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ANALYZING THE IMPACT OF TOURISM ACTIVITIES ON LAND-USE CHANGE IN THE PELANGAN TOURISM AREA

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Abstract:

Tourism development often reshapes land-use patterns, particularly in areas endowed with attractive natural resources and adequate accessibility. This study examines land-use changes in the Pelangan Tourism Area between 2015 and 2025 and explores how those changes relate to the growth of tourism activities. A mixed-methods design was adopted, combining quantitative and qualitative analysis with Geographic Information System (GIS) technology. Data were obtained from the interpretation of Google Earth imagery for 2015 and 2025, field observations, a literature review, and interviews with village officials, local residents, and business operators. Spatial analysis comprised image rectification, on-screen digitization, area calculation, and overlay analysis in ArcGIS. The study area was divided into four observation zones to capture local variation in land-use dynamics. The findings show an expansion of built-up land, including residential areas, homestays, bungalows, restaurants, food stalls, kiosks, and hotel development. These changes have occurred gradually and are concentrated mainly in locations with better accessibility, proximity to the coast, and direct connections to marine-tourism activity centers. By contrast, areas with limited road access and inadequate supporting facilities have developed more slowly. Tourism has also generated economic opportunities through transport services, accommodation, retail, and local culinary businesses. Nevertheless, this growth has not been matched by sufficient infrastructure, safety facilities, or visitor amenities. Integrated spatial-planning controls and infrastructure improvements are therefore required to support sustainable tourism development in the Pelangan Tourism Area.

Keywords: Tourism Activities; Land-Use Change; Spatiotemporal Analysis; Geographic Information System; Sustainable Tourism

INTRODUCTION

The tourism sector is currently facing the consequences of rapid global growth (Munawar, 2023). Tourism is one of the fastest-growing development sectors (Kabu & Lau, 2022; Saha & Paul, 2021). Many countries, including Indonesia, have positioned tourism as an important source of national revenue, making tourism development a major strategy for advancing regional economies (Widiati & Permatasari, 2022). Like other economic activities, tourism forms part of broader economic development and plays an important role in strengthening local economies (Saha & Paul, 2021; Tandilino & Alang, 2021). Nevertheless, tourism expansion does not generate economic benefits alone; it may also place pressure on the environment, including by accelerating land-use change (Yusuf & Hadi, 2020).

Lombok Island is one of Indonesia's major tourist destinations and forms part of West Nusa Tenggara Province. Sekotong, particularly Pelangan Village, is among the areas with considerable tourism-development potential. Pelangan Village is located in Sekotong District and consists of 20 hamlets. West Lombok Regent Decree No. 61 of 1995 concerning the appointment of the acting head



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of Pelangan Preparatory Village states that Pelangan became a distinct administrative area following its separation from West Sekotong Village.

Nearly every hamlet in Pelangan Village offers attractions that could be further developed if supported by adequate road access. The area combines coastal scenery, including Batu Kijuk, Elak-Elak, and Sekotong Indah beaches, with mountain landscapes visible along many routes. Mekaki Beach is one of the village's best-known destinations. The winding road leading to the beach allows visitors to enjoy views of the sea and surrounding hills throughout the journey (Ander Sriwi et.al, 2024).

A study conducted in Pelangan Village, Sekotong District, West Lombok Regency (Ander Sriwi et.al, 2024) found that the village's tourism potential makes it highly suitable for further development. However, limited support from the village government has constrained tourism growth. The relatively weak role of the tourism awareness group (Pokdarwis) and low community participation have created additional barriers. Pokdarwis should take a more active role in developing local tourism and serve as a driving force for its advancement (Khairnisyah, 2019). Field observations indicate that accommodation development in Pelangan remains limited, whereas marine-tourism services have expanded more visibly than large-scale physical development. Even so, land-use changes are already evident at several locations.

Another study, conducted in Sedit Tourism Village, Bebalang District, Bangli Regency (Ida Rayta Wira Pratami, 2018), examined land-use changes resulting from the allocation of land to tourism activities. It also identified the factors encouraging tourism-related land utilization, focusing on the land functions that had changed and the dominant factors driving those changes.

Previous studies have generally examined land-use change in tourism areas characterized by large-scale physical development. Pelangan Tourism Area presents a different pattern, as its physical development remains relatively modest. Nevertheless, field observations reveal land-use conversion at several locations, indicating that change is already underway despite its limited scale.

This study investigates land-use change through a spatiotemporal analysis covering 2015 and 2025. The analysis identifies changes in land-use categories and examines their relationship with tourism activities in the study area. The findings are subsequently used to assess the direction of local development, which is currently dominated by community-based tourism services, while large-scale accommodation and tourism facilities remain limited and have not yet expanded significantly.

The authors expect this study to provide baseline information for spatial-use policy formulation, tourism-area development, and sustainable regional development.

RESEARCH METHOD

Research Approach

This study was conducted in Pelangan Village, Sekotong District, West Lombok Regency. It applied both qualitative and quantitative approaches, supported by Geographic Information System (GIS) analysis, to examine land-use changes within the study area.



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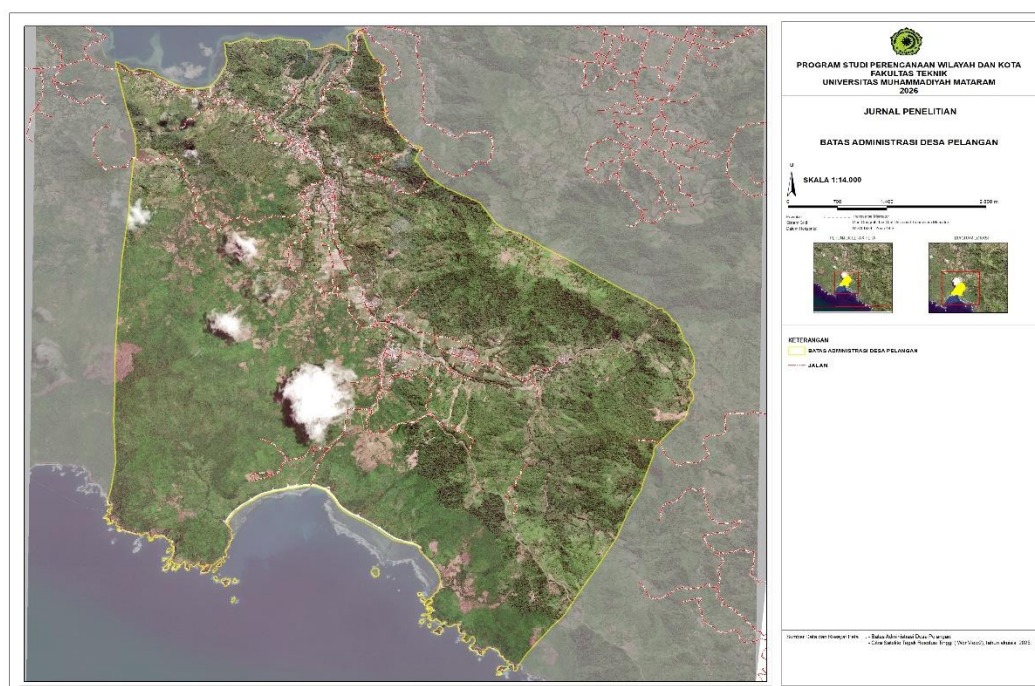


Figure 1. Study Area

Source: ArcGIS

Data Types and Data-Collection Techniques

This study draws on both qualitative and quantitative data. Combining the two types of evidence enables researchers to explore issues that may not have emerged clearly in earlier phases of the research (Teddle & Tashakhori, 2018). Data were collected through field observations, a literature review, and interviews. Field observations and the interpretation of Google Earth imagery from 2015 and 2025 were used to identify land-use changes within the study area. Interviews were conducted with the village head, local residents, and business operators to obtain supporting contextual information.

Data-Analysis Method

Google Earth was used to obtain high-resolution satellite imagery with adequate temporal coverage, making it effective for detecting land-use change (Gorelick et al., 2017; Malarvizi et al., 2016). Because the downloaded images initially lacked sufficiently accurate spatial coordinates, rectification was performed using a reference map of the same area (Sukojo & Maffufah, 2021). The rectified imagery was then processed through on-screen digitization. Land-use areas were calculated using the Calculate Geometry function in ArcGIS. The digitized results were subsequently interpreted and validated against objects observed during field surveys.

Research Variables

Table 1. Research Variables

NO.	VARIABLE	INDICATOR	SOURCE
1.	Land-use change	Land-use change between 2015 and 2025	Source: Google Earth and ArcGIS
		Land-use change involves the expansion of one land-use	Technically, land-use change can be analyzed



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		category at the expense of another over a particular period or across different periods (Suprayogi & Rochani, 2021).	through digital mapping using an overlay or map-superimposition method (Asmidar et al.,2023).
2.	Implications of land-use change in the study area	Development needs for tourism facilities and infrastructure, spatial utilization in the tourism area, and economic activities within the tourism area	Source: Field Observations and Interviews
3.	Relationship between land-use change and tourism activities in the study area	Accommodation, accessibility, attractions, and land-use change patterns	Source: Map-overlay results, field observations, and interviews

RESULTS AND DISCUSSION

OVERVIEW OF THE STUDY AREA

Pelangan Village, located in Sekotong District, West Lombok Regency, has considerable natural tourism potential. Its attractions include the coastal landscapes of Batu Kijuk, Elak-Elak, and Sekotong Indah beaches, as well as mountain scenery visible along many of the area's roads. Mekaki Beach is among the best-known destinations, and the winding route leading to it offers continuous views of the sea and surrounding hills (Ander Sriwi et.al, 2024). These natural assets attract both domestic and international visitors, particularly for marine-tourism activities such as tour-guide services, sea crossings, boat services, and related activities.

Many residents of Pelangan Village still depend on fishing and farming for their livelihoods. As tourism activities and visitor numbers have increased, however, the local economy has begun to diversify. Food stalls, retail businesses, tourism services, and other small enterprises have emerged and are gradually expanding at several locations.

Field observations indicate that physical development in Pelangan Village remains relatively limited, particularly in the accommodation sector. Even so, changes in land use are already visible at several locations within the tourism area.

MAP OF THE STUDY AREA

The study area was divided into four observation zones to support a more detailed analysis and to facilitate the identification of land-use change patterns over the study period.



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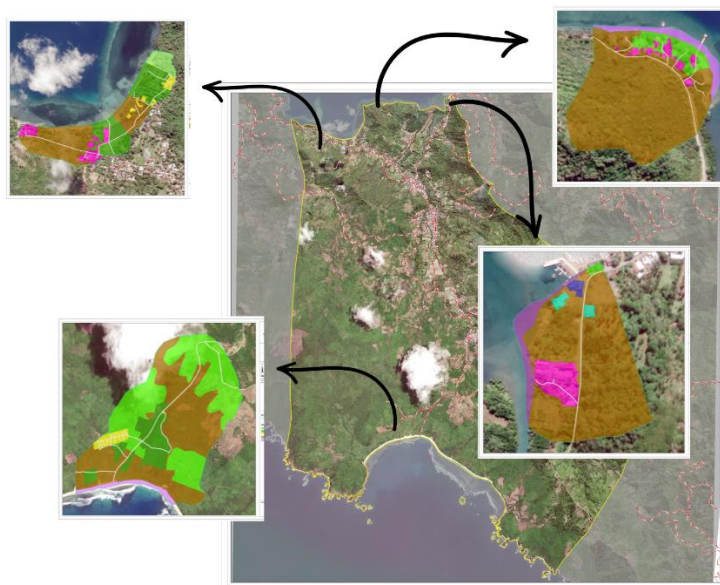


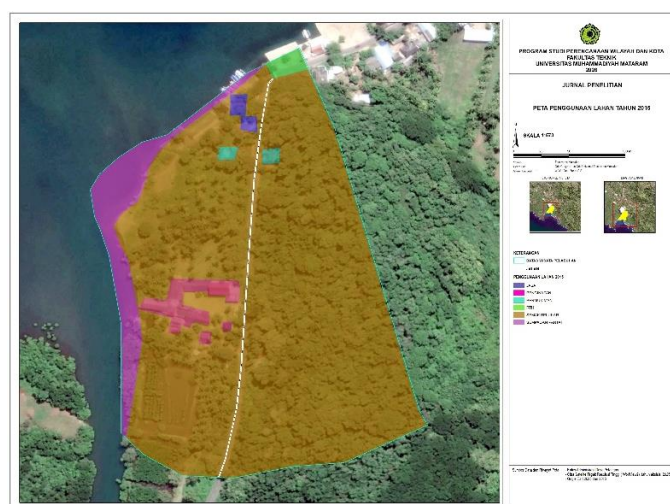
Figure 2. Division of the Study Area into Four Observation Zones

Source: Authors' Spatial Analysis

ANALYSIS OF LAND-USE CHANGE IN THE PELANGAN TOURISM AREA, 2015-2025

This analysis identifies spatial utilization in the Pelangan Tourism Area in 2015 and 2025 through a spatiotemporal approach. Google Earth imagery from both years was interpreted and overlaid to determine the extent, types, and spatial distribution of land-use changes. The study area was divided into four observation zones so that the development pattern could be examined more systematically and in greater spatial detail.

ZONE 1



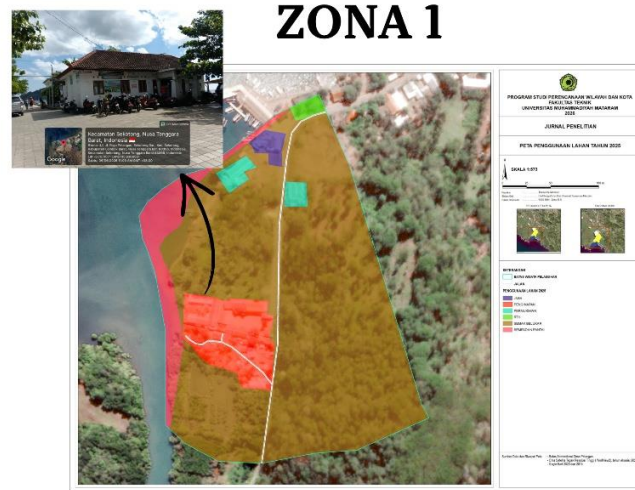


Figure 3. Location of Zone 1

Source: Authors' Spatial Analysis of Zone 1

Zone 1 is located at the entrance to Pelangan Village, along the main road, where accessibility is relatively good. It is also close to the ferry pier serving nearby tourism destinations. Land-use change in this zone remains relatively limited; however, the growth of service facilities and accommodation indicates a gradual shift toward a marine-tourism service-center function.



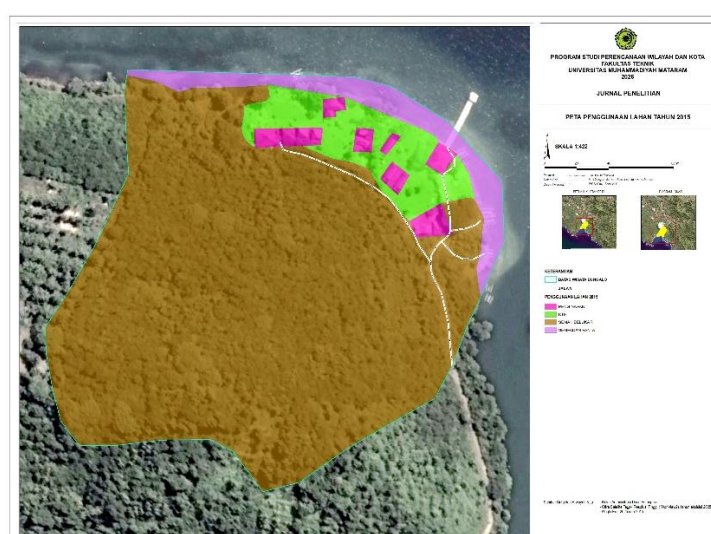
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Table 2. Land-Use Area in Zone 1, 2015 and 2025

Land Use in 2015	Area (ha)	Land Use in 2025	Area (ha)
Trade and Services	0.047314	Trade and Services	0.089110
Accommodation	0.218256	Accommodation	0.877674
Residential Area	0.039061	Residential Area	0.091865
Green Open Space	0.056442	Green Open Space	0.058257
Shrubland	6.689628	Shrubland	6.078464
Coastal Setback	0.593959	Coastal Setback	0.593959

Source: Authors' Spatial Analysis

ZONE 2



ZONA 2



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Figure 4. Location of Zone 2

Source: Authors' Spatial Analysis

Zone 2 contains a bungalow near the shoreline, where the coastal panorama supports tourism activities, particularly marine tourism. Field observations indicate that road access to the accommodation remains inadequate. Land-use change in Zone 2 is relatively limited, and the area continues to be dominated by natural land-cover characteristics, including green open space, shrubland, and the coastal setback.

Table 3. Land-Use Area in Zone 2, 2015 and 2025

Land Use in 2015	Area (ha)	Land Use in 2025	Area (ha)
Shrubland	4.433424	Shrubland	4.400834
Coastal Setback	0.350895	Coastal Setback	0.350895
Accommodation	0.013963	Accommodation	0.183048
Green Open Space	0.114699	Green Open Space	0.438993

Source: Authors' Spatial Analysis

ZONE 3



ZONA 3



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Figure 5. Location of Zone 3

Source: Authors' Spatial Analysis

Zone 3 contains supporting facilities such as homestays and local dining establishments (lesehan), which contribute to both tourism and community economic activity. Built-up land has also expanded as residential areas have grown. Land-use change in this zone follows the road network and is concentrated in locations with good accessibility, direct access to the beach, and coastal views. This pattern indicates that Zone 3 integrates local economic activity, residential functions, and tourism services.



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Table 4. Land-Use Area in Zone 3, 2015 and 2025

Land Use in 2015	Area (ha)	Land Use in 2025	Area (ha)
Forest	1.020906	Forest	1.006424
Residential Area	1.136808	Residential Area	1.753382
Rice Fields	5.076142	Rice Fields	4.644582
Shrubland	6.463701	Shrubland	6.297549

Source: Authors' Spatial Analysis

ZONE 4

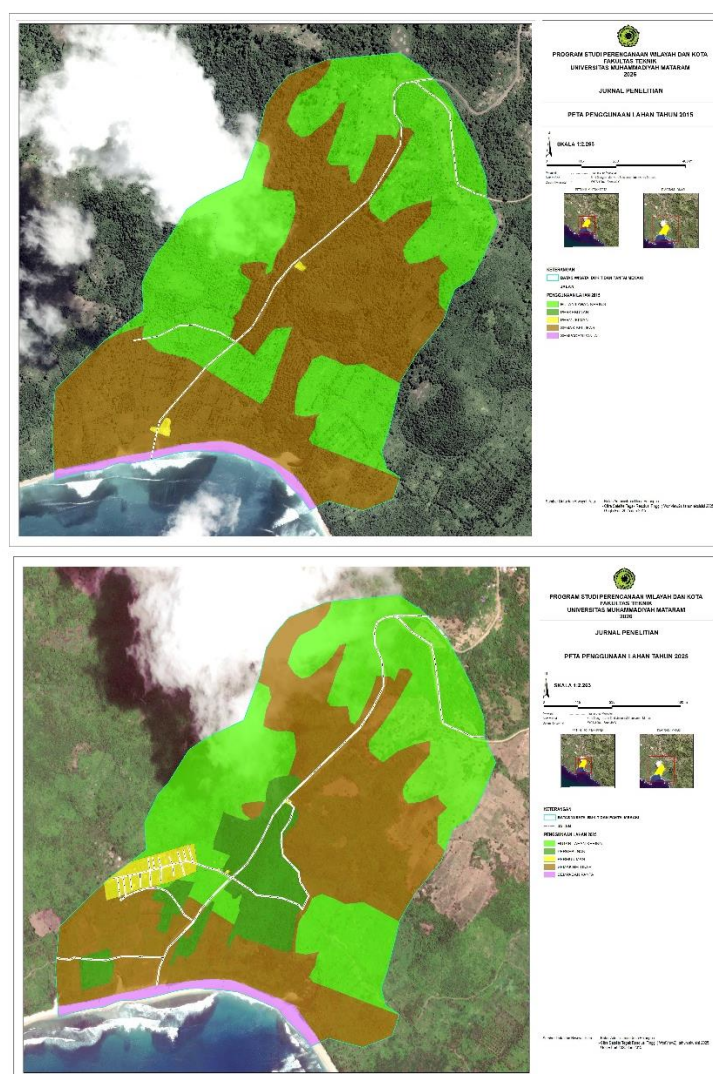


Figure 6. Location of Zone 4

Source: Authors' Spatial Analysis

Zone 4 includes Mekaki Hill and Mekaki Beach, two of the principal tourism attractions in the area. Built-up land has increased, particularly for residential use. Field observations also indicate growing tourism investment, as reflected in hotel construction near Mekaki Beach. Nevertheless, supporting infrastructure, especially the road leading to the destination, remains inadequate.



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Field observations at Mekaki Hill also reveal a shortage of essential supporting facilities, including street lighting, safety barriers on steep slopes, community-based economic activities, and designated photo spots that could enhance the visitor experience. As a result, the scenic tourism potential of Mekaki Hill has not yet generated substantial added value for the surrounding community. This condition suggests that land-use development in Zone 4 must be supported by adequate infrastructure and visitor facilities to encourage sustainable tourism development.

Table 5. Land-Use Area in Zone 4, 2015 and 2025

Land Use in 2015	Area (ha)	Land Use in 2025	Area (ha)
Dryland Forest	57.873098	Dryland Forest	50.962439
Residential Area	0.307811	Residential Area	17.194346
Shrubland	67.846967	Shrubland	57.493646
Coastal Setback	2.765315	Coastal Setback	3.149021

Source: Authors' Spatial Analysis

IMPLICATIONS

Table 6. Implications of Land-Use Change

NO.	ASPECT	FIELD OBSERVATION	IMPLICATION
1.	Spatial Utilization	Accommodation (bungalows), local dining establishments (lesehan), homestays, residential areas, and hotel construction	The tourism-area function is developing gradually.
2.	Facilities and Infrastructure	1. Street lighting 2. Safety barriers 3. Tourism-support facilities (MSMEs, photo spots, seating areas, and similar amenities) 4. Road access remains inadequate	Local-government participation is required to improve infrastructure and tourism facilities in support of sustainable development.
3.	Economy	Sea-crossing services, food stalls, kiosks, accommodation, local dining establishments, and related businesses	Creates opportunities to strengthen the local economy.

Source: Authors' Field Observations

Relationship Between Tourism Activities and Land-Use Change

Table 7. Relationship between Tourism Activities and Land-Use Change

LAND-USE CHANGES IN THE STUDY AREA	RELATIONSHIP WITH TOURISM ACTIVITIES
Homestays, accommodation (bungalows), local dining establishments, hotel construction, residential areas, food stalls, kiosks, and tourism services	The development of marine-tourism activities in the Pelangan Tourism Area is associated with an increase in built-up land, particularly in locations where tourism activity is more intensive. In areas with limited accessibility and insufficient tourism-support facilities, land-use change occurs more slowly.

Source: Authors' Analysis

The table demonstrates that the growth of tourism activities in the study area has influenced the direction of spatial utilization. However, land-use change remains relatively small in scale and continues to occur gradually.



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CONCLUSION

The spatiotemporal analysis of 2015 and 2025 identified land-use changes characterized by an expansion of built-up areas associated with the growth of tourism activities. These changes have occurred gradually and are concentrated mainly in areas with better accessibility and locations near tourism-activity centers. Overall, development in the study area remains incremental and has not yet been matched by adequate supporting facilities and infrastructure.

The findings are expected to provide a basis for controlling spatial utilization and guiding sustainable tourism-area development. Such development should balance economic opportunities for local communities with the provision of infrastructure, tourism-support facilities, and environmental sustainability.

RECOMMENDATIONS

Greater attention should be given to spatial-use controls and the development of tourism facilities through improved infrastructure. Priorities include better road access to tourism destinations, street lighting, visitor-support facilities, safety infrastructure in areas with steep topography, and facilities that support local economic activities.

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