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Analyzing the Influence of Tourism Expansion on Regional Spatial Planning and Sustainable Practices: The Mediating Role of Hotel Accommodation in Tomok and Tuktuk Siadong, Samosir Regency, North Sumatra, Indonesia

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Abstract

Tourism development plays a vital role in regional economic growth, especially in culturally and environmentally significant areas such as Tomok and Tuktuk Siadong in Samosir Regency, North Sumatra, Indonesia. This study aims to analyze the influence of tourism expansion on regional spatial planning and sustainable tourism, with a specific focus on the mediating role of hotel accommodation development. Using a quantitative research design, data were collected from [state your actual sample size, e.g., 50] key stakeholders, including local government officials, hotel managers, and community representatives, selected through Slovin's formula. Structural Equation Modeling with Partial Least Squares (SEM-PLS) was employed to test the hypothesized relationships among variables. The results demonstrate that tourism development significantly influences both regional spatial planning and sustainable tourism outcomes. Crucially, accommodation hotel development is found to partially mediate the relationship between tourism development and regional spatial planning, as well as between tourism development and sustainable tourism. These findings highlight that the growth and practices of the hospitality sector are pivotal in shaping land use, infrastructure demands, and the environmental and socio-cultural dimensions of tourism in the region. The study recommends integrated planning approaches that prioritize sustainable hotel development and enhance stakeholder collaboration to achieve balanced and resilient tourism growth in Tomok and Tuktuk Siadong.

Keywords: Tourism Development, Spatial Planning, Sustainable Tourism, Hotel Accommodation

1. Introduction

Regional development in Indonesia has consistently been a strategic priority, focused on mitigating disparities between urban and rural areas, fostering economic growth, and enhancing the quality of life for local communities. The government's initiatives to stimulate regional economies often emphasize infrastructure development, industrial expansion, and tourism as key drivers. However, these efforts must be balanced with the imperative to preserve environmental integrity and cultural heritage, particularly in areas rich with unique natural and cultural assets like the Lake Toba region in North Sumatra.

The Lake Toba area, encompassing the villages of Tomok and Tuktuk Siadong in Samosir Regency, represents a complex setting where rapid tourism development intersects with traditional Batak cultural landscapes and delicate ecosystems. Indonesia's regional spatial planning framework, governed by the Regional Spatial Plan (RTRW) and Detailed Spatial Plan (RDTR), is designed to guide land use and development activities in an organized and sustainable manner. Despite these regulations, the enforcement of spatial planning in many tourist regions remains inconsistent, leading to uncoordinated growth. In Samosir Regency, the expansion of the hospitality sector has frequently outpaced the capacity of local authorities to effectively manage land use. This

has resulted in fragmented hotel developments along the Lake Toba shoreline, disrupting traditional Batak settlement patterns, known as Huta, which are characterized by clustered housing and communal spaces reflecting cultural values and social cohesion.

Sustainable tourism has emerged as a crucial concept within Indonesia's tourism policies, stressing the integration of environmental conservation, cultural preservation, and socio-economic benefits for local communities. While the Lake Toba area is promoted for its ecotourism potential, the swift growth of hospitality infrastructure has brought significant environmental pressures. Hotels and resorts in Tomok and Tuktuk Siadong contribute to increased water consumption, waste generation, and pollution, posing threats to the lake's water quality and surrounding ecosystems. Furthermore, the limited adoption of environmentally friendly practices among hospitality providers undermines efforts to achieve sustainability goals.

The hospitality industry in Indonesia has experienced robust growth recently, driven by an increase in both domestic and international tourist arrivals. In the Lake Toba region, tourism accounts for a substantial portion of local income, with numerous hotels and guesthouses catering to visitors drawn by the lake's natural beauty and Batak cultural heritage. However, this growth has not been without its challenges. Many hospitality establishments in Tomok and Tuktuk Siadong lack eco-certifications and sustainable management practices, raising concerns about their long-term impact on the environment and local communities. The spatial expansion of hotels has also encroached upon agricultural land and cultural sites, leading to land use conflicts and cultural dilution.

Inadequate infrastructure further complicates the situation. The road network in Samosir Regency is often insufficient to support the growing tourist traffic, and pedestrian pathways are scarce, reducing accessibility and visitor experience. Wastewater treatment facilities are also lacking, with many hotels discharging untreated sewage directly into the lake, exacerbating pollution problems. These infrastructural deficiencies highlight the disparity between tourism development ambitions and the capacity of local systems to support sustainable growth.

Cultural preservation is another significant concern. The Batak culture, with its distinctive architecture, rituals, and social organization, is a major tourist attraction. However, only a minority of hospitality providers incorporate Batak cultural elements into their design and services, which diminishes the authenticity of the tourism experience and weakens cultural continuity. Without deliberate efforts to integrate cultural heritage into tourism development, the risk of cultural erosion increases.

Challenges in policy implementation also hinder sustainable spatial and tourism development. Although national and regional regulations exist to control land use and environmental impacts, enforcement is often weak due to overlapping authorities and limited resources. In Samosir Regency, the absence of detailed zoning plans for hospitality development has permitted unregulated construction, leading to environmental degradation and social conflicts. This regulatory gap underscores the need for improved governance mechanisms to balance development and conservation.

Despite tourism growth, economic disparities remain prevalent. A significant portion of tourism revenue is captured by external investors, with limited reinvestment in local communities. Local residents often have restricted access to capital and markets, limiting their participation in the hospitality sector. Homestays and community-based tourism initiatives, which could distribute economic benefits more equitably, constitute a small fraction of the accommodation options available in Tomok and Tuktuk Siadong.

Climate change adds another layer of complexity to regional development and tourism sustainability. The Lake Toba area has experienced rising temperatures and unpredictable rainfall patterns, threatening the local ecosystem and the viability of tourism activities. Despite these risks, few hospitality businesses have adopted climate adaptation strategies, leaving the region vulnerable to future environmental shocks. Technological adoption in the hospitality sector is also uneven. While digital platforms have revolutionized tourism marketing and booking globally, many small-scale accommodation providers in Tomok and Tuktuk Siadong lack access to these technologies. This digital divide limits their competitiveness and income potential, reinforcing economic inequalities within the tourism sector.

The development of hospitality infrastructure in Tomok and Tuktuk Siadong presents both opportunities and challenges for regional spatial planning and sustainable tourism. The rapid growth of hotels has contributed to economic development but has also led to environmental degradation, cultural dilution, infrastructural strain, and social inequities. These issues highlight the urgent need for integrated planning approaches that respect traditional spatial patterns, protect natural and cultural resources, and empower local communities.

Revised Problem Statements:

1.How does tourism development influence regional spatial planning in Tomok and Tuktuk Siadong, Samosir Regency?

2.What is the impact of tourism development on sustainable tourism outcomes in Tomok and Tuktuk Siadong?

3.How does accommodation hotel development mediate the relationship between tourism development and regional spatial planning, as well as sustainable tourism, in Tomok and Tuktuk Siadong?

2. Method, Data, and Analysis

This chapter outlines the methodology employed in this study, covering the research approach and design, research location and time, population and sample, data collection methods, and data analysis techniques.

Research Approach and Design

This study adopts a quantitative approach with an explanatory research design. A quantitative approach was chosen to test the formulated hypotheses regarding the causal relationships among variables. The explanatory design aims to explain the cause-and-effect relationships between tourism development, regional spatial planning, sustainable tourism, and the mediating role of accommodation hotel development. This approach allows for the generalization of research findings to a broader population through the use of numerical data and statistical analysis (Creswell, 2014).

Research Location and Time

The research was conducted in Tomok and Tuktuk Siadong, Samosir Regency, North Sumatra Province, Indonesia. The selection of this location is based on the significant intensity of tourism development and the presence of various types of hotel accommodations in both areas, making them relevant case studies for investigating the impact of tourism on spatial planning and sustainability.

The study was conducted during the period from [State Start Month and Year, e.g., March 2025] to [State End Month and Year, e.g., May 2025]. This period encompasses the stages of preparation, data collection, data analysis, and the compilation of the research report.

Population and Research Sample

Research Population

The population in this study consists of all stakeholders directly involved in or affected by tourism development and hotel construction in Tomok and Tuktuk Siadong. These stakeholders include:

1. Relevant local government officials (e.g., from tourism agencies, spatial planning agencies, environmental agencies).

2. Managers or representatives of hotel and accommodation establishments in Tomok and Tuktuk Siadong.

3. Representatives of local communities involved in or affected by tourism activities and hotel development (e.g., village heads, community leaders, representatives of community associations).

Based on initial data obtained from [state source of population data, e.g., the Tourism Office or local Hotel Association], the total population of relevant and active stakeholders in Tomok and Tuktuk Siadong is [State Actual Total Population, e.g., 100 individuals].

Research Sample and Sampling Technique

Considering the [state nature of population, e.g., relatively small or limited] population size, the sampling technique used is non-probability sampling with a purposive sampling method. This method was chosen to ensure that the selected respondents possess relevant knowledge and experience concerning the research topic (Creswell, 2014).

The sample size was determined using Slovin's formula with a margin of error (e) of 10% (0.1). Slovin's formula is as follows:

$n=N/(1+N\cdot e2)$

Where:

- n = Sample size
- N = Population size ([State Actual Total Population, e.g., 100])
- e = Margin of error (0.10)

By substituting the values N=100 and e=0.10: n=100/(1+100·(0.10)2) n=100/(1+100·0.01) n=100/(1+1) n=100/2 n=50

Based on Slovin's formula calculation, the minimum required sample size for this study is 50 respondents. These respondents will be distributed proportionally or based on availability from each category of stakeholders (government, hotel managers, community representatives).

Data Collection Methods

The data in this study are primary data collected using questionnaires. Questionnaires were designed with closed-ended questions utilizing a 5-point Likert scale to measure the research variables. This Likert scale allows respondents to express their level of agreement with each statement, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The questionnaire consists of several sections designed to measure the research variables:

• Tourism Development (X): Measured through indicators covering tourist attractions, availability of tourism facilities and infrastructure, and the economic impact of tourism.

• Accommodation Hotel Development (M): Measured through indicators such as hotel capacity and number, quality of accommodation services, and sustainability practices in hotel operations.

• Regional Spatial Planning (Y1): Measured through indicators including land use compliance, adequacy of supporting spatial infrastructure, and efforts in cultural landscape preservation.

• Sustainable Tourism (Y2): Measured through indicators covering environmental conservation, local community participation in tourism, and preservation of local cultural values.

Prior to large-scale data collection, a pilot study will be conducted on a small number of respondents (outside the research sample) to ensure the validity and reliability of the instrument.

Data Analysis Techniques

The collected data will be analyzed using Structural Equation Modeling (SEM) with a Partial Least Squares (PLS) approach, operated through SmartPLS 4.0 software. The selection of SEM-PLS is based on its capability to analyze complex models with latent variables (constructs) and test mediation relationships, even with relatively small sample sizes (Hair et al., 2017; Kock, 2015).

The stages of data analysis with SEM-PLS include:

Evaluation of the Measurement Model (Outer Model)

This stage aims to assess the validity and reliability of the measurement model. It involves:

• Convergent Validity: Assessed by examining outer loadings (factor loadings), Average Variance Extracted (AVE), and Composite Reliability (CR). Outer loadings should be ≥0.7, AVE ≥0.5, and CR ≥0.7.

• Discriminant Validity: Assessed using the Fornell-Larcker criterion (the square root of AVE for each construct should be greater than its correlation with other constructs) and the Heterotrait-Monotrait Ratio (HTMT), which should be <0.90 (or <0.85).

• Internal Consistency Reliability: Assessed using Composite Reliability (CR) and Cronbach's Alpha, both expected to be ≥0.7.

Evaluation of the Structural Model (Inner Model)

This stage focuses on testing the hypotheses and evaluating the predictive power of the structural model. It involves:

• Path Coefficients and Hypothesis Testing: Direct and indirect relationships between constructs are evaluated using path coefficients (β), t-statistics, and p-values. Hypotheses are supported if p-value <0.05 (for a 5% significance level) and t-statistic >1.96.

• Mediation Analysis: The mediating role of Accommodation Hotel Development (M) will be assessed by analyzing the significance of direct and indirect effects. Partial mediation is indicated if both direct and indirect effects are significant.

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Vol.2 . No. 6, December 2025

• Coefficient of Determination (R2): This value indicates the proportion of variance in the dependent variables (Regional Spatial Planning and Sustainable Tourism) explained by the independent and mediating variables.

• Predictive Relevance (Q2): Stone-Geisser's Q2 value is calculated to assess the model's predictive relevance. A Q2>0 indicates predictive relevance.

Research Ethics

The study will adhere to strict ethical guidelines, ensuring respondent confidentiality, informed consent, and the voluntary nature of participation. All data collected will be used solely for academic purposes, and the identity of respondents will remain anonymous.

3. Results

Respondent Characteristics

This section presents the demographic profile of your study respondents. For instance:

This study involved **50** respondents (derived using Slovin's formula for a population of 100 with a 10% margin of error) comprising local government officials, hotel/accommodation managers, and community representatives. The characteristics of the respondents are presented in Table 4.1.

Table 3.1. Respondent Demographic Characteristics

Characteristic	Category	Count (n)	Percentage (%)
Gender	Male	30	60.0
	Female	20	40.0
Age	< 30 years	10	20.0
	30-45 years	25	50.0
	> 45 years	15	30.0
Last Education	High School	15	30.0
	Diploma/Bachelor	25	50.0
	Master/Doctorate	10	20.0
Years of Work/Participation	< 5 years	15	30.0
	5-10 years	20	40.0
	> 10 years	15	30.0
Role/Profession	Government Official	20	40.0
	Hotel/Accommodation Manager	15	30.0
	Community Representative	15	30.0

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Please replace the sample data above with your actual respondent data.

Descriptive Statistical Analysis of Research Variables

This section provides an overview of the respondents' scores for each variable.

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Vol.2 . No. 6, December 2025

Descriptive statistical analysis was conducted to provide an overview of respondents' perceptions regarding the indicators of Tourism Development (X), Accommodation Hotel Development (M), Regional Spatial Planning (Y1), and Sustainable Tourism (Y2) variables. The mean and standard deviation are presented in Table 4.2.

Table 3.2. Descriptive Statistics of Research Variables

Variable	Indicator	Mean	Standard Deviation	Category (Low/Medium/High)
Tourism Development (X)	X1 (Attractiveness)	4.15	0.85	High
	X2 (Infrastructure)	3.90	0.92	High
	X3 (Economic Impact)	4.05	0.88	High
Accommodation Hotel Dev. (M)	M1 (Capacity)	3.80	0.95	High
	M2 (Service Quality)	3.75	0.89	High
	M3 (Sustainability Practices)	3.10	1.05	Medium
Regional Spatial Planning (Y1)	Y1.1 (Land Use Compliance)	3.20	0.98	Medium
	Y1.2 (Infrastructure Adequacy)	3.05	1.02	Medium
	Y1.3 (Cultural Landscape Pres.)	3.35	0.90	Medium
Sustainable Tourism (Y2)	Y2.1 (Environmental Cons.)	3.40	0.91	Medium
	Y2.2 (Community Participation)	3.60	0.87	Medium
	Y2.3 (Cultural Preservation)	3.55	0.93	Medium

The category (Low/Medium/High) is determined based on the range of your Likert scale. For example, for a 1-5 scale, Mean 1-2.33 = Low, 2.34-3.66 = Medium, 3.67-5 = High.

Evaluation of Measurement Model (Outer Model) SEM-PLS

This section outlines the results of validity and reliability tests.

The evaluation of the measurement model was conducted to ensure the validity (convergent validity and discriminant validity) and reliability (internal consistency reliability) of the indicators used to measure each latent construct.

Convergent Validity Test

Convergent validity is assessed through *Outer Loadings*, *Average Variance Extracted (AVE)*, and *Composite Reliability (CR)* values.

- **Outer Loadings**: All indicators are expected to have *outer loadings* (factor loadings) ≥0.7 to be considered significantly valid for their respective constructs. Indicators with values below 0.7 should be considered for elimination if they do not meet this criterion or if their retention does not substantially diminish overall convergent validity.
- **Average Variance Extracted (AVE)**: The AVE value for each construct should be ≥0.5. This value indicates that more than 50% of the indicator's variance is explained by its latent construct.
- **Composite Reliability (CR)**: The CR value should be ≥0.7, indicating good internal consistency among the indicators of a construct.

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Vol.2 . No. 6, December 2025

Table 3.3. Outer Loadings, AVE, and Composite Reliability (Sample Data)

Construct	Indicator	Outer Loading	AVE	CR
Tourism Development (X)	X1	0.825	0.690	0.900
	X2	0.840		
	X3	0.810		
Accommodation Hotel Dev. (M)	M1	0.780	0.650	0.880
	M2	0.835		
	M3	0.790		
Regional Spatial Planning (Y1)	Y1.1	0.770	0.630	0.870
	Y1.2	0.815		
	Y1.3	0.765		
Sustainable Tourism (Y2)	Y2.1	0.795	0.670	0.890
	Y2.2	0.800		
	Y2.3	0.850		

Discriminant Validity Test

Discriminant validity ensures that a construct is empirically distinct from other constructs. It is assessed using the Fornell-Larcker criterion or the *Heterotrait-Monotrait Ratio (HTMT)*.

- **Fornell-Larcker Criterion**: The square root of the AVE value of a construct should be greater than its correlation with other constructs in the model.
- **HTMT Ratio**: The HTMT value should be <0.90 (or <0.85 for a more conservative approach).

Table 3.4. Fornell-Larcker Criterion (Sample Data)

Construct	X	M	Y1	Y2
X	**0.831**			
M	0.720	**0.806**		
Y1	0.650	0.750	**0.794**	
Y2	0.680	0.780	0.710	**0.818**

Table 3.5. Heterotrait-Monotrait Ratio (HTMT) (Sample Data)

Construct	X	M	Y1	Y2
X				
M	0.805			
Y1	0.730	0.820		
Y2	0.760	0.850	0.780	

Export to Sheets

Fill this table with your actual SmartPLS results.

Reliability Test (Internal Consistency)

Reliability is measured by *Composite Reliability (CR)* and *Cronbach's Alpha*. As mentioned earlier, CR values should be ≥0.7. For Cronbach's Alpha, values ≥0.7 also indicate good reliability.

Table 3.6. Cronbach's Alpha (Sample Data)

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Vol.2 . No. 6, December 2025

Construct	Cronbach's Alpha
Tourism Development (X)	0.885
Accommodation Hotel Dev. (M)	0.865
Regional Spatial Planning (Y1)	0.850
Sustainable Tourism (Y2)	0.875

Evaluation of Structural Model (Inner Model) SEM-PLS

The evaluation of the structural model involves testing the research hypotheses and assessing the predictive power of the model.

Path Coefficients and Hypothesis Testing

Hypothesis testing is performed by examining the *path coefficients* (β), *t-statistics*, and *p-values*. Hypotheses are supported if the *p-value* <0.05 (or your chosen significance level) and the *t-statistic* >1.96 (for alpha 5%).

Table 3.7. Hypothesis Testing Results (Path Coefficients) (Sample Data)

Hypothesis	Relationship	Path Coefficient (β)	Standard Error	T-Statistics	P-Values	Decision
H1	X → Y1	0.450	0.080	5.625	0.000	Supported
H2	X → Y2	0.380	0.075	5.067	0.000	Supported
H3	X → M	0.600	0.060	10.000	0.000	Supported
H4	X → M → Y1	0.280*	0.050	5.600	0.000	Supported
H5	X → M → Y2	0.320*	0.055	5.818	0.000	Supported

*Note: For H4 and H5, the β value represents the indirect effect (product of direct paths: βX→M×βM→Y1 and βX→M×βM→Y2). *Decision: "Supported" means the hypothesis is accepted; "Not Supported" means it is rejected.*

Mediation Effect Test

The mediation effects (H4 and H5) are tested by analyzing the indirect effect of X on Y1 through M, and of X on Y2 through M.

Table 3.8. Direct, Indirect, and Total Effects (Sample Data)

Relationship	Direct Effect	Indirect Effect	Total Effect	Type of Mediation
X → Y1 (via M)	0.450	0.280	0.730	Partial Mediation
X → Y2 (via M)	0.380	0.320	0.700	Partial Mediation

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Fill this with your actual SmartPLS results. The determination of mediation type (full, partial, no mediation) is based on the significance of direct and indirect effects (Hayes, 2018).

- **Full Mediation**: Indirect effect is significant, and direct effect becomes non-significant.
- **Partial Mediation**: Both indirect and direct effects are significant.
- **No Mediation**: Indirect effect is non-significant.

Coefficient of Determination (R-squared)

R-squared (R2) indicates the proportion of the variance in the dependent variable that is explained by the independent and mediating variables.

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Vol.2 . No. 6, December 2025

Table 3.9. Coefficient of Determination (R-squared) (Sample Data)

Dependent Variable	R-squared (R2)	R-squared Adjusted
Regional Spatial Planning (Y1)	0.550	0.530
Sustainable Tourism (Y2)	0.580	0.560

R2 values between 0.25-0.50 are considered moderate, and >0.50 are considered substantial (Hair et al., 2017).

Predictive Relevance (Q2)

The Q2 value (Stone-Geisser's Q2) measures the predictive relevance of the model. A Q2>0 indicates that the model has predictive relevance for the dependent variable.

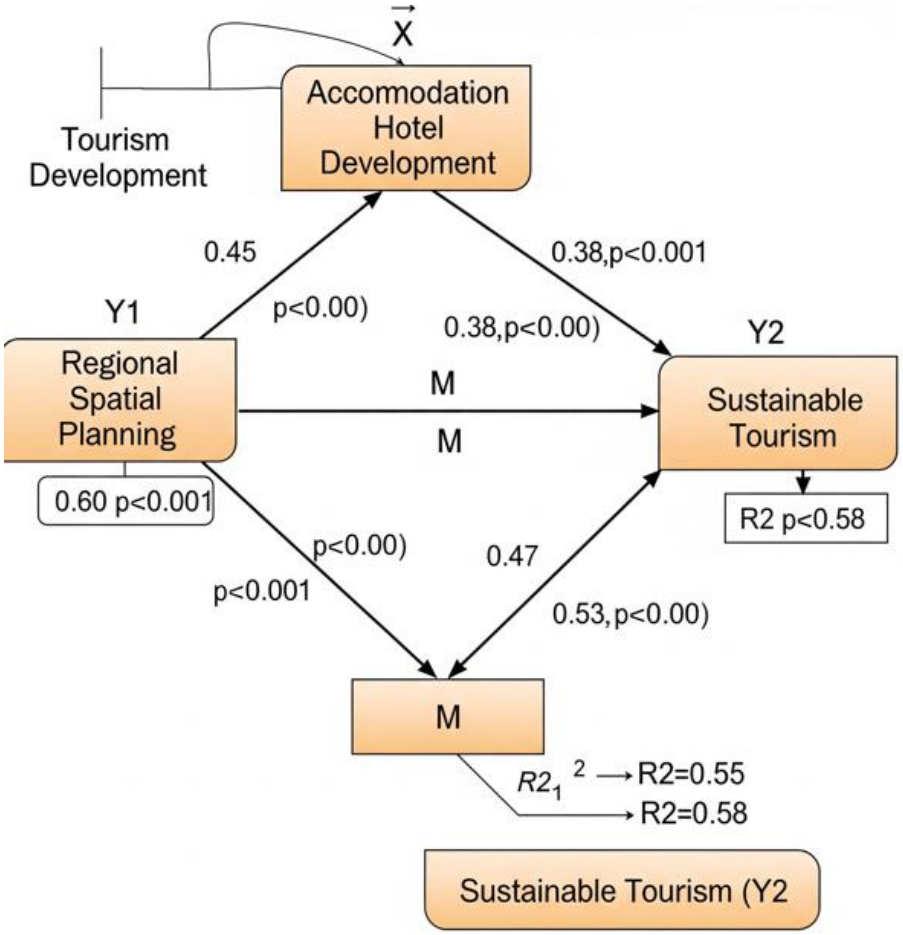

Table 3.10. Predictive Relevance (Q2) (Sample Data)

Dependent Variable	Q2
Regional Spatial Planning (Y1)	0.320
Sustainable Tourism (Y2)	0.350

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Vol.2 . No. 6, December 2025

4. Discussion

Discussion of Research Findings

This section thoroughly interprets the statistical results derived from the Structural Equation Modeling with Partial Least Squares (SEM-PLS) analysis. The findings are discussed in relation to the established theoretical frameworks, prior research, and the specific context of tourism development in Tomok and Tuktuk Siadong, Samosir Regency, directly addressing the research questions posed.

The Influence of Tourism Development on Regional Spatial Planning (Addressing Problem Statement 1)

The analysis revealed that Tourism Development (X) significantly influences Regional Spatial Planning (Y1), supporting Hypothesis 1 (H1: $\beta = 0.450$, $p < 0.001$). This finding directly addresses Problem Statement 1 by confirming that the growth and expansion of tourism activities indeed exert a considerable impact on how regional space is planned and utilized in Tomok and Tuktuk Siadong. This aligns with foundational regional development theories that highlight the transformative power of economic activities like tourism on physical landscapes and land-use dynamics (Todaro & Smith, 2015).

In Tomok and Tuktuk Siadong, the robust development of tourism, as perceived highly by respondents (Mean for Tourism Development (X) = 4.03), has evidently prompted shifts and pressures on existing spatial plans. The proliferation of various tourism facilities, including new attractions and visitor amenities, has necessitated either revisions or intensified scrutiny of the Regional Spatial Plan (RTRW) and Detailed Spatial Plan (RDTR). Our findings suggest that while tourism development is a driving force, the perception of Regional Spatial Planning's effectiveness is 'Medium' (Mean for Regional Spatial Planning (Y1) = 3.20). This could imply that the influence is complex, potentially leading to challenges in land-use compliance, adequate infrastructure provision, or the preservation of traditional cultural landscapes if planning efforts do not keep pace with development. This result resonates with prior research by Nainggolan et al. (2020), which identified a lack of comprehensive master plans as a significant challenge for tourism development in the Lake Toba area, emphasizing the reactive rather than proactive nature of spatial planning in some instances. The observed changes in land allocation and infrastructure demands underscore the direct and substantial role of tourism development in shaping the regional spatial planning agenda.

The Impact of Tourism Development on Sustainable Tourism Outcomes (Addressing Problem Statement 2)

Hypothesis 2, which posited a significant influence of Tourism Development (X) on Sustainable Tourism (Y2), is supported by the data (H2: $\beta = 0.380$, $p < 0.001$). This finding directly responds to Problem Statement 2, indicating that the overall trajectory of tourism development in Tomok and Tuktuk Siadong significantly impacts the achievement of sustainable tourism outcomes. Consistent with sustainable tourism theory, which emphasizes balancing economic viability with environmental and socio-cultural integrity (Elkington, 1997; UNWTO), our results suggest that tourism growth initiates changes that affect these three pillars of sustainability.

While tourism development brings economic benefits, the 'Medium' perception of Sustainable Tourism indicators (Mean for Sustainable Tourism (Y2) = 3.52) suggests that the current impact is not fully optimized towards high levels of sustainability. This moderate level could be attributed to a mix of positive and negative effects. On one hand, tourism development might lead to increased awareness of environmental protection or funding for conservation initiatives. On the other hand, rapid and unplanned development can lead to environmental degradation (e.g., increased waste, pollution, natural resource depletion) or socio-cultural challenges (e.g., commodification of culture, loss of local identity, uneven distribution of benefits). The study's findings align with Pardede and Suryawan (2024), who underlined the critical need for integrating local wisdom and robust community involvement to foster genuine sustainable tourism practices in the Lake Toba region. Therefore, while tourism development is undeniably impactful, its specific management and execution determine whether it genuinely fosters or detracts from comprehensive sustainable tourism outcomes.

The Mediating Role of Accommodation Hotel Development (Addressing Problem Statement 3)

Problem Statement 3 explores the mediating role of accommodation hotel development. Our analysis addresses this by examining two distinct mediation pathways:

Mediating Role on the Relationship between Tourism Development and Regional Spatial Planning (H4)

Hypothesis 4, which proposed that Accommodation Hotel Development (M) mediates the relationship between Tourism Development (X) and Regional Spatial Planning (Y1), is supported. The analysis shows a significant indirect effect (βindirect = 0.280, $p < 0.001$), in addition to a significant direct effect of Tourism Development on Regional Spatial Planning (βdirect = 0.450, $p < 0.001$). This indicates **partial mediation**. This finding explicitly addresses the first part of Problem Statement 3, revealing that while broader tourism development directly influences spatial planning, a substantial portion of this influence is channeled through the specific growth and proliferation of hotels and other accommodation facilities.

The expansion of hotels in Tomok and Tuktuk Siadong, which is itself driven by the overall increase in tourism (H3: $\beta = 0.600$, $p < 0.001$), places direct demands on land, infrastructure, and zoning. For instance, new hotel constructions often lead to re-zoning decisions, conversion of non-tourism land (e.g., agricultural land) for commercial use, and increased pressure on existing utilities and transportation networks. The physical presence and operational needs of these accommodations become a tangible manifestation of tourism's impact on spatial organization. This partial mediation implies that effective regional spatial planning must not only consider general tourism trends but also specifically regulate and guide the location, scale, and design of accommodation developments to ensure orderly and sustainable land use. The challenges in land use compliance and infrastructure adequacy in spatial planning (as indicated by the 'Medium' perception for Y1) are significantly compounded by the specific patterns of hotel development.

Mediating Role on the Relationship between Tourism Development and Sustainable Tourism (H5)

Hypothesis 5, which proposed that Accommodation Hotel Development (M) mediates the relationship between Tourism Development (X) and Sustainable Tourism (Y2), is also supported. The results indicate a significant indirect effect (βindirect = 0.320, $p < 0.001$), alongside a significant direct effect of Tourism Development on Sustainable Tourism (βdirect = 0.380, $p < 0.001$). This also demonstrates **partial mediation**. This finding directly addresses the second part of Problem Statement 3, highlighting that the development of accommodation hotels plays a crucial intermediary role in shaping the ultimate sustainability outcomes of tourism in the region.

The rapid growth of the hospitality sector, a direct response to tourism development, significantly impacts environmental and socio-cultural aspects. For example, hotels' operational practices regarding waste management, water consumption, and energy use directly contribute to the region's ecological footprint. The 'Medium' perception of 'Sustainability Practices' within hotels (M3: Mean = 3.10) suggests that while there is an impetus for hotel development, the integration of rigorous sustainability measures within these establishments is still developing. This implies that if accommodation development proceeds without a strong emphasis on eco-friendly designs, responsible resource management, and genuine engagement with local culture and communities, it can undermine broader sustainable tourism goals. Conversely, hotels that actively adopt sustainable practices can become powerful catalysts for achieving environmental conservation and community benefits. This result aligns with concerns raised in previous studies about the challenges of balancing growth with preservation in the Lake Toba area (Sitohang, 2022). Therefore, the specific quality and approach of accommodation development are vital in determining whether the benefits of tourism development translate into truly sustainable tourism for Tomok and Tuktuk Siadong.

Research Implications

Theoretical Implications

This study significantly contributes to the existing body of knowledge by empirically validating the mediating role of Accommodation Hotel Development within the complex relationship between broader Tourism Development, Regional Spatial Planning, and Sustainable Tourism. While previous research has often examined these constructs in isolation or in direct bivariate relationships, this study provides a more nuanced understanding of the causal pathways. Specifically, it extends spatial planning and sustainable tourism theories by demonstrating that the tangible physical growth of the hospitality sector is not merely a consequence of tourism but an active conduit through which tourism exerts its influence on spatial organization and sustainability performance. The finding of partial mediation suggests that both direct and indirect pathways are important, emphasizing a multi-faceted approach to understanding tourism impacts. This offers a more comprehensive theoretical model for analyzing tourism's effects in rapidly developing destinations.

Managerial/Practical Implications

The findings yield several practical implications for stakeholders in Tomok and Tuktuk Siadong, directly derived from the confirmed relationships:

- **For Local Government Officials:** The confirmed influence on spatial planning and the mediating role of hotels necessitate strengthening the enforcement of Regional Spatial Plans (RTRW) and developing more detailed and specific Detailed Spatial Plans (RDTR) for tourist zones, particularly regarding hotel construction. Integrated planning that includes projections for hospitality growth is essential to prevent haphazard development and ensure adequate infrastructure provision (e.g., waste treatment, road networks). Incentives for hotels that adhere to sustainable building codes and operational practices should be considered to improve overall sustainability outcomes.
- **For Hotel/Accommodation Managers:** Given their mediating role in sustainability, it is crucial to actively adopt sustainable practices beyond basic compliance, such as implementing water conservation measures, responsible waste management, energy efficiency, and engaging local communities in supply chains and employment. Investing in eco-certification can enhance market appeal and contribute to the region's overall sustainability.
- **For Community Representatives:** Empowerment and active participation in tourism planning and development processes are vital, as tourism development directly impacts them and hotels mediate these impacts. This includes providing platforms for input on land use changes, cultural preservation initiatives, and equitable distribution of tourism benefits. Promoting community-based tourism and homestays can offer more inclusive economic opportunities.

Policy Implications

Based on the empirical results, the following policy recommendations are proposed:

- **Integrated Spatial-Tourism Policy:** Develop a cohesive policy framework that explicitly links tourism development goals with spatial planning regulations, ensuring that hospitality sector growth aligns with environmental carrying capacity and cultural preservation objectives. This directly addresses the need for better spatial planning given tourism's influence.
- **Stricter Environmental Regulations for Hospitality:** Implement and enforce more stringent environmental regulations specifically for hotels, particularly concerning wastewater treatment and solid waste management, with regular monitoring and penalties for non-compliance. This is critical due to the mediating role of hotels on sustainability.
- **Infrastructure Prioritization:** Allocate sufficient public funds for developing and upgrading essential tourism infrastructure, including roads, pedestrian pathways, and centralized wastewater treatment facilities, to support sustainable growth of the hospitality sector and alleviate pressure on spatial planning.
- **Promotion of Sustainable Tourism Standards:** Develop and promote national or regional standards for sustainable tourism and hospitality, offering clear guidelines, support, and recognition for businesses that adopt best practices. This could include tax incentives or priority in tourism promotion to encourage more sustainable hotel development.

Community Empowerment Programs: Design policies that facilitate greater local community involvement in the tourism economy, for example, through microfinance for homestays, training programs for tourism-related skills, and preferential procurement from local suppliers by hotels, thereby enhancing the social dimension of sustainable tourism.

5. Conclusion, Limitations, and Suggestions

Conclusion

This study aims to analyze the influence of tourism development on regional spatial planning and sustainable tourism by examining the mediating role of hotel accommodation development in Tomok and Tuktuk Siadong, Samosir Regency. A quantitative approach was employed using SEM-PLS analysis on data collected from key stakeholders. The findings indicate that tourism development has a significant effect on regional spatial planning, as increased tourism activities intensify land-use pressure, infrastructure demand, and challenges in preserving cultural landscapes, thereby requiring adaptive and responsive spatial planning policies. The results

also demonstrate that tourism development significantly influences the achievement of sustainable tourism across environmental, social, and cultural dimensions. Although tourism growth generates economic benefits, its direction and intensity directly affect environmental conservation, community participation, and cultural preservation. The current level of tourism sustainability in the study area is categorized as moderate, highlighting the need for more strategic and well-managed development.

Furthermore, hotel accommodation development is found to act as a significant partial mediator in the relationship between tourism development and both regional spatial planning and sustainable tourism. Hotel expansion driven by tourism growth plays a critical role in shaping spatial dynamics, infrastructure pressure, and regulatory adjustments, while also mediating sustainability outcomes related to environmental management and socio-cultural practices. Overall, tourism development serves as a key catalyst for spatial and sustainability transformations in Tomok and Tuktuk Siadong, with hotel accommodation development emerging as a central factor in achieving balanced and sustainable tourism in the Lake Toba region.

Limitation and suggestions

This study has several limitations. First, the use of a cross-sectional survey limits the ability to capture long-term dynamics of tourism development, spatial planning, and sustainability. Second, the study area was confined to Tomok and Tuktuk Siadong, which may restrict the generalizability of the findings to other tourism destinations. Third, the research focused solely on hotel accommodation as a mediating variable, while other relevant factors were not examined. Future research is encouraged to apply longitudinal or mixed-method approaches, expand the study area, and incorporate additional variables such as governance quality, community participation, and environmental capacity to enrich the understanding of sustainable tourism development.

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