, environmental education, and local economic development. Unlike conventional tourism, geotourism emphasizes the protection of geoheritage while fostering community well-being through active participation in tourism activities. Within the framework of UNESCO Global Geoparks, local communities are recognized not merely as beneficiaries of tourism but as key stakeholders responsible for preserving geological, cultural, and ecological resources. Consequently, strengthening

community participation has become a fundamental prerequisite for achieving sustainable geotourism development.

The Toba Caldera UNESCO Global Geopark is one of Indonesia's most significant geological landscapes, possessing outstanding volcanic heritage, rich biodiversity, and distinctive Batak cultural traditions. Since receiving UNESCO Global Geopark status, the area has experienced increasing attention from policymakers and tourism stakeholders seeking to enhance its international competitiveness. Nevertheless, sustainable geotourism development within the Toba Caldera continues to face several challenges. Local communities often have limited opportunities to participate in tourism planning and governance, while tourism benefits remain unevenly distributed among stakeholders. Furthermore, institutional coordination, community capacity, and collaborative management mechanisms require further strengthening to ensure that tourism development supports both conservation and local livelihoods.

Previous studies have extensively discussed community-based tourism as an effective strategy for promoting sustainable destination development. Research has demonstrated that community participation contributes to environmental conservation, cultural preservation, social empowerment, and local economic growth. Similarly, studies on UNESCO Global Geoparks emphasize the importance of stakeholder collaboration and participatory governance in protecting geoheritage while enhancing visitor experiences. However, most existing studies primarily examine community-based tourism or geopark management separately. Relatively limited attention has been given to understanding how local community participation can be strategically integrated into sustainable geotourism governance within UNESCO Global Geoparks, particularly in developing-country contexts such as Indonesia. This gap is particularly relevant to the Toba Caldera UNESCO Global Geopark, where tourism development requires balancing geoheritage conservation with the socio-economic aspirations of local communities. Although several studies have investigated tourism development in the Lake Toba region, few have examined community participation from the perspective of collaborative geotourism governance and sustainable destination management. Consequently, empirical evidence regarding mechanisms that strengthen local participation remains insufficient.

2. LITERATURE REVIEW

2.1 Sustainable Geotourism

Geotourism has developed into a strategic approach that integrates geoheritage conservation, environmental education, cultural preservation, and local economic development. Unlike conventional tourism, geotourism emphasizes the appreciation of geological landscapes while ensuring that tourism activities contribute to environmental sustainability and community welfare (Dowling, 2013). Within UNESCO Global Geoparks, geotourism is considered a principal mechanism for achieving sustainable regional development through the integration of conservation, education, and economic opportunities for local communities.

The UNESCO Global Geoparks framework recognizes that sustainable geotourism requires not only internationally significant geological heritage but also effective governance,

stakeholder collaboration, and community participation. The management of geoparks should therefore balance environmental protection with socio-economic development through participatory planning and local empowerment. Recent UNESCO guidance further emphasizes that successful geotourism depends on strong partnerships among governments, local communities, researchers, and the private sector, supported by inclusive destination management and community-based tourism initiatives.

Recent systematic reviews also indicate that geotourism research has gradually shifted from a predominantly geological perspective toward interdisciplinary approaches incorporating governance, sustainability, and community development. Nevertheless, the social dimension of geotourism remains comparatively underexplored, particularly in developing countries.

2.2 Local Community Participation

Community participation is widely recognized as one of the fundamental principles of sustainable tourism development. Arnstein (1969) conceptualizes participation as a continuum ranging from manipulation and tokenism to partnership, delegated power, and citizen control. This framework suggests that genuine participation occurs when local communities possess meaningful influence over decision-making rather than merely receiving information or consultation.

In tourism studies, Tosun (2000) further explains that community participation is frequently constrained by operational, structural, and cultural limitations. These include inadequate institutional support, unequal access to tourism resources, centralized decision-making, and limited community capacity. Consequently, strengthening participation requires not only opportunities for involvement but also institutional arrangements that facilitate collaboration among stakeholders. Within geotourism contexts, community participation contributes to geoheritage conservation, cultural preservation, destination interpretation, tourism entrepreneurship, and local economic diversification. Communities also play an essential role in maintaining local identity and transmitting indigenous knowledge that enriches visitor experiences.

2.3 Collaborative Governance in UNESCO Global Geoparks

Collaborative governance refers to institutional arrangements in which public agencies, private organizations, academic institutions, and civil society jointly participate in consensus-oriented decision-making (Ansell & Gash, 2008). Rather than relying solely on government intervention, collaborative governance promotes shared responsibility for planning, implementation, monitoring, and evaluation. This approach aligns closely with UNESCO Global Geoparks, where sustainable management requires active cooperation among multiple stakeholders. UNESCO emphasizes that geoparks should establish governance systems capable of integrating conservation objectives, tourism development, education, and community empowerment. Such governance structures encourage transparency, trust-building, knowledge sharing, and equitable distribution of tourism benefits. Empirical evidence further demonstrates that UNESCO Global Geoparks generate significant economic benefits for local

communities when collaborative governance effectively supports community entrepreneurship, destination branding, and local product development.

2.4 Previous Studies and Research Gap

Previous research has consistently demonstrated positive relationships between geotourism, sustainable development, and local economic growth. Lee and Jayakumar (2021), for example, found that UNESCO Global Geoparks stimulate local entrepreneurship, strengthen destination branding, and increase community income through sustainable tourism initiatives. Similarly, recent systematic reviews conclude that geotourism contributes to achieving the Sustainable Development Goals (SDGs) by integrating environmental conservation, education, and regional development. However, existing studies predominantly examine either geotourism management or community participation independently. Stoffelen (2020) argues that geopark research has historically focused on geoheritage and geosciences while giving insufficient attention to the societal embedding of geoparks and the role of local communities. Consequently, limited empirical evidence explains how community participation can be institutionally strengthened through collaborative governance mechanisms within UNESCO Global Geoparks, particularly in developing countries such as Indonesia. This research addresses this gap by proposing a Community Participation Framework for Sustainable Geotourism Governance that integrates community capacity, collaborative governance, inclusive participation, and equitable benefit-sharing as interconnected dimensions supporting sustainable geotourism development in the Toba Caldera UNESCO Global Geopark.

2.5 Theoretical Framework

This study is underpinned by three complementary theoretical perspectives. First, Arnstein's Ladder of Citizen Participation explains the varying levels of community involvement in tourism governance, emphasizing that sustainable participation requires genuine decision-making power rather than symbolic consultation. Second, the Collaborative Governance Model developed by Ansell and Gash (2008) provides a framework for understanding how governments, communities, private sectors, and academic institutions cooperate in managing complex tourism destinations. Third, the Sustainable Geotourism Framework advocated by UNESCO positions geotourism as an integrated approach that combines geoheritage conservation, education, community empowerment, and sustainable economic development. Integrating these perspectives, this study argues that community capacity strengthens meaningful participation; meaningful participation enhances collaborative governance; collaborative governance promotes equitable benefit-sharing; and equitable benefit-sharing ultimately contributes to sustainable geotourism development.

Because this research employs a qualitative case study approach, no statistical hypotheses are formulated. Instead, the study is guided by the following proposition:

Research Proposition: Strengthening local community participation through collaborative governance enhances sustainable geotourism development by improving geoheritage conservation, cultural preservation, and equitable local economic benefits. The model encompasses four main dimensions: Community Capacity Building (training, geotourism literacy, and human resource development). Collaborative Governance (synergy among

government, local communities, academia, and the private sector). Inclusive Decision-Making (community participation in planning and evaluation processes). Equitable Benefit Sharing (fair distribution of economic benefits among local communities).

3. RESEARCH METHODS

3.1 Research Design

This study employed a qualitative case study design to explore how local community participation contributes to strengthening sustainable geotourism development within the Toba Caldera UNESCO Global Geopark. A qualitative approach was selected because it enables an in-depth understanding of social interactions, stakeholder perceptions, and governance processes that cannot be adequately captured through quantitative methods. The case study design is particularly appropriate for investigating complex social phenomena within their real-life context, where multiple stakeholders interact in tourism planning, conservation, and community development.

3.2 Study Area

The research was conducted in the Toba Caldera UNESCO Global Geopark, North Sumatra Province, Indonesia. The geopark comprises a network of geosites distributed across seven regencies surrounding Lake Toba. As one of the world's largest volcanic calderas, the area possesses exceptional geological heritage, rich biodiversity, and distinctive Batak cultural traditions. The geopark has become one of Indonesia's priority tourism destinations, making it an appropriate setting for examining community participation in sustainable geotourism development. To obtain comprehensive information, the study focused on selected geotourism destinations representing active community involvement in tourism development and conservation initiatives.

3.3 Research Participants

This study employed purposive sampling to select participants who possessed relevant knowledge and experience regarding geotourism development. The participants consisted of village leaders, community elders, tourism awareness groups (Pokdarwis), local tourism entrepreneurs, managers of geotourism attractions, officials from local tourism and geopark management agencies, representatives of community organizations, and academics involved in tourism and geopark development. Participant selection continued until data saturation was achieved, meaning that additional interviews no longer generated substantially new information.

3.4 Data Collection Methods

Data were collected using multiple qualitative techniques to enhance the credibility of the findings. **First**, semi-structured interviews were conducted to obtain participants' perspectives on community participation, tourism governance, conservation practices, and local economic development. **Second**, participant observation was undertaken to examine tourism activities, community interactions, visitor services, conservation practices, and local cultural events. **Third**, document analysis was carried out by reviewing government

regulations, geopark management plans, tourism policy documents, UNESCO reports, statistical publications, and other relevant documents. The use of multiple data sources enabled methodological triangulation, thereby improving the trustworthiness of the research findings.

3.5 Research Instruments

The primary research instrument was the researcher, supported by an interview guide developed from the conceptual framework of the study. The interview protocol covered four major themes: Community capacity and empowerment; Forms of community participation; Collaborative governance among stakeholders; Sustainable geotourism outcomes. Field observation sheets, document review checklists, field notes, digital audio recorders, and photographic documentation were also utilized to support data collection.

3.6 Data Analysis

The collected data were analyzed using thematic analysis following the six-stage procedure proposed by Braun and Clarke (2006). The analysis involved: Familiarization with the data; Initial coding of interview transcripts and field notes; Identification of emerging themes; Review and refinement of themes; Definition and interpretation of themes; Preparation of analytical findings and interpretation. To improve research rigor, the study applied source triangulation, method triangulation, member checking, and peer debriefing. These procedures enhanced the credibility, dependability, confirmability, and transferability of the qualitative findings.

3.7 Ethical Considerations

Prior to data collection, all participants were informed about the objectives of the study and voluntarily agreed to participate. Informed consent was obtained from every participant, and confidentiality was maintained by anonymizing personal identities. The research adhered to ethical principles concerning voluntary participation, privacy, confidentiality, and responsible use of research data.

4. RESULTS AND DISCUSSION

The thematic analysis identified four major dimensions of local community participation in supporting sustainable geotourism development within the Toba Caldera UNESCO Global Geopark: (1) geoheritage conservation, (2) socio-cultural preservation, (3) tourism service delivery, and (4) collaborative destination governance. These themes demonstrate that community participation extends beyond economic activities to encompass environmental stewardship and cultural sustainability. The findings indicate that local communities have become key actors in the implementation of sustainable geotourism. Their participation contributes directly to environmental conservation while simultaneously generating local economic opportunities. Community members perceive tourism not merely as a source of income but also as a mechanism for safeguarding their cultural identity and natural heritage.

However, several barriers remain evident. Interviews revealed that many community groups possess limited technical knowledge regarding geotourism management, digital marketing, and sustainable business development. Furthermore, coordination among local governments, tourism authorities, community organizations, and private stakeholders is not yet fully integrated. As a consequence, tourism benefits are distributed unevenly, and local communities often have limited influence over strategic planning decisions. Based on these findings, the study proposes a Community-Centered Sustainable Geotourism Framework, consisting of four interconnected pillars: 1. Collaborative governance among government, local communities, private sector, and academic institutions. 2. Continuous capacity building through education, training, and entrepreneurship development. 3. Inclusive participation in tourism planning and decision-making. 4. Equitable distribution of tourism benefits to strengthen local welfare while encouraging long-term conservation.

The findings support the fundamental principles of Community-Based Tourism (CBT), which emphasize that local communities should serve as active participants rather than passive beneficiaries of tourism development. Community participation in the Toba Caldera UNESCO Global Geopark illustrates how environmental conservation, cultural preservation, and economic development can reinforce one another when local residents are meaningfully involved.

These results are consistent with previous studies emphasizing that community participation significantly enhances sustainable tourism outcomes. Active local engagement increases destination resilience, improves visitor experiences, and strengthens long-term conservation efforts. The findings also align with the principles promoted by UNESCO Global Geoparks, where geological heritage protection is inseparable from community empowerment and sustainable regional development. Nevertheless, this study identifies several persistent governance challenges. Limited institutional capacity and fragmented stakeholder collaboration reduce the effectiveness of community participation. These findings correspond with collaborative governance theory, which argues that sustainable destination management depends upon effective coordination among multiple stakeholders, transparent communication, and shared decision-making mechanisms.

Another important finding concerns the unequal distribution of tourism benefits. While tourism has generated additional income for certain community members, economic opportunities remain concentrated among groups possessing better access to capital, information, and business networks. This condition may weaken social cohesion and reduce public support for conservation initiatives if not addressed through more inclusive policies. The proposed Community-Centered Sustainable Geotourism Framework extends existing Community-Based Tourism theory by integrating collaborative governance, capacity building, inclusive planning, and equitable benefit-sharing into the specific context of UNESCO Global Geoparks. Rather than focusing solely on community participation in tourism services, the framework positions local communities as strategic partners in destination governance, conservation, and sustainable development.

Overall, the findings demonstrate that strengthening local participation requires not only increasing community involvement but also improving institutional collaboration and ensuring fair access to tourism opportunities. Such an integrated approach will contribute to

the long-term sustainability of the Toba Caldera UNESCO Global Geopark while simultaneously enhancing environmental protection, cultural resilience, and inclusive local economic development.

5. CONCLUSION

This study demonstrates that local community participation constitutes a fundamental pillar in achieving sustainable geotourism within the Toba Caldera UNESCO Global Geopark. The findings reveal that local communities contribute significantly to geoheritage conservation, cultural preservation, tourism service delivery, and destination promotion. Their involvement not only supports environmental sustainability but also strengthens local identity and generates economic opportunities. However, the effectiveness of community participation remains constrained by limited institutional capacity, insufficient stakeholder coordination, unequal distribution of tourism benefits, and restricted involvement in strategic decision-making processes.

The study proposes a Community-Centered Sustainable Geotourism Framework that integrates collaborative governance, capacity building, inclusive planning, and equitable benefit-sharing as the core mechanisms for enhancing sustainable destination management. This framework extends the application of Community-Based Tourism theory by emphasizing the strategic role of local communities as active partners in governance, conservation, and regional development within the context of UNESCO Global Geoparks.

From a practical perspective, the findings provide valuable implications for policymakers, destination management organizations, local governments, and community stakeholders. Strengthening institutional collaboration, expanding community capacity through continuous education and training, and ensuring more inclusive governance are essential to maximize the long-term sustainability of geotourism while improving local livelihoods. Future research may employ mixed-methods or comparative studies across different UNESCO Global Geoparks to validate and refine the proposed framework in diverse socio-cultural and institutional contexts.

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ENVIRONMENTAL JURISPRUDENCE AND CONSERVATION LAW: EXAMINING THE SUSTAINABILITY OF GEOPARK AREAS FROM A SHARIA PERSPECTIVE

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ABSTRACT

UNESCO Global Geopark areas such as the Toba Caldera face a persistent tension between ecological conservation and the economic aspirations of surrounding communities a tension that became starkly evident when UNESCO issued a “yellow card” warning in 2023 due to weak synergy among stakeholders. Conservation regulation in Indonesia remains predominantly positivist-secular and rarely engages the ethical-religious resources of the Muslim communities that inhabit many geopark areas. This study aims to examine how the principles of environmental jurisprudence (fiqh al-bi'ah) can be integrated with positive conservation law to strengthen the legal and ethical foundations of geopark sustainability. Employing a normative legal research method through statutory and conceptual approaches, this study examines Law Number 32 of 2009 on Environmental Protection and Management and Government Regulation Number 37 of 2014 on the Lake Toba Area, alongside the environmental jurisprudential doctrines of hifz al-bi'ah, tawazun, khilafah, and hima, interpreted through the framework of maqashid syariah. The findings show that environmental jurisprudence offers a normative concept that is structurally aligned with and capable of reinforcing the conservation, education, and community-economy pillars of geopark governance, particularly by grounding community participation in obligations that carry religious legitimacy rather than mere administrative compliance. This study concludes that integrating maqashid syariah-based environmental jurisprudence into geopark governance instruments offers a culturally and religiously inclusive legal pathway for resolving the conservation development tension in the Toba Caldera, while simultaneously strengthening Indonesia's position as a world-class center for geopark research.

Keywords: Environmental jurisprudence; conservation law; geopark; maqashid syariah; sustainability

1. INTRODUCTION

UNESCO Global Geoparks are designed to integrate three pillars geological conservation, education, and sustainable local economic development within a single, holistically managed area (UNESCO, 2026). The Toba Caldera, designated a UNESCO Global Geopark in 2020, exemplifies how difficult it is to maintain these three pillars simultaneously: a landscape formed by a supervolcanic eruption that is at once the living space of the Batak Toba people, a rapidly growing tourism economy, and an internationally monitored conservation asset. In September 2023, UNESCO issued a “yellow card” warning to the Toba

Caldera Geopark, signaling serious concern over weak synergy between government institutions and local communities in its management (Hajar et al., 2025). Although “green card” status was successfully regained in 2025 following governance reform (Hajar et al., 2025), the episode exposed a structural weakness commonly found in geoparks worldwide: conservation regulation built almost entirely on positivist-secular administrative law, leaving very limited normative space for the ethical and religious frameworks that actually shape the daily conduct of communities living within geopark areas.

This weakness becomes particularly significant in geopark areas with Muslim-majority populations such as North Sumatra, where customary practice, religious authority, and state regulation operate side by side. Indonesia's environmental legal architecture, anchored in Law Number 32 of 2009 on Environmental Protection and Management and, specifically for the Toba area, Government Regulation Number 37 of 2014 on the Lake Toba Area, provides a formal-administrative foundation for conservation. Yet comparative geopark governance research elsewhere including recent studies on geoheritage governance in China shows that technocratic, top-down conservation frameworks frequently fail to secure sustained community support, precisely because they treat geoheritage as an objective, value-free resource rather than a construct embedded in local systems of meaning (Zhuang et al., 2024). Since at least the 1990s, Islamic legal scholarship has developed a parallel yet still underutilized body of doctrine: *fiqh al-bi'ah*, or environmental jurisprudence, which frames environmental stewardship as a religious obligation rather than a merely discretionary administrative target (Gade, 2015; Mangunjaya & McKay, 2012).

This study addresses a genuine research gap: the conceptual relationship between *fiqh al-bi'ah* and positive conservation law has rarely been examined specifically within the context of UNESCO Global Geopark governance and, to the authors' knowledge, has never been examined in relation to the Toba Caldera Geopark. Existing studies of Islamic environmental law in Indonesia have focused predominantly on MUI fatwas concerning wildlife, mining, and forest fires (Hajar et al., 2025; Mangunjaya & Praharawati, 2019), while existing studies of Toba Caldera governance have focused mainly on adaptive public administration models without engaging Islamic legal theory (Hajar et al., 2025). A recent umbrella review of the religious-environmental literature in Indonesia further emphasizes that integrating Islam into conservation action is not a frictionless process, calling for a more multidisciplinary, empirically grounded approach rather than mere normative theological justification (Testriono & Billahi, 2025). This study aims to examine how the core doctrines of *fiqh al-bi'ah* (*hifz al-bi'ah* (environmental stewardship), *tawazun* (ecological balance), *khilafah* (human responsibility as steward), and *hima* (the protected-area institution in classical Islam) can be conceptually integrated with Indonesia's positive conservation law and the *maqashid syariah* framework, in order to strengthen the legal-ethical foundations for the sustainable governance of the Toba Caldera Geopark. The contribution of this study is twofold: theoretically, it extends the study of *fiqh al-bi'ah* specifically into the domain of geopark governance; practically, it offers a normative foundation that can be drawn upon by local governments, geopark management bodies, and religious authorities such as MUI in formulating community-based conservation instruments for the Toba Caldera and other Muslim-majority geopark areas.

2. LITERATURE REVIEW

2.1 Fiqh al-Bi'ah as Environmental Jurisprudence

Fiqh al-bi'ah, literally meaning “environmental jurisprudence,” is a branch of Islamic legal reasoning that derives normative environmental obligations from the Qur'an, Hadith, and the broader corpus of *usul al-fiqh*. Gade (2015) shows that religious authorities in Indonesia increasingly translate this doctrine into concrete instruments, chiefly through fatwa and *da'wa* rather than formal legislation. At the heart of *fiqh al-bi'ah* lies the concept of *khilafah* (human responsibility as steward), which positions humankind as trustee rather than owner of the earth's resources, together with the principle of *tawazun* (balance), which obliges believers to avoid actions that disrupt ecological equilibrium. Mangunjaya and McKay (2012) trace how this doctrine has been operationalized in Indonesia through faith-based environmental education in *pesantren* and collaboration between conservation NGOs and religious leaders, arguing that grassroots religious legitimacy succeeds precisely where top-down state regulation fails to reach. A recent conceptual study (Bsoul et al., 2022) affirms that environmental sustainability in Islam rests on the unity of *tawhid*, *amanah*, and *khilafah*, such that ecological responsibility cannot be separated from faith itself. Mangunjaya (2021), drawing on his own extensive activist record, documents how Islam-based environmental movements in Indonesia have evolved from grassroots religious forums into points of reference for national climate policy, while Imran (2023) extends this discourse philosophically by tracing the ecological thought of Seyyed Hossein Nasr, who critiques the paradigm of secular scientism and calls for the restoration of a religious worldview toward nature. Danhas (2024) complements this discourse by systematically establishing *fiqh al-bi'ah* as a distinct branch of environmental science within the contemporary Islamic legal corpus.

2.2 Hima and Maqashid Syariah

Among the classical instruments of *fiqh al-bi'ah*, *hima* a protected area historically designated by religious or political authority to safeguard grazing land, forests, or water sources stands as the doctrinal precedent most closely aligned with the modern concept of a conservation area or geopark zone. Its legitimacy derives not only from administrative designation but also from the religious prohibition against harm (the principle of *la dharar wa la dhirar*), which endows protected status with a normative weight that operates independently of, and precedes, the state's law-enforcement capacity. This doctrinal architecture connects to the broader framework of *maqashid syariah* (the higher objectives of Islamic law), in which environmental protection is increasingly understood as part of the preservation of life (*hifz al-nafs*) and the preservation of wealth/resources (*hifz al-mal*) for present and future generations. A scientometric mapping (Mohammed, 2024) of global *maqashid al-shariah* scholarship confirms that environmental and ecological applications now constitute one of the fastest-growing interdisciplinary clusters in the literature, with Indonesia and Malaysia as leading contributors indicating that the integration proposed in this study sits within an active and expanding scholarly trajectory rather than a marginal discourse. Nasir et al. (2022) further note that global environmental degradation directly threatens the *dharuriyyah* (essential needs) level of *maqashid syariah*, meaning that ecological conservation can no longer be positioned as a secondary issue in Islamic jurisprudence, while Azmin Shompa

et al. (2024) demonstrate that the maqashid framework can be practically operationalized into resource-management policy a methodological precedent relevant to this study's proposed hima-equivalent zoning. Comparatively, a global literature review of sacred natural sites by Tatay and Merino (2023) affirms that religiously grounded conservation institutions such as hima are not an exclusively Islamic phenomenon but one variant of a universal pattern in which spiritual authority lends normative force to the protection of natural areas, often proving more durable than administrative regulation alone. More broadly, the maqashid framework has also proven to be a meeting point between global sustainability principles and Islamic economic ethics, as shown by Hassan et al. (2021) in their comprehensive study of Islamic finance and sustainable development, consistent with the finding of Zain et al. (2024) that ESG (environmental, social, and governance) principles can be coherently integrated with maqashid syariah to form an operational blueprint for institutions seeking to make ecological sustainability part of shariah compliance rather than a mere ethical addendum outside the framework of Islamic law.

2.3 Islamic Environmental Law in Practice in Indonesia

At the level of state practice, Ramlan (2020) shows that Indonesia, alongside Malaysia and Singapore, implements Islamic environmental law chiefly through non-binding religio-legal instruments namely fatwa and khutbah rather than through constitutional institutionalization. Mangunjaya and Praharawati (2019) document several MUI fatwas addressing population and development, environmentally friendly mining, the protection of endangered species, and the prevention of land and forest burning, noting that their social effectiveness depends heavily on the active follow-up of religious authorities rather than on the fatwa text alone. Recent findings from the Riau Islands reinforce this pattern: the effectiveness of eco-fatwas in driving behavioral change consistently depends on the active role of local ulama in translating fatwas into everyday da'wa practice and community accompaniment, rather than on the textual force of the fatwa itself (Ansori et al., 2025). This pattern indicates that any effort to integrate fiqh al-bi'ah into geopark governance must be accompanied by institutional follow-up jointly involving MUI, local religious leaders, and geopark management bodies rather than being treated as a one-off normative declaration. Empirical evidence from the field application of MUI fatwas further supports this pattern: a study by Praharawati et al. (2022) of communities around the Rimbang Baling Wildlife Sanctuary in Riau found that community knowledge of MUI Fatwa No. 4 of 2014 on the protection of endangered species correlated positively and significantly with community intention to participate in conservation a finding that strengthens the argument that religio-legal instruments such as fatwa can effectively shape conservation behavior when actively disseminated at the grassroots level.

2.4 Geopark Governance and the Toba Caldera Context

From a governance-theory perspective, a qualitative study by Zhuang et al. (2024) of a UNESCO Global Geopark in China shows that conflicting understandings of what “geoheritage” means among scientific, administrative, and local authorities routinely undermine geopark management when these understandings are not actively negotiated precisely because geoheritage is treated as an objective technical category rather than a value-laden social

construct. A mixed-methods study by Hajar et al. (2025) of the Toba Caldera Geopark in Samosir Regency empirically confirms a similar dynamic: local wisdom has no statistically significant direct influence on sustainable tourism unless institutionalized through adaptive governance mechanisms, while geosite governance itself shows only a marginal direct influence on sustainability outcomes. This pattern is also consistent with the finding of Lee and Jayakumar (2021) that the economic benefits of UNESCO Global Geopark designation in Asia depend heavily on the extent to which local communities are actively engaged in geotourism strategy, rather than on international recognition status alone. A global comparative review compiled by Singh et al. (2021) of dozens of geoparks across multiple continents reinforces this pattern, showing that the success of the three geopark pillars (conservation, education, community economy) consistently depends on the extent to which local including religious values and knowledge are integrated into governance, rather than on the completeness of scientific infrastructure alone. A recent quantitative study of the Kinabalu UNESCO Global Geopark in Malaysia by Dousin et al. (2024) further confirms that community support for geopark development serves as a critical linking variable between economic-sociocultural benefits and community well-being a finding relevant to this study's argument that social legitimacy, rather than administrative status alone, determines the success of geopark governance in Muslim-majority populations. A critical study by Ristiawan et al. (2023, 2024) of the Gunungsewu and Ciletuh Geoparks in Indonesia, however, warns of the other side of this issue: without an inclusive governance framework, UNESCO Global Geopark status can trigger the commodification of rural landscapes and rent-gap dynamics that benefit investors and local-regional elites rather than the communities who should be the primary beneficiaries of the three geopark pillars a warning relevant to the Toba Caldera given similar dynamics among the Geopark Management Body, local government, and tourism investors. At the local level within Samosir Regency itself, a recent study by Simanihuruk et al. (2025) in Salaon Toba Village documents that Batak Toba customary institutions such as Raja Bius and Raja Bondar have historically functioned as authorities governing the use of Lake Toba's water resources and ecology, including customary prohibitions protecting specific sites along the lakeshore a local institutional precedent structurally aligned with the logic of hima in fiqh al-bi'ah, while also affirming that local-wisdom-based conservation instruments in the Toba Caldera must not be designed exclusively along Islamic lines without accommodating the customary authority that has long helped maintain the area's ecological balance. Read together, these studies indicate that the variable still missing from current geopark-governance theory is an institutional mechanism that grants legal standing to local normative systems both customary and religious within the formal governance structure. Fiqh al-bi'ah, which draws its binding force from religious obligation and is articulated through the doctrine of hima, is proposed in this study as one such mechanism for the Muslim majority communities of the Toba Caldera area.

3. RESEARCH METHOD

This study employs a normative (doctrinal) legal research method, suited to examining the conceptual coherence between two normative systems positive conservation law and Islamic environmental jurisprudence rather than to measuring empirical behavior. Two complementary approaches are used: a statute approach, applied to Law Number 32 of 2009

on Environmental Protection and Management and Government Regulation Number 37 of 2014 on the Lake Toba Area; and a conceptual approach, applied to classical and contemporary fiqh al-bi'ah doctrine and the maqashid syariah framework. Primary legal materials comprise the Qur'an, Hadith, the two regulations above, and relevant MUI fatwas as discussed in secondary literature. Secondary legal materials comprise Scopus-indexed journal articles selected for their direct relevance to Islamic environmental jurisprudence, maqashid syariah, and geopark governance theory. Data were collected through library research and analyzed using qualitative legal interpretation techniques grammatical, systematic, and teleological interpretation to identify points of conceptual convergence between the two normative systems, which were then synthesized descriptively analytically and mapped onto the three governance pillars (conservation, education, community economy) that constitute UNESCO Global Geopark management.

4. RESULTS AND DISCUSSION

4.1 Convergence between Fiqh al-Bi'ah Principles and Geopark Governance Pillars

The analysis identifies four classical fiqh al-bi'ah principles that correspond directly to the three UNESCO Global Geopark governance pillars, as summarized in Table 1.

Table 1. Convergence between Fiqh al-Bi'ah Principles and Geopark Governance Pillars

Principle	Meaning in Islamic Law	Geopark Governance Pillar
Hifz al-bi'ah	The obligation to preserve the environment and prevent ecological harm	Conservation
Tawazun	The maintenance of ecological and social balance	Conservation / Community economy
Khilafah	Humankind as trustee, not owner, of natural resources	Education
Hima	A protected area grounded in religious authority with normative binding force	Conservation / Law enforcement

4.2 Resolving the Conservation-Development Tension

The 2023 UNESCO yellow-card episode concerning the Toba Caldera Geopark, as documented by Hajar et al. (2025), was triggered chiefly by weak inter-institutional coordination and the limited integration of local values into formal governance precisely the gap identified by Zhuang et al. (2024) in the Chinese context. Positive legal instruments such as Government Regulation Number 37 of 2014 establish zoning and institutional authority but do not, by themselves, generate the social legitimacy needed for community compliance a limitation also implied in Hajar et al.'s (2025) finding that local wisdom must be institutionalized through governance mechanisms in order to exert a measurable influence on sustainable-tourism outcomes. Fiqh al-bi'ah offers an institutional bridge that has thus far been missing for

Muslim-majority communities: because the doctrine of hima derives its binding force from religious obligation rather than administrative sanction alone, a geosite formally designated as a hima equivalent conservation area through fatwa, khutbah, and the support of local religious leaders working alongside the Toba Caldera Geopark Management Body can produce socially self-enforcing compliance that does not depend entirely on state monitoring capacity, consistent with faith-based conservation outcomes already documented elsewhere in Indonesia by Mangunjaya and Praharawati (2019). A recent study of the Gargano Geopark in Italy underscores the same pattern at the global level: the success of the UNESCO Global Geopark model as an instrument of sustainable development is determined chiefly by the social acceptance of local stakeholders, rather than by international status designation alone (Esengulova et al., 2026).

4.3 Maqashid Syariah as an Integrating Normative Framework

Reading the four principles above through the lens of maqashid syariah lends new meaning to the purpose of geopark conservation: protecting the geological and ecological assets of Lake Toba becomes part of *hifz al-mal* (the preservation of wealth/resources) and *hifz al-nafs* (the preservation of life), rather than a merely technical or economic objective. This reframing carries governance implications consistent with Mohammed's (2024) observation that maqashid-based applications continue to expand precisely because of their interdisciplinary and policy-applicable nature: a regional regulation or geopark management decision that explicitly invokes the principle of maqashid Syariah as a complement to, not a replacement for, existing positive law would provide local communities with a normative anchor that carries both religious legitimacy and legal force, thereby addressing the balance between global and social legitimacy that Hajar et al. (2025) identify as the principal challenge of adaptive geosite governance in Samosir Regency.

4.4 Limitations of the Integration Model

This integration is not without limitations. As Ramlan (2020) cautions, fatwa-based instruments in Indonesia remain legally non-binding unless actively followed up through institutionalization; without sustained engagement from MUI, local ulama, and the Geopark Management Body, the maqashid syariah framework risks becoming merely symbolic rather than operational. Furthermore, the hima model, despite its strong doctrinal fit, must be adapted carefully to multireligious and multiethnic societies such as Samosir Regency, where the Batak Toba community includes a significant non-Muslim population governed by customary law that functions as an equally valid normative source; an exclusively Islamic legal framework, if implemented without equal respect for customary institutions, risks reproducing the very exclusion that weakened social legitimacy during the 2023 yellow-card episode. A recent study on legal pluralism in Aceh Province shows that the success of reconciling customary norms and state law in natural-resource governance depends heavily on the strength of local customary institutions and the degree of community social cohesion (Tias et al., 2026) a lesson relevant to the multiethnic, multireligious context of Samosir Regency. The neglect of recognition and engagement of customary and religious custodians in the governance of World Heritage-status areas has also been widely documented as a structural

weakness in international practice, and must therefore be anticipated from the outset in the design of hima-based conservation instruments in the Toba Caldera (Verschuuren et al., 2022).

5. CONCLUSION

The classical fiqh al-bi'ah principles *hifz al-bi'ah*, *tawazun*, *khilafah*, and *hima* are structurally aligned with, and capable of reinforcing, the conservation, education, and community-economy pillars that constitute UNESCO Global Geopark governance. Through the *maqashid syariah* framework, environmental conservation in the Toba Caldera Geopark can be normatively reframed as part of the preservation of life and resources for present and future generations, rather than as a mere target of administrative compliance. Theoretically, this study extends the study of fiqh al-bi'ah previously concentrated on fatwas concerning wildlife, mining, and forest fires specifically into the domain of UNESCO Global Geopark governance. Practically, this study recommends that the Toba Caldera Geopark Management Body, local government, and religious authorities such as MUI North Sumatra jointly explore community-based conservation instruments (such as fatwa, khutbah, and hima-equivalent zoning) that operate alongside, rather than replace, existing positive law such as Government Regulation Number 37 of 2014 provided that such instruments are developed inclusively, with explicit recognition of customary law for the area's significant non-Muslim population. Future research should empirically test community acceptance of such instruments in the Toba Caldera area, and comparatively examine how other Muslim-majority UNESCO Global Geoparks have or have not integrated legal-religious normativity into their governance frameworks. By strengthening the legal-ethical foundations of geopark governance, this approach is expected to support Indonesia's broader aspiration to establish the Toba Caldera as a world-class center for geopark research and information.

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THE SOCIAL WELL-BEING OF LOCAL COMMUNITIES IN SUSTAINABLE GEOPARK DEVELOPMENT: A GENDER AND INCLUSION PERSPECTIVE

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ABSTRACT

Sustainable geopark development is increasingly positioned as an instrument of local economic growth, but its contribution to the social welfare of host communities, especially through gender and inclusion perspectives, is still underexplored, especially in the Indonesian context. This research maps the intellectual structure of the literature on social welfare, gender, and inclusion through bibliometric analysis, as well as formulates a conceptual framework that can be adapted into the governance of UNESCO Global Geoparks such as the Toba Caldera Geopark. Bibliometric data were obtained from the Scopus database and visualized using VOSviewer 1.6.20 through network, density, and keyword co-occurrence overlays. The results of the analysis identified four thematic clusters: (1) gender and demographic studies, (2) life experiences, diversity, and qualitative inclusion methods, (3) academic literature and access to knowledge, and (4) inclusion policies and strategies, with the words "gender", "inclusion", and "study" functioning as the main connecting nodes. The discussion synthesizes the four clusters into a WHO–HOW–POLICY framework for social welfare with a gender perspective in the geopark area, which is enriched with the perspective of Maqashid Syariah which is relevant to the Islamic socio-economic context at the study site. This study concludes that although the gender-inclusion-well-being literature has matured conceptually, its explicit application to the development of geopark communities especially in the context of the Toba Caldera is still a significant research gap, and proposes a further field research agenda that combines this bibliometric foundation with empirical case studies on the role of women in geopark-based livelihoods.

Keywords: Social Welfare; Gender Inclusion; Sustainable Geoparks; Bibliometric Analysis; Community Empowerment; Maqashid Syariah

1. INTRODUCTION

Geoparks have become an instrument of sustainable development that is increasingly recognized globally through the UNESCO Global Geoparks Network (Saputri, 2024; Sijabat & Zulian, 2026), which combines geological heritage conservation, education, and geotourism-based economic development. Indonesia has a number of areas that have obtained UNESCO Global Geopark status, including the Toba Caldera Geopark in North Sumatra, which is currently hosting The 2nd International Conference on Geotourism with the theme "Strengthening Global Geopark Research Networks and Transforming the Toba Caldera into a World-Class

Center for Geopark Research and Information" (Hajar et al., 2025; Sibarani et al., 2025; Sinambela & Fachrudin, 2022).

The development of geoparks is not automatically inclusive of all local community groups (Berliandaldo & Fasa, 2022). An ethnographic study at the Qeshm UNESCO Global Geopark in Iran shows that the transition to community-based tourism changes women's visibility and economic participation unevenly between villages, depending on the degree of openness of local culture and the involvement of external actors (Nikjoo et al., 2025). In line with that, a systematic study of community participation in sustainable tourism in Indonesia identified the limitations of the inclusion of women, the younger generation, and indigenous peoples as One of the main gaps that has not been addressed by existing community-based tourism models (Muda, 2025).

Academic studies on social well-being, gender, and inclusion are actually fields of knowledge that have matured and developed rapidly independently. A global bibliometric mapping of 835 documents from Scopus and the Web of Science shows fragmentation across disciplines but consistent scientific growth on issues of gender equality, public policy, health, and culture (Guamán-Llongo et al., 2026). A bibliometric review of 376 documents on rural women's empowerment confirms significant post-2015 growth driven by the Sustainable Development Goals agenda (Vela Meléndez et al., 2025). The question is, to what extent this mature conceptual framework is explicitly adapted into the context of geopark governance in Indonesia, especially the Toba Caldera Geopark which is building new institutional cooperation with universities.

Based on these gaps, this study aims to: (1) map the intellectual structure of the literature on social welfare, gender, and inclusion through bibliometric analysis using VOSviewer; and (2) synthesize the thematic structure into a conceptual framework relevant to the social welfare of the community in the sustainable geopark area, enriched with the perspective of Maqashid Syariah according to the Islamic socio-economic context in the study environment. This research is explicitly positioned as a conceptual paper-based conceptual study, not an empirical field study in the Toba Caldera area, and is intended as an academic foundation for the advanced field research agenda.

2. METHODS

This study uses a bibliometric analysis approach (Olivia & Hidayat, 2024) to map the intellectual structure of the social well-being, gender, and inclusion literature. Scientific document data was obtained from the Scopus database with keywords that focus on the concepts of social welfare (social welfare/wellbeing), local community, gender, and social inclusion, limited to the range of publications from 2015–2026 and the type of journal article document. The search was conducted on July 28, 2026 resulting in 1,149,549 documents which were subsequently exported in RIS/CSV format for analysis (Olivia et al., 2025).

Bibliometric visualization is performed using VOSviewer software version 1.6.20 (Vela Meléndez et al., 2025), which is widely used in science mapping studies to analyze the co-occurrence of keywords. Three types of visualizations were generated: (1) network visualization, which displays linkages between keywords and thematic clustering based on color; (2) density visualization, which shows the intensity of the appearance and thematic

proximity of a keyword in the corpus; and (3) Overlay Visualization, which maps additional dimensions (average score) on each keyword node.

3. RESULTS

3.1 Network Visualization

The results of the network visualization (Figure 1) show four main thematic clusters differentiated by color. The red cluster is centered on the keywords woman, gender, study, data, man, age, effect, role, group, intervention, education, and girl. The green cluster is centered on experience, challenge, barrier, diversity, interview, individual, participant, support, perception, and response. The blue cluster contains author, article, work, access, term, paper, literature, gap, and violence. The yellow cluster is the smallest but most central cluster containing inclusion, policy, perspective, context, and strategy. The keywords study, research, gender, and inclusion seem to function as bridging nodes that unite the four clusters, indicating that the gender discourse in this literature is inherently cross-themed covering demographic, methodological, academic, and policy dimensions. A summary of the four clusters and their relevance to the geopark context is presented in Table 1.

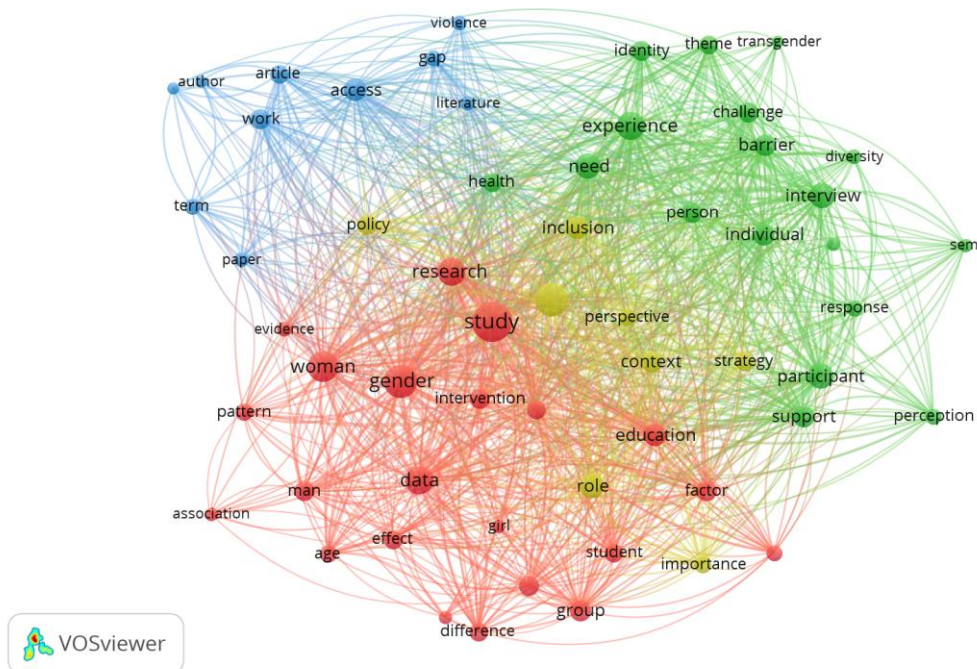


Figure 1. Network Visualization: Map of Social Wellbeing, Gender, and Inclusion Literature Keyword Co-occurrence (processed with VOSviewer 1.6.20)

Klaster	Dominant Keywords	Label Theme	Relevance to the Welfare of Geopark Communities
1 (Red)	woman, gender, man, age, data, effect, role, group, intervention, education, difference, girl, student	Gender & Studi Demografis — "WHO"	Identify specific target groups (women, men, cross-ages, younger generations) who are involved/affected by geopark economic activities
2 (Green)	experience, challenge, barrier, diversity, interview, individual, participant, support, perception, response, semi(-structured)	Experience, Diversity & Inclusion Methods — "HOW"	A qualitative-participatory approach (semi-structured interviews) to capture experiences, barriers, and community support needs in an inclusive manner
3 (Blue)	author, article, work, access, term, paper, literature, gap, violence	Academic Literature & Access to Knowledge — "FOUNDATION"	The academic basis and research gap that underlie the urgency of further study in the context of geoparks
4 (Yellow)	inclusion, policy, perspective, context, strategy	Inclusion Policy & Strategy — "POLICY"	Bridge the translation of academic findings into geopark governance and policy documents

3.2 Thematic Density (Density Visualization)

The density visualization (Figure 2) reinforces the findings on the network map, with bright yellow zones indicating the highest research intensity concentrated on the keywords study, research, gender, and woman. This suggests that although gender issues are discussed from various perspectives (policy, health, education, violence), the thematic gravity of this literature remains in the study of gender and women in general, with other thematic branches (such as inclusion, barriers, and policy) in the moderate density zone that surrounds it.

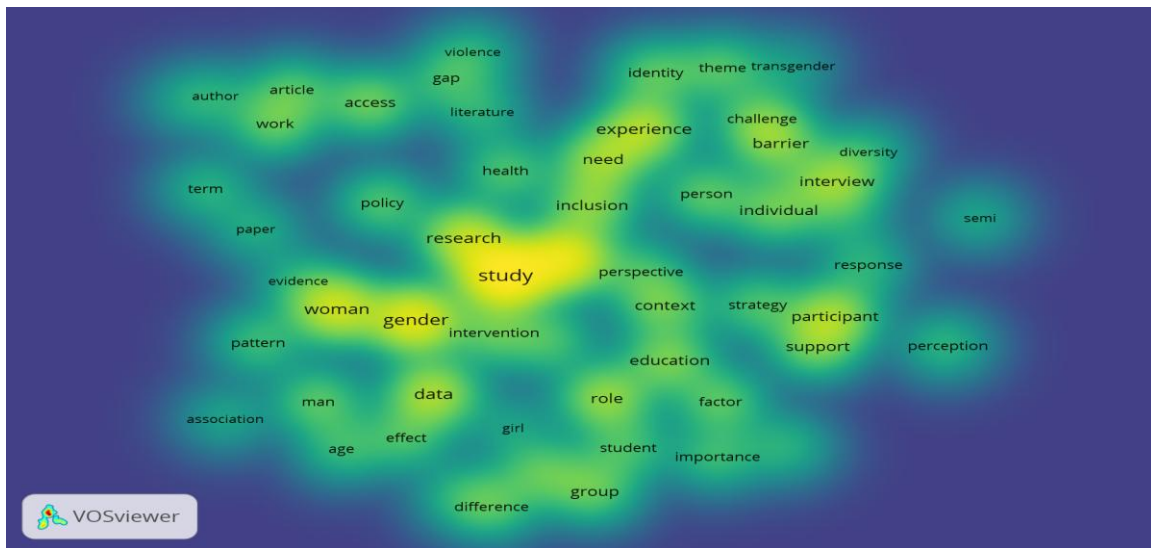


Figure 2. Density Visualization: Thematic Occurrence Intensity of Keywords (processed with VOSviewer 1.6.20)

3.3 Overlay Visualization

The overlay visualization (Figure 3) maps additional scores according to the parameters selected at the time of data processing (temporal score or citation score) on each keyword node. On this map, most of the keywords are on a relatively homogeneous range of scores, indicating that the core themes in the corpus develop at periods or levels of scientific impact that are adjacent to each other, without one sub-theme being predominantly more recent or more cited than the other sub-themes.

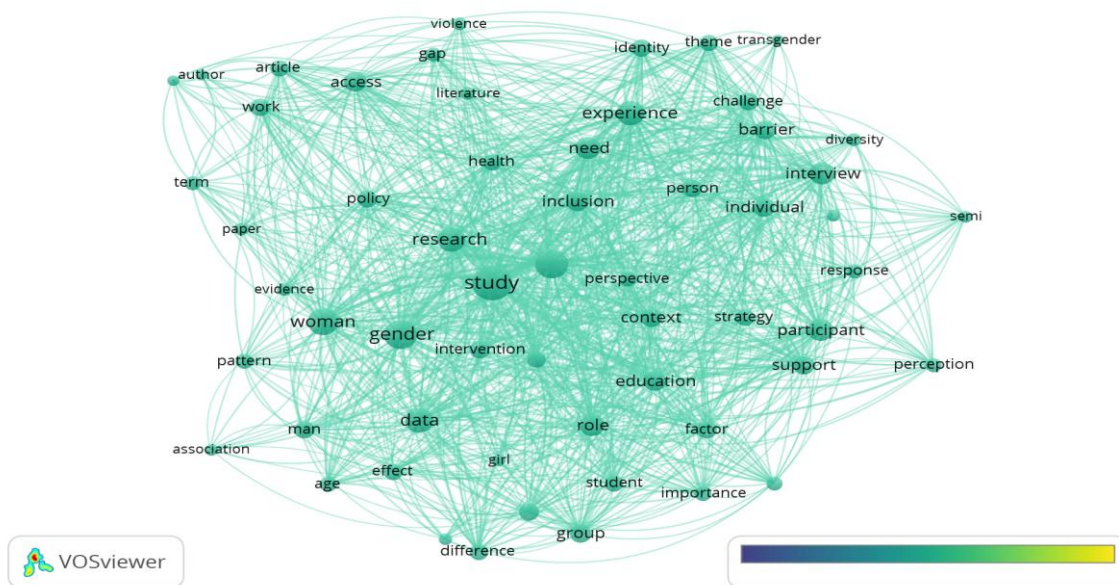


Figure 3. Overlay Visualization: Additional Score Distribution on Keyword Maps (processed with VOSviewer 1.6.20)

4. DISCUSSION

The four clusters identified in the Results section can be synthesized into a conceptual framework relevant to the governance of social welfare in sustainable geopark areas, which in this study is referred to as the WHO–HOW–POLICY framework (Table 2). The gender-demographic cluster (cluster 1) answered the WHO question which local community groups are the targets or the main actors in the geopark economy, including women MSME actors, tour guides, and the younger generation. The experience-diversity cluster (cluster 2) answers the question of HOW what participatory methods are relevant to capture the life experiences and obstacles faced by the group, as has been practiced in a semi-structured interview-based ethnographic study at the Qeshm Geopark (Nikjoo et al., 2025). The policy-inclusion cluster (cluster 4), although the smallest in the network map, plays the most strategic role as a POLICY bridge that translates academic findings into regional governance documents.

These findings are directly relevant to the gaps identified by Muda (2025) in a systematic review of community participation in Indonesia's sustainable tourism, which highlights the limitations of women, young generation, and indigenous peoples as key challenges that have not been addressed by the community-based tourism model in Indonesia, including in geopark areas. The WHO–HOW–POLICY framework proposed in this study offers a conceptual roadmap to fill these gaps more systematically, while answering the themes of "Community Empowerment in Geopark Areas" and "Policy and Governance for Sustainable Geopark Management" which are the main topics of GEOFEST 2026.

As a normative enrichment that distinguishes this research from secular gender-inclusion studies in general, the framework is strengthened by the perspective of Maqashid Sharia, an Islamic ethical framework that is oriented towards the protection of five main aspects of human life: religion (din), soul (nafs), intellect ('aql), heredity (nasl), and property (mal) (A'yun, 2025). Scientometric mapping of Maqasid al-Shariah literature shows that this framework has been applied across disciplines, including economic and business issues, but its specific application in the context of gender welfare in geotourism areas has not been widely explored. In the context of Islamic socio-economics inherent in the community around the Toba Caldera and institutions under the umbrella of Muhammadiyah), the principles of hifz al-nafs (protection of life/safety) and hifz al-mal (protection of property/economic livelihood) can be an additional lens to assess the extent to which gender inclusion in the geopark economy also meets the broader standards of benefit (maslahah), beyond the indicators of economic inclusion alone.

The conceptual contribution of this research is to position the mature welfare-gender-inclusion literature as an adaptive foundation, not to be applied directly, but to be carefully contextualized into sustainable geopark governance based on local and Islamic values (Adinugraha et al., 2025; Muzakkir et al., 2025). The proposed follow-up research agenda is a qualitative field study in the Toba Caldera Geopark area, focusing on the role of women MSME actors and tour guides in the geopark buffer area, using the WHO–HOW–POLICY framework as an analytical instrument and Maqashid Syariah as an evaluative lens.

This research has a number of limitations that need to be openly acknowledged. First, its conceptual nature is bibliometric-based, meaning that primary data from the field in the Toba Caldera area are not yet available. Second, the use of one database (Scopus) has the

potential to limit the representation of literature indexed in other databases such as the Web of Science or local sources in Indonesian. Third, the analysis of keyword co-occurrence is quantitative-descriptive and does not include a more in-depth analysis of content or sentiment towards the content of the mapped articles.

5. CONCLUSION

This study maps the intellectual structure of the social well-being, gender, and inclusion literature through VOSviewer bibliometric analysis, and identifies four main thematic clusters: gender-demographic, experience-diversity, academic literature, and policy-inclusion. The results are synthesized into the WHO–HOW–POLICY conceptual framework enriched with the perspective of Maqashid Sharia, as a roadmap for the mainstreaming of social welfare from a gender perspective in sustainable geopark governance. These findings confirm that although the gender-inclusion-well-being literature has matured conceptually globally, its explicit application to the development of geopark communities in Indonesia, especially the Toba Caldera, is still a significant research gap and is open to follow-up.

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HALAL TOURISM AND LOCAL ECONOMIC DEVELOPMENT: A BIBLIOMETRIC ANALYSIS OF GLOBAL RESEARCH TRENDS

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ABSTRACT

Halal tourism has become one of the fastest growing segments of the global travel industry, yet its intersection with local economic development has rarely been mapped as a distinct research theme. This study conducts a bibliometric analysis of halal tourism and local economic development research indexed in Scopus between 2014 and 2026. An initial search using the keyword “halal tourism” returned 5,705 documents. The search was then narrowed using the keywords “tourism” and “local economic development,” reducing the dataset to 1,836 documents, and after applying inclusion and exclusion criteria, a final dataset of 602 documents was obtained. Data were analyzed using Scopus analytical tools for publication trend statistics and VOSviewer software for keyword co-occurrence network, overlay, and density visualization. The results show a slow but steady growth in publications since 2014, with a sharp increase after 2019 and the Journal of Islamic Marketing as the dominant outlet. Three main keyword clusters were identified, covering destination governance and policy, halal industry and certification, and Muslim consumer behavior, while no distinct cluster explicitly representing local economic development emerged. This gap is discussed alongside case studies in West Sumatera and the Lake Toba region that address local economic impacts in depth yet remain disconnected from the field's broader bibliometric structure. The study concludes that halal tourism research has matured conceptually but has not been deliberately integrated with local economic development as a unit of analysis, and offers recommendations for future research bridging this gap in community based geotourism destinations.

Keywords: Halal Tourism, Local Economic Development, Bibliometric Analysis, VOSviewer, Geotourism

1. INTRODUCTION

Halal tourism has grown into one of the most closely watched segments of the global travel industry over the past decade. The number of Muslim travelers worldwide is projected to reach 230 million by 2026, contributing approximately USD 300 billion to the global economy (Lestari et al., 2023). This growth is driven by the rising global Muslim population, increasing middle class income, and easier access to information through digital technology. Indonesia and Malaysia consistently appear as the two leading contributors of publications on this topic (Kurniawan et al., 2025), while Thailand, Azerbaijan, and several other countries follow with smaller shares (Chantarungsri et al., 2024).

Although research on halal tourism has expanded rapidly, its intersection with local economic development has rarely stood out as a distinct theme within large scale keyword maps of the field. Most existing bibliometric studies converge on three broad areas, namely destination governance and policy, halal industry and certification, and Muslim consumer behavior. The local economic development dimension, including community welfare and micro, small, and medium enterprises, tends to appear only within single case studies rather than as an independent cluster at the global level. This gap forms the central problem addressed in this study.

Rather than mapping halal tourism in general, this study deliberately combines two keywords, halal tourism and local economic development, to examine how strongly and how maturely these two fields intersect within the Scopus indexed literature. This approach is academically relevant because few bibliometric studies have isolated this intersection as the primary unit of analysis, and it is practically relevant because several regions in Indonesia, including geopark areas and community based destinations such as Lake Toba, are actively promoting halal tourism as a strategy to strengthen local economies (Lumbanraja & Saraan, 2025). The urgency of this study is further supported by Indonesia's position as the world's top ranked halal tourism destination since 2019 and by national sharia economic policy that places halal tourism among its key pillars. Based on this background, the present study aims to map annual publication trends, identify the intellectual structure and thematic clusters of the field, trace the evolution of themes over time, and identify the research gap at the intersection of halal tourism and local economic development within the Scopus database from 2014 to 2026.

2. LITERATURE REVIEW

Halal tourism refers to tourism activities and services that comply with Islamic principles, ranging from food and accommodation to broader destination management practices. As a field of study, halal tourism has matured conceptually, as shown by (Vargas-Sánchez & Moral-Moral, 2020), through two separate literature reviews concluding that the field has moved beyond its early descriptive stage, even though it still relies heavily on single country case studies. Bibliometric analysis itself has become a common method for capturing the structure and direction of a research field rather than testing causal relationships between variables (Aria & Cuccurullo, 2017; Mulet-Forteza et al., 2019), and it is considered suitable for tracing the maturity of an emerging field through the co-occurrence of keywords and publication metadata (Valérie & Pierre, 2010).

Several bibliometric studies have mapped the structure of halal tourism research. (Chantarungsri et al., 2024) analyzed 304 Scopus documents published between 2013 and 2023 and identified four main schools of thought, namely Islamic tourism principles, customer satisfaction, risk management, and Muslim tourist experience. (Kurniawan et al., 2025) focused specifically on the Indonesian context between 2017 and 2024 and found that those themes were dominated by sharia regulation, destination competitiveness, and tourist loyalty, while also noting that the involvement of Indonesian authors and affiliations in international publications remained disproportionate to the country's research output. Earlier comparative work by (Moshin et al., 2020; Samori et al., 2016) similarly pointed to certification and community perception as recurring themes across Asian halal tourism destinations.

Despite this growing body of literature, the explicit connection between halal tourism and local economic development tends to surface mainly through single case studies. (Janita Dewi, 2023) examined place attachment and resident wellbeing in Yogyakarta, while (Sutono et al., 2024) modeled the Muslim friendly tourism value chain in West Sumatera and identified gaps in stakeholder coordination at the regional level. Closer to the context of this study, (Lumbanraja & Saraan, 2025) analyzed the impact of halal tourism policy on natural resources and the local economy in the Lake Toba region, providing direct evidence that halal tourism is being positioned as a vehicle for community economic development in geopark areas. (Suryanto et al., 2024) further compared halal tourism strategy models for economic growth between Indonesia and Malaysia, while Abbasian (2021) offered a contrasting perspective by documenting skepticism among Swedish tourism stakeholders toward the halal tourism concept, illustrating that its reception and economic relevance vary considerably across different cultural and market contexts.

Taken together, these studies suggest a theoretical framework in which halal tourism functions simultaneously as a religious market segment and as an instrument of local economic development, a dual role that has been documented in depth at the case study level but has not yet been confirmed at the level of the field's intellectual structure. As this study is exploratory and descriptive in nature, it does not test a specific hypothesis. Instead, it uses bibliometric mapping to examine whether the local economic development dimension has matured into a distinct thematic cluster within the broader halal tourism literature, a question that directly informs the research gap and contribution outlined in the Introduction.

3. RESEARCH METHODS

This study employs a quantitative descriptive bibliometric design (Olivia et al., 2025). This approach was chosen because the objective of the study is not to test causal relationships between variables, but to map the intellectual structure, publication trends, and thematic evolution of a research field, consistent with common practice in tourism related bibliometric research (Aria & Cuccurullo, 2017).

Data were collected from the Scopus database due to its broad coverage of reputable indexed journals and its ability to provide complete metadata for keyword network analysis (Burnham, 2006)(Singh et al., 2021). The initial search using the keyword “halal tourism” in the title, abstract, and keyword fields returned 5,705 documents. The search was then narrowed by adding the keywords “tourism” and “local economic development,” reducing the dataset to 1,836 documents. Inclusion and exclusion criteria were subsequently applied, restricting the dataset to journal articles and conference papers, English language documents, the business, management, economics, and social science subject areas, and the 2014 to 2026 publication window. This screening process followed the identification, screening, and eligibility stages commonly used in systematic literature reviews (Moher et al., 2009), resulting in a final dataset of 602 documents that served as the unit of analysis for this study.

Data analysis combined two complementary approaches. First, Scopus's built in analytical tools were used to generate descriptive statistics, including the annual document trend and the distribution of documents by source journal. Second, VOSviewer software was used to construct three types of visualization, namely a keyword co-occurrence network to

reveal the thematic cluster structure, an overlay visualization to show the average publication year of each term and trace the evolution of themes over time, and a density visualization to identify the concentration of research attention on particular terms. A minimum occurrence threshold was applied to filter out infrequent terms so that the resulting network would remain readable and substantively interpretable.

4. RESULTS AND DISCUSSION

The screening process produced a substantial reduction in the number of documents, from 5,705 documents under the general “halal tourism” search to 1,836 documents once the local economic development keywords were added, and finally to 602 documents after the inclusion and exclusion criteria were applied. This reduction is consistent with the objective of isolating the intersection between two broad themes rather than capturing halal tourism research in general, as summarized in Table 1.

Table 1. Document Selection Process

Stage	Search Terms / Criteria Applied	Number of Documents
1	"halal tourism" (title, abstract, keywords)	5,705
2	+ "tourism" AND "local economic development"	1,836
3	+ document type, language, subject area, and year inclusion/exclusion criteria	602

Source: Scopus, processed by author (2026)

The annual publication trend, presented in Figure 1, shows a slow but steady growth pattern since 2014, with a sharp increase becoming visible only after 2019. The Journal of Islamic Marketing emerges as the most consistent outlet for this theme throughout the observation period, recording 16 documents in 2025 before a slight decline in 2026. Other journals, including the Journal of Islamic Accounting and Business Research, the International Journal of Religious Tourism and Pilgrimage, GeoJournal of Tourism and Geosites, and IOP Conference Series: Earth and Environmental Science, only began contributing after 2019 and still account for a relatively small number of documents. This pattern indicates that discussion of the intersection between halal tourism and local economic development remains concentrated in a single dominant journal, while other outlets are only beginning to open space for the theme.

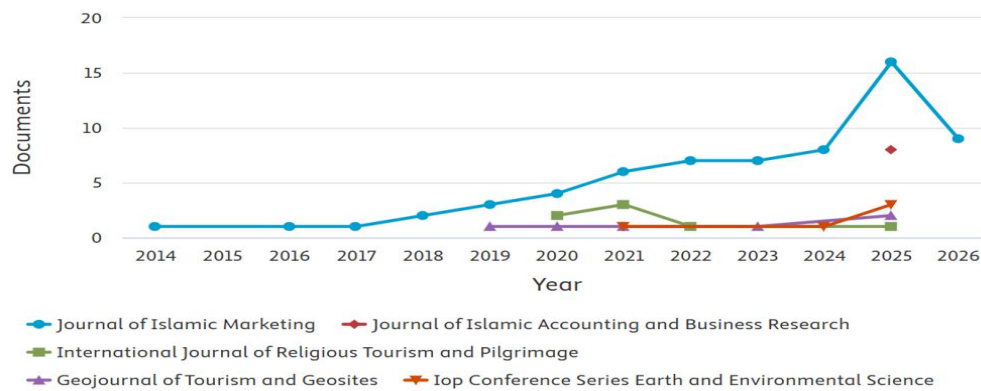


Figure 1. Annual Document Trend by Source Journal
Source: Scopus, processed by author (2026)

The keyword co-occurrence network, shown in Figure 2, reveals three main clusters. The first cluster, shown in red, contains terms related to destination governance and policy, such as halal tourism, halal tourism policy, local government, and local community. The second cluster, shown in blue, contains terms related to industry and certification, such as halal industry, halal certification, halal standard, and supply chain. The third cluster, shown in green, contains terms related to consumer behavior, such as intention, behavior, religiosity, and structural equation modeling. These three clusters are consistent with the intellectual structure found in broader bibliometric studies of halal tourism (Chantarungsri et al., 2024), yet they do not produce a fourth cluster that explicitly represents local economic development, such as community income, employment, or micro, small, and medium enterprises.

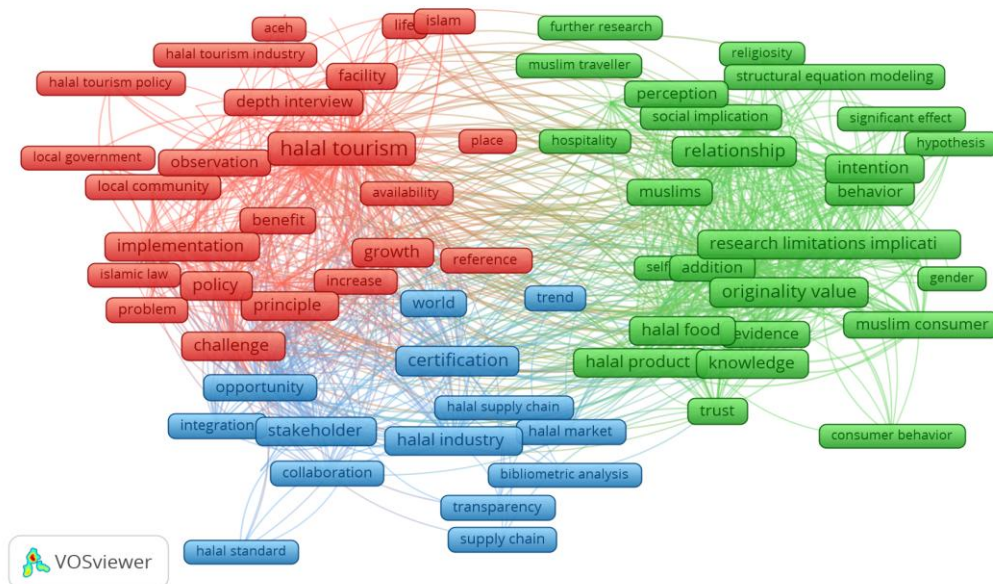
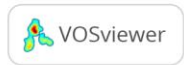


Figure 2. Keyword Co-occurrence Network Visualization
Source: VOSviewer, processed by author (2026)



Source: VOSviewer, processed by author (2026)



Source: VOSviewer, processed by author (2026)

Taken together, these results address the four objectives of this study. The annual trend and journal distribution answer the objective of mapping publication trends, the three identified clusters answer the objective of identifying the intellectual structure, the overlay visualization answers the objective of tracing thematic evolution, and the absence of a standalone local economic development cluster answers the objective of identifying the research gap that underlies the novelty claim of this study.

These findings are coherent with several previous bibliometric studies of halal tourism in two respects. First, the dominance of the Journal of Islamic Marketing as the leading outlet is consistent with (Chantarungsri et al., 2024), who also identified this journal as the largest contributor in a broader bibliometric mapping. Second, the position of Indonesia and Malaysia as the two leading contributing countries is consistent with (Kurniawan et al., 2025) in the specific context of Indonesia. However, the findings also reveal an important contrast. Single case studies in various regions, such as West Sumatera (Sutono et al., 2024) and the Lake Toba region (Lumbanraja & Saraan, 2025), explicitly discuss the impact of halal tourism on local community economies, supported by field data and regional regulations. Yet when this literature is mapped together at the global scale, the local economic dimension is not strong enough to form its own keyword cluster. In other words, what is already known in depth at the case study level remains insufficiently recognized at the level of the field's overall intellectual structure, and this gap between the depth of case studies and the breadth of thematic mapping forms the starting point for the following discussion.

The objective of mapping the intellectual structure and research gap in this study is grounded in the understanding that halal tourism cannot be treated solely as a matter of sharia compliance or consumer behavior, but also as an instrument of local economic development, as reflected in national sharia economic policy and Indonesia's position as the world's leading halal tourism destination. This framing is consistent with (Vargas-Sánchez & Moral-Moral, 2019), who argued that halal tourism has matured conceptually, even though that conceptual maturity has not yet been matched by thematic maturity at its intersection with local economic development. This study contributes by being among the few bibliometric works that deliberately combine these two keywords as a single unit of analysis, rather than treating local economic development as a peripheral note within the broader halal tourism discussion. The concentration of research on certification and consumer behavior, also observed by (Moshin et al., 2020; Samori et al., 2016) suggests that policies that have largely focused on standardization and destination promotion need to be balanced with policies that specifically encourage research and data collection on the economic impact on local businesses, including micro, small, and medium enterprises in halal tourism destinations, in line with the comparative halal tourism growth strategy models proposed for Indonesia and Malaysia by (Suryanto et al., 2024).

These findings carry several practical implications. For halal tourism business operators, particularly micro, small, and medium enterprises in destinations such as the Lake Toba region, this mapping highlights the need for more systematic documentation and publication of economic impact data, since the current academic literature does not yet capture their contribution in a measurable way. For destination managers and business associations, the dominance of the certification and supply chain cluster suggests that the halal certification process could serve as an entry point for recording local economic data, rather than functioning merely as an administrative requirement. For local governments and policymakers, the absence of a local economic development cluster in the bibliometric map can serve as a basis for promoting applied research that directly links halal tourism programs with regional economic indicators, in line with the direction of national sharia economic policy. Collaboration among universities, local governments, and managers of community based geopark areas may help fill this thematic gap while strengthening the evidence base for local economic development policy built around halal tourism.

Generalization of these findings should be qualified in several respects. First, the dataset relies solely on Scopus and is restricted to English language documents, so Indonesian language literature and regional policy reports that are not indexed in Scopus are not captured, even though some studies on local economic impact are likely found in such sources. Second, the dominance of Indonesia and Malaysia in the dataset means that this thematic map mostly reflects halal tourism in Muslim majority regions, so the generalization should be limited when applied to destinations in countries with Muslim minority populations, which involve different market dynamics and policy settings, as illustrated by a study in Sweden that found considerable skepticism among tourism stakeholders toward the halal tourism concept (Abbasian, 2021). Third, the absence of a local economic development cluster in the keyword map does not necessarily mean that research on the economic impact of halal tourism does not exist, but rather indicates that such research has not yet been sufficiently concentrated and

thematically connected to form its own cluster at the bibliometric level. Given these limitations, the findings of this study should be read as a snapshot of the indexed literature during the observation period, rather than as a final conclusion about the empirical relationship between halal tourism and local economic development in practice.

5. CONCLUSION

This study has addressed all of the objectives set out at the beginning of the research. The annual publication trend at the intersection of halal tourism and local economic development shows slow growth since 2014 that only becomes clearly visible after 2019, with the Journal of Islamic Marketing as the leading contributor. The intellectual structure of this field is built around three main clusters, namely destination governance and policy, halal industry and certification, and Muslim consumer behavior. The evolution of themes moves from descriptive studies toward quantitative, model based approaches in more recent years. Most importantly, this study identifies a genuine gap in the form of the absence of a standalone local economic development cluster, even though this topic is widely discussed at the case study level across different regions. This gap forms the basis of the novelty claimed by this study and answers the question of how far these two broad fields truly intersect within the indexed academic literature.

This study has a number of limitations that should be acknowledged openly. Reliance on a single database, Scopus, together with the restriction to English language documents, means that the resulting picture may not fully represent all literature discussing halal tourism and local economic development, including regional policy reports and Indonesian language studies that are not indexed. Bibliometric analysis is also only able to map what is recorded in publication metadata, rather than assess the quality or depth of the argument within each document. For future research, combining bibliometric mapping with in depth case studies in specific destinations, such as community based geopark areas, may help bridge the local economic development gap identified in this study. Future research could also incorporate databases beyond Scopus and include grey literature and regional policy documents to produce a more complete picture. Despite these limitations, this study is intended as a starting point for research that more deliberately connects halal tourism with the local economic development agenda, rather than allowing the two fields to continue along separate research trajectories.

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