



Spatial Changes in the Settlement of Panta'nakan Lolo Tourism Village, Kesu District, North Toraja Regency

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DOI: <https://doi.org/10.53697/ijgaes.v2i1.3547>

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Received: 02-01-2024

Accepted: 03-02-2025

Published: 31-03-2025



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Abstract: The tourism sector is growing rapidly and emerging as a key driver of regional development. One approach to fostering tourism is establishing Tourism Villages, such as Panta'nakan Lolo Village, which capitalizes on its tourism potential. As a tourist village, it features iconic attractions like Ke'te Kesu. Tourism development has driven increased accommodations alongside physical and spatial changes in the settlement environment. These include new construction, spatial reorganization, and changes in tourism activities and management. This study examines spatial changes in Panta'nakan Lolo Village's settlements before and after its designation as a Tourism Village. Using a qualitative method, data were collected through field surveys, in-depth interviews, and documentation. Spatial-temporal analysis identified changes in land use patterns during 2012, 2018, and 2024. Additionally, settlement patterns were assessed using the Nearest Neighbor Analysis approach with ArcGIS software. The results reveal significant spatial transformations linked to the village's tourism development. These changes include expanded built-up areas, integration of tourism elements into settlements, and the rise of tourism-related activities and management systems.

Keywords: Spatial Change, Settlements, Tourism

Introduction

The development of the tourism sector has encouraged communities to become more aware of the importance of ecosystems and residential environments in tourism activities. One form of tourism development that integrates environmental aspects is tourism villages, which represent a sustainable rural development effort by prioritizing the tourism sector. In tourist villages, one essential element apart from cultural traditions is the presence of tourist attractions. These attractions draw visitors and influence spatial changes in residential areas.

As the tourism sector grows, the demand for accommodations increases, affecting the physical transformation of residential environments ([Hantari & Nareswari, 2021](#)). Spatial changes in residential areas often become one of the significant impacts of tourism village development. Panta'nakan Lolo Village, located in Kesu District, North Toraja Regency, is a tangible example of how tourism development influences residential spatial dynamics. Its

designation as a tourism village in 2018 has spurred significant growth in residential development, marked by the emergence of new spaces and buildings in the area.

The spatial changes in Panta'nakan Lolo Village are driven not only by internal factors, such as the community's needs for housing and livelihoods but also by external factors, such as increased visits from domestic and international tourists and tourism village development policies. These changes reflect a dynamic interplay between the preservation of local culture and the demands of modernization fueled by the tourism industry.

Tourism also impacts infrastructure development and accommodation provision, which continue to be advanced by the local community. These changes have led residential spatial areas to adapt to the needs of tourism components, such as homestays, restaurants, trekking facilities, and other tourist attractions ([Nguyen, 2021](#)). Residential areas previously served as agrarian and traditional zones are now evolving into regions with tourism-supporting elements. The designation of Panta'nakan Lolo as a tourism village has also accelerated the development of facilities and infrastructure, including roads, parking areas, and other public amenities. This development enhances the village's appeal as a tourist destination and accelerates significant spatial transformations in the residential areas.

In the context of spatial changes, it is crucial to understand how these transformations affect the spatial planning of residential areas, environmental sustainability, and the social and economic lives of the local community. Previous studies have discussed land-use changes caused by tourism in rural areas, such as shifts from agrarian to commercial areas. However, little attention has been given to tourism villages in mountainous regions that face geographic challenges, such as steep topography and limited accessibility. For instance, [Kartika et al. \(2020\)](#) Examined the impact of tourism development on farmland conversion in Canggu Village. They found that tourism development led to an increase in the conversion of farmland into accommodation facilities such as hotels, homestays, villas, and restaurants, which also influenced socio-cultural changes in the local community. [Pratiwi et al. \(2022\)](#) Conducted a study on transforming residential typologies around the forest tourism area in Ciwidey, South Bandung. Their study revealed that residents transformed their homes into commercial facilities to accommodate tourists, leading to physical and territorial changes in residential areas. Furthermore, another study observed land transformation from agrarian areas to tourism hubs in Mandalika, Lombok. Farmlands previously used for rice and vegetable cultivation were converted into luxury resorts, hotels, and villas. Tourism infrastructure development, such as roads, shopping centers, and international race circuits, also caused significant changes in the local economic structure and land use ([Kompasiana, 2024](#)).

This study aims to analyze the extent to which tourism village development influences spatial changes in Panta'nakan Lolo Village. The research focuses on land-use changes and

residential development patterns and their impacts on environmental sustainability and the social lives of the local community. This study seeks to contribute significantly to understanding how tourism affects residential structures in rural areas by identifying the changes occurring. Additionally, the study seeks to address critical questions about balancing tourism development with environmental preservation and the protection of local culture.

Methods

This study was conducted in Panta'nakan Lolo Tourism Village, Kesu Subdistrict, North Toraja Regency, to examine the spatial changes in the settlement area using a spatiotemporal approach. The research employs a qualitative method involving data collection through observation, in-depth interviews, documentation, and map analysis. The purposive sampling technique was applied to select relevant samples that reflect spatial changes, such as land converted into residential or commercial areas ([Lenaini et al., 2021](#)). The research informants include residents who have experienced spatial changes, Ke'te Kesu tourist site managers, tourists, local authorities, and relevant institutions. The buildings sampled are those constructed during specific periods (2012, 2018, and 2024) and have undergone functional changes, from residential houses to tourism-related businesses.

The spatiotemporal analysis utilizes satellite imagery from Google Earth Pro with spatial resolution ranging from 1 to 15 meters to compare the 2012, 2018, and 2024 settlement conditions. This satellite imagery is used to identify changes in land area usage types and settlement patterns using the Nearest Neighbor Analysis approach in ArcGIS. Field verification and reference data, such as regional maps and aerial photos, were conducted to ensure data accuracy. These steps ensure the spatial analysis results are reliable and accurately reflect the field conditions. The selection of relevant years, such as 2012, 2018, and 2024, also considers periods of significant change associated with developing tourism and infrastructure in the Ke'te Kesu area ([Prasetya, 2024](#)). Nearest Neighbor Analysis can be seen in **Figure 1**.

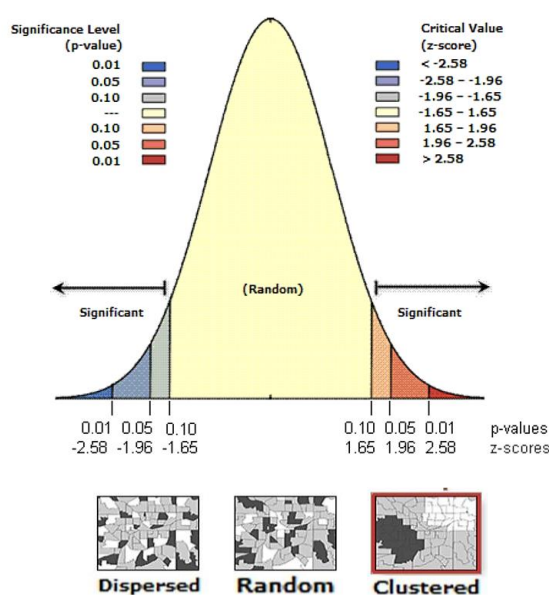


Figure 1. Nearest Neighbor Analysis Curve

The distribution forms of data in these statistical results are as follows ([Sari et al., 2024](#)):

- Random occurs when the z-score value is between -1.65 and 1.65. It is considered random when several points are randomly located in various locations. The position of other points does not influence the position of one point.
- Dispersed occurs when the z-score value is between 1.65 and more significant than 2.58. It is considered dispersed when each point forms a group closely situated to each other.
- Clustered occurs when the z-score value is between -2.58 and -1.65. It is considered clustered when several points form a group and are close to each other.

Fourth, identify the tourism elements based on ([Utomo et al., 2024](#)) theory that can influence settlement spatial changes. These elements include tourist attractions, accessibility, amenities, and ancillary services. The analysis stages are as follows:

- Tourist Attractions: Identifying and mapping the locations of tourist attractions within the settlement area, such as natural, cultural, and historical sites.
- Accessibility: Analyzing the transportation network and accessibility to and within the settlement area, including the availability of roads, bridges, and public transportation.
- Amenities: Identifying supporting tourism facilities such as accommodation, restaurants, and other public services.
- Ancillary Services: Mapping additional services that support tourism activities, such as information centers, souvenir shops, and tour guide services.

Fifth, the theory of ([Khan et al., 2023](#)) related to key factors that need to be considered in activities within settlements to understand the activities of both the local community and tourists in the Panta'nakan Lolo Tourist Village. This theory explores how activities in the

tourism sector can influence spatial changes in settlements. Several indicators influence the formation of activity settings in settlements:

- a. Activity Participants: Identifying various participants involved in activities within the settlement, both residents and tourists.
- b. Types of Activities: Classifying the types of activities carried out in the settlement, such as economic, social, and cultural activities.
- c. Activity Timing: Observing the timing of activities to understand daily and seasonal patterns of activities in the settlement.

Results and Discussion

A. Spatial Settlement of Panta'nakan Lolo Tourism Village

Panta'nakan Lolo Village has undergone significant changes in its built-up areas, clearly visible when comparing the conditions before and after its designation as a tourism village. These physical changes can be analyzed through three distinct periods: 2012, 2018, and 2024.

Initially, Panta'nakan Lolo Village was a rural settlement characterized by a simple and sparse level of development, with minimal infrastructure within its boundaries. The settlement was dominated by open spaces and natural surroundings, offering a picturesque environment that reflected the lifestyle of a traditional village largely untouched by modernization or urbanization.

Over time, the village began to experience growth and development. This transformation included increasing the number of buildings, expanding facilities, and developing supporting infrastructure within the settlement area. Much of this development was driven by the village's status as a tourism destination, which created a growing demand for supporting facilities such as accommodations, restaurants, and improved accessibility.

The physical changes in Panta'nakan Lolo Village's built-up areas reflect a transformation from a traditional village into a more modern and developed area. This transformation aligns with the growth of the tourism sector, highlighting the village's adaptability and the increasing integration of tourism activities into its spatial and economic development.

1. Changes Built-up Area Physical Tourist Village Settlement Lolo's 2012 Panta'nakan

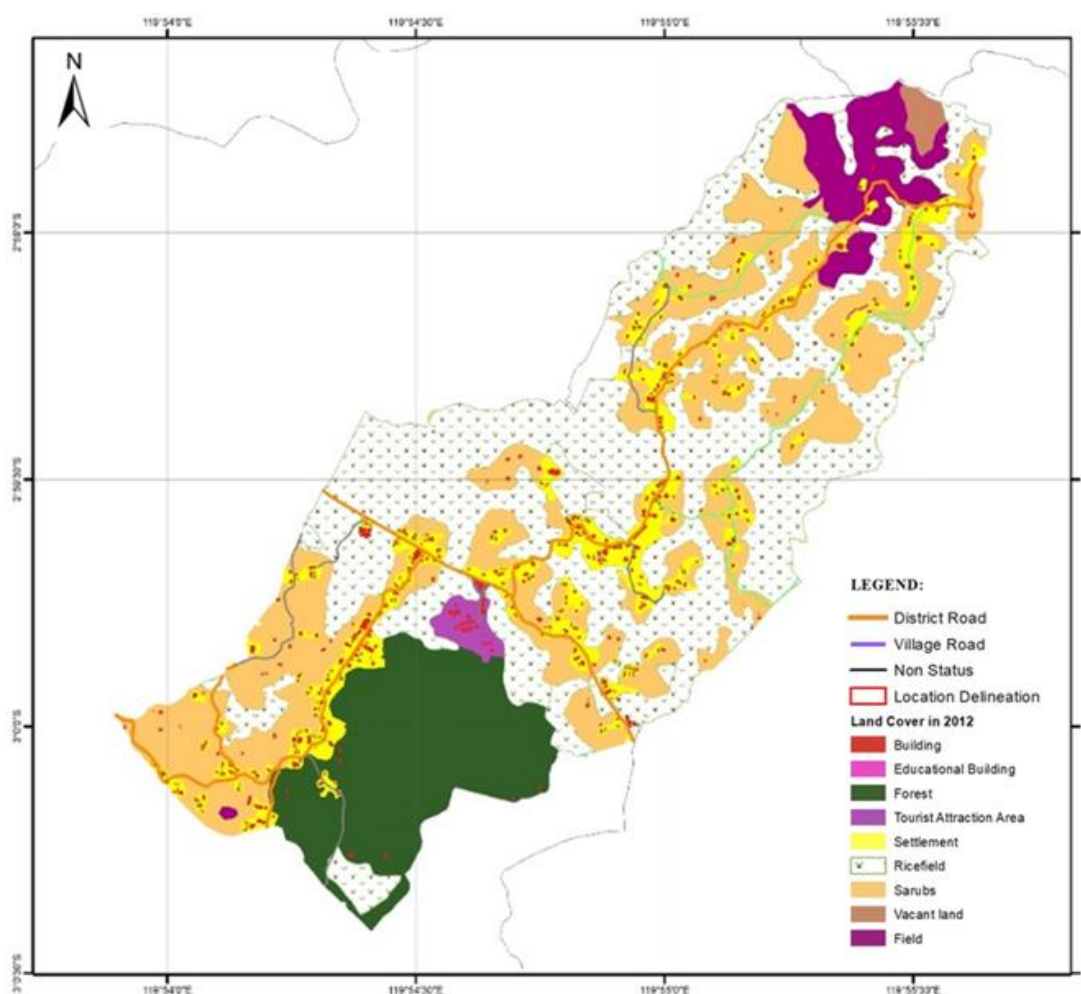
Based on data and observational results, as well as the interpretation of map images using ArcGIS software, the land use in Panta'nakan Lolo Village in 2012 (prior to its designation as a tourism village, as shown in **(Figure 2)**) included various categories such as residential areas, forest areas, tourism sites, wet agricultural land (rice fields), built-up areas, shrublands, open land, dry agricultural land (fields/plantations), and educational facilities.

Table 1. Area of Land Use in Panta'nakan Lolo Village in 2012

No	Land Use	Area (Ha)
1	Settlement	38.59
2	Forest	57.40
3	Object Area Tour	3.74
4	Ricefield	168
5	Building	8.30
6	Shrubs	114.80
7	Open Land	2.55
8	Fields /fields	18.76
9	Educational Building	0.15
Amount		412.29

Source: Research Results, 2024

From Table 1 above, we can observe that the most extensive land use in the village is rice fields, covering 168 hectares (40.7%) of the total village area of 412.29 hectares. In contrast, the most minor land use is public facilities, which occupy only 0.15 hectares (0.03%).

**Figure 2.** Land Use Map of Panta'nakan Lolo Village in 2012

A natural environment and an intense cultural atmosphere still characterized the settlement of Panta'nakan Lolo Village at that time. Most houses were traditional buildings, while large portions of the land remained unused or unoccupied. The settlement pattern tended to be clustered and followed the road network, forming linear or elongated patterns along transportation routes (**Figure 3**).

This pattern developed because settlements generally aligned with transportation routes, such as main roads, village roads, or topographical features that facilitated grouping along easily accessible paths ([Kong et al., 2021](#)). The land use in the study area included plantations for crops such as coffee, cloves, corn, and vegetables. Rice fields were dedicated to cultivating rice. The village's forest areas were divided into protected forests and production forests.

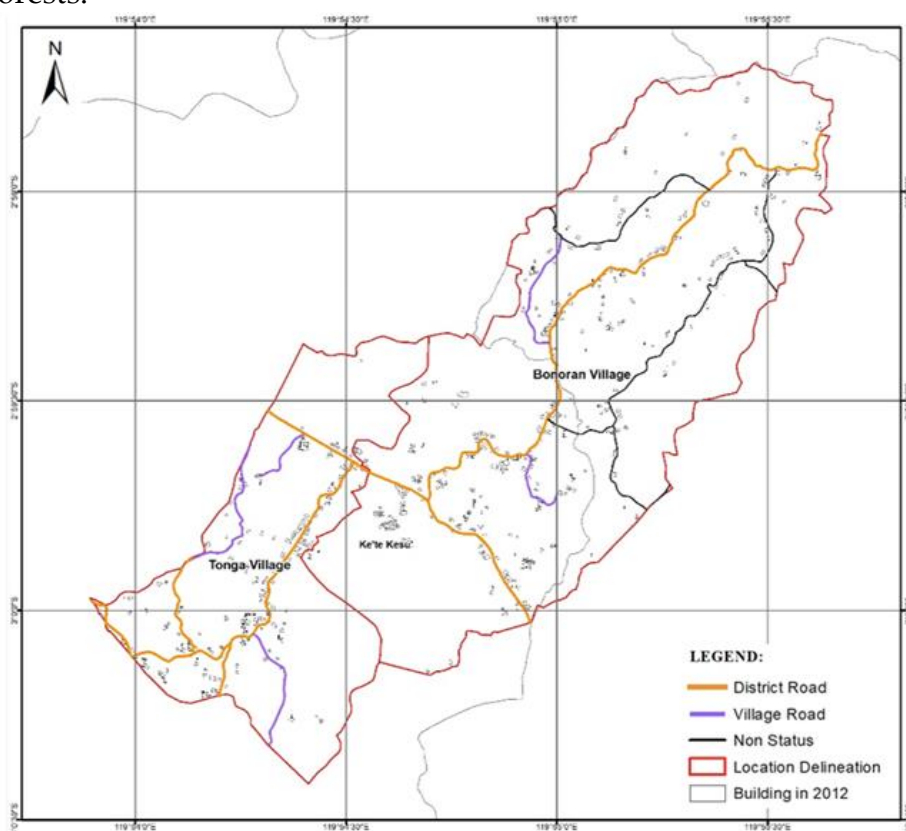


Figure 3. Mapping Physique Tourist Panta'nakan Lolo Village Settlement in 2012

2. Changes Built-up Area Physical Tourist Village Settlement Lolo's 2018 Panta'nakan

The Panta'nakan Lolo Tourism Village, inaugurated on April 23, 2018, has undergone significant physical and developmental changes since its designation. Establishing this status has prompted local communities to construct houses around the residential area, highlighting improvements in residential development to meet the demand for accommodation and support tourism-related activities.

The designation as a Tourism Village has also accelerated infrastructure development within the settlement, including roads, public facilities, and utilities ([Muryanti, 2023](#)). Additionally, it has encouraged the community to create various tourist attractions within residential areas.

One of the village's main attractions is its role as a center for Toraja carvings, showcasing artworks that reflect the region's cultural heritage. In addition to carving, the village is home to artisans specializing in sculpting, bead crafting, and blacksmithing, producing various artistic and craft works. Traditional cake makers also contribute to preserving the area's unique culinary traditions. Furthermore, the village features local eateries offering Toraja cuisine and a dance studio that serves as a hub for dance training and performances.

Between 2012 and 2018, significant land-use changes occurred in Panta'nakan Lolo Village, driven by its designation as a Tourism Village. These changes are particularly evident in the expansion of residential areas, the conversion of rice fields, and the construction of tourism-related facilities, such as buildings dedicated to tourist attractions (Figure 4).

Table 2. Area of Land Use in Panta'nakan Lolo Village in 2018

No	Land Use	Area (Ha)
1	Settlement	45.30
2	Forest	57.10
3	Object Area Tour	3.89
4	Ricefield	163.57
5	Building	10.17
6	Shrubs	110.90
7	Open Land	2.30
8	Fields /fields	18.32
9	Building Objects Tour	0.58
10	Educational Building	0.16
Amount		412.29

Source: Research Results, 2024

From Table 2 above, it can be seen that the most extensive land use in the village is for rice fields, covering an area of 163.57 hectares (39.67% of the total area of 412.29 hectares). In contrast, the most minor land use is for public facilities, which occupy only 0.16 hectares (0.03%). The increase in the area of settlements, buildings, and tourism-related structures demonstrates the direct impact of the village's tourism status on land use patterns. Conversely, the decline in rice fields, bushes, and open land indicates land conversion to meet development needs. These changes highlight a spatial transformation driven by tourism development, urbanization, and the growing demand for infrastructure and facilities.

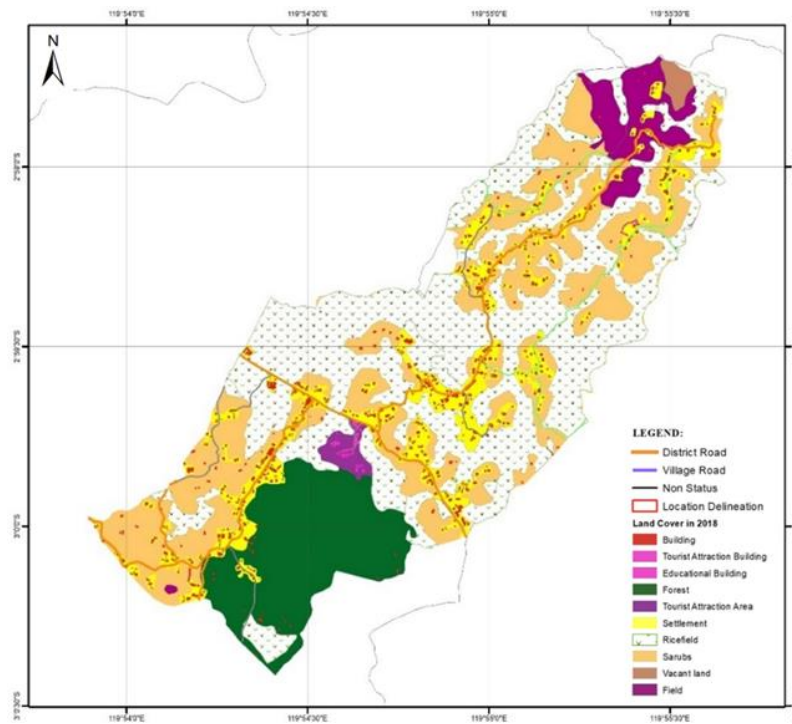


Figure 4. Land Use Map of Panta'nakan Lolo Village in 2018

In 2018, the settlement pattern began to exhibit more complex development, characterized by clusters forming around the main residential areas (**Figure 5**). These changes were driven by increased development in the village, including the construction of homestays and facilities to support tourism, such as accommodations, restaurants, and commercial spaces.

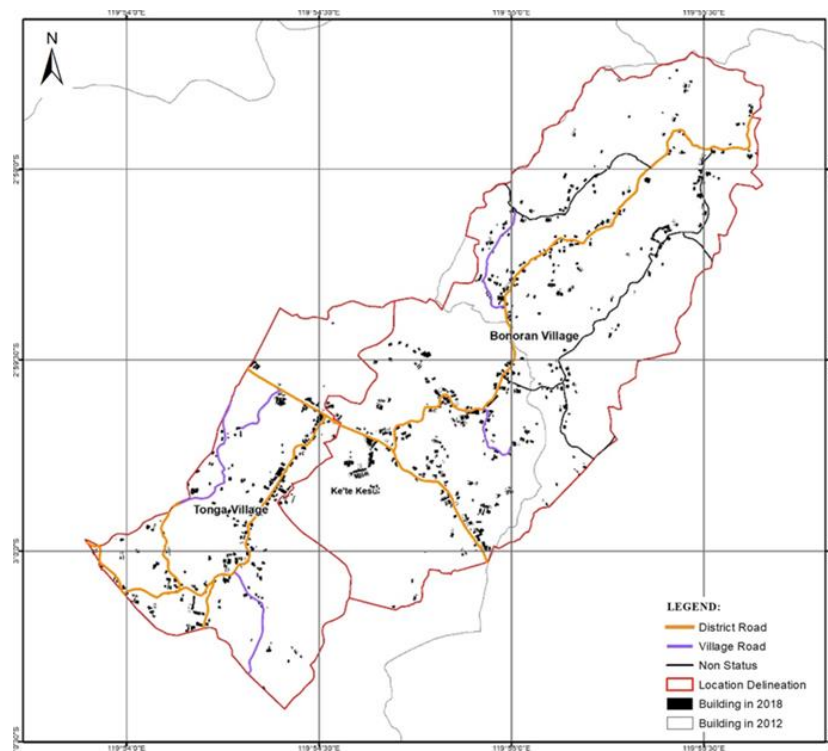


Figure 5. Mapping Physique Tourist Panta'nakan Lolo Village Settlement in 2018

3. Changes Built-up Area Physical Tourist Village Settlement Lolo's 2024 Panta'nakan

Between 2018 and 2024, the Panta'nakan Lolo Tourism Village settlements experienced significant improvements and developments, accompanied by the growth of various tourism attractions (**Figure 8**). The local community actively participated in creating and developing these attractions, which have spread throughout the residential area, strengthening the village's tourism appeal.

The tourism attractions developed in the Panta'nakan Lolo Tourism Village include nature, artificial, and cultural tourism. Nature-based tourism features trekking trails with stunning views through bamboo groves and beautiful residential areas. Artificial tourism attractions designed by the community include the traditional Ma' Randing performance, which introduces various types of welcoming dances for guests. Cultural tourism is represented by attractions such as Ma' Pompong, a traditional Toraja music performance involving around 40 people playing bamboo instruments, producing a unique and beautiful melody ([Matandung et al., 2018](#)) (**Figure 6**). Additionally, Ke'te Kesu, with its rich history and culture, remains the main tourism draw, offering significant cultural and historical value.



Figure 6. *Ma' Pompong and Traditional Ma' Randing*

To enhance tourism potential, the village area features a heritage museum showcasing Toraja cultural artifacts and a park designed to promote general knowledge ([Kausar & Gunawan, 2018](#)). This development results from collaboration between the local community and the government (**Figure 7**). These facilities serve not only as educational and recreational spaces but also as efforts to preserve and promote Toraja's rich culture to visitors ([Madandola & Boussaa, 2023](#)). The development aims to improve travelers' comfort while enhancing the local community's quality of life.



Figure 7. *Museum and Reading Park Culture and Knowledge General*

There has been a noticeable development trend between 2018 and 2024, particularly in residential areas, general buildings, and tourist facilities. This reflects the influence of tourism development on land use in Panta'nakan Lolo Village. The decline of forests, rice fields, and thickets indicates land conversion to meet the demands of this development (Table 3). This transformation aligns with the dynamics of village tourism development, which has driven the growth of settlements and supporting infrastructure.

Table 3. Area of Land Use in Panta'nakan Lolo Village in 2024

No	Land Use	Area (Ha)
1	Settlement	50,60
2	Forest	55.16
3	Object Area Tour	3.78
4	Ricefield	161.37
5	Building	11.97
6	Shrubs	107.63
7	Open Land	2.59
8	Fields /fields	18.28
9	Building Objects Tour	0.71
10	SDN 1 Kesu'	0.20
Amount		412.29

Source: Research Results, 2024

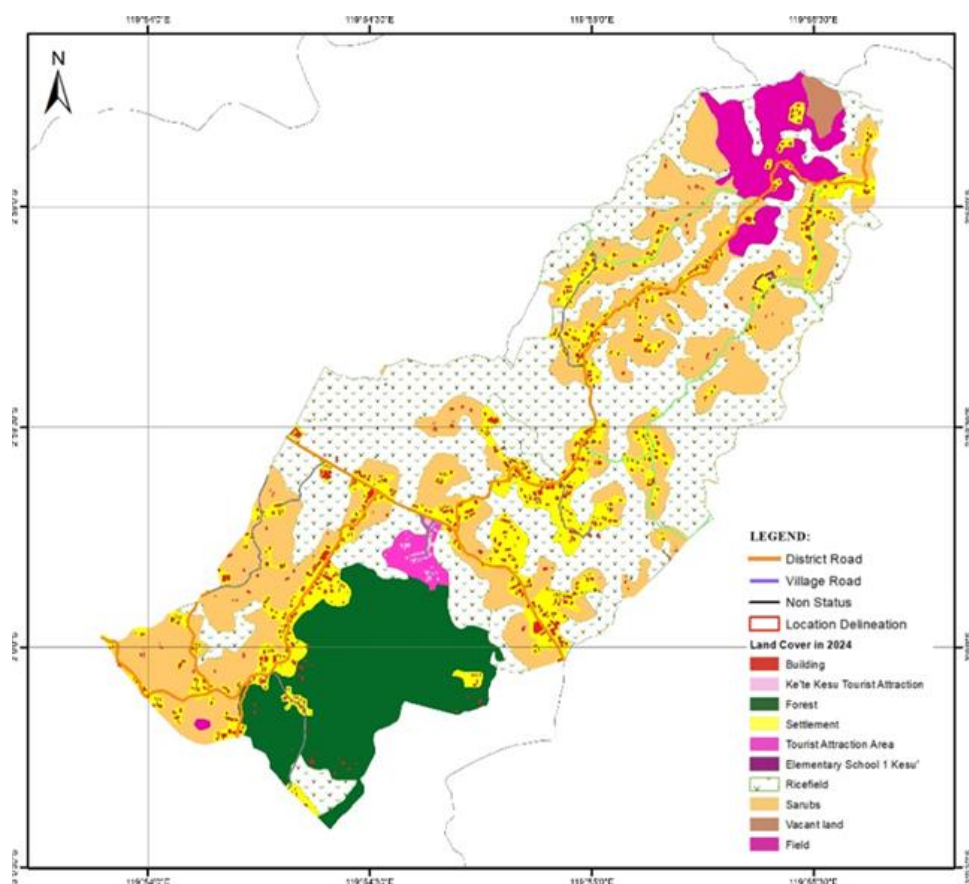


Figure 8. Land Use Map of Panta'nakan Lolo Village in 2024

This study aims to determine the settlement distribution patterns in Panta'nakan Lolo Tourism Village for 2012, 2018, and 2024. The Z-score method was used in conjunction with the nearest neighbor analysis technique, utilizing ArcGIS tools to analyze this. The results revealed a Z-score of -33.96, which falls within the range classified as a clustered pattern. A pattern is considered clustered if the Z-score value falls between -2.58 and -1.65, indicating that several points form a group and are close to each other (**Figure 9**).

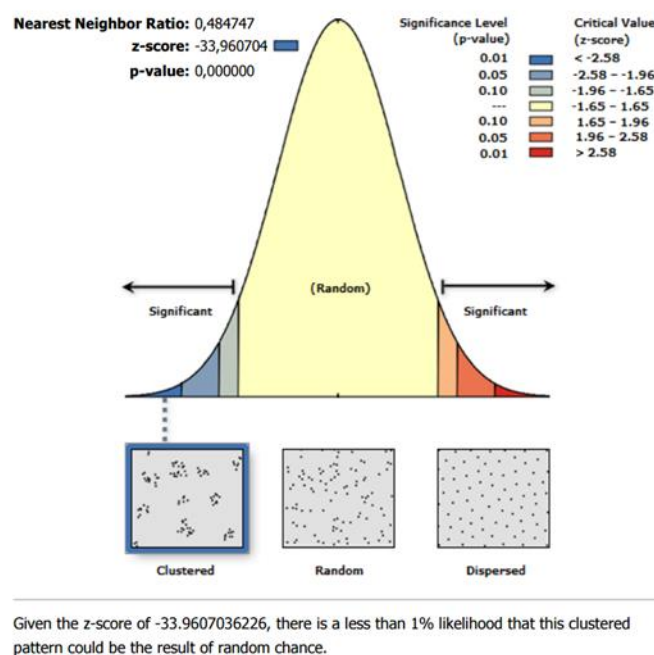


Figure 9. Average Nearest Neighbor Clustered Pattern

Based on this study, the settlement pattern in the Panta'nakan Lolo Tourism Village exhibits a clustering pattern that tends to follow the main road (**Figure 10**). Settlements are concentrated along the road or access routes, making these areas focal points for new development and serving as magnets for settlement growth. This clustering pattern encourages the centralization of regional development, with general facilities and supporting infrastructure tending to concentrate around the development areas.

The driving factor behind the clustering of settlements in certain areas is the region's rapid development, which has transformed it into a hub for activities such as tourism, trade, and government. This has made the area a strategic location for establishing new settlements ([Wulandari & Setyowati, 2020](#)).

The pattern shows that the proximity of land to the main road significantly influences land prices. As land gets closer to the road, its price tends to increase. This, in turn, drives settlement development along the main road. The convenience of accessibility and affordability serve as key factors attracting residents to establish homes in these areas.

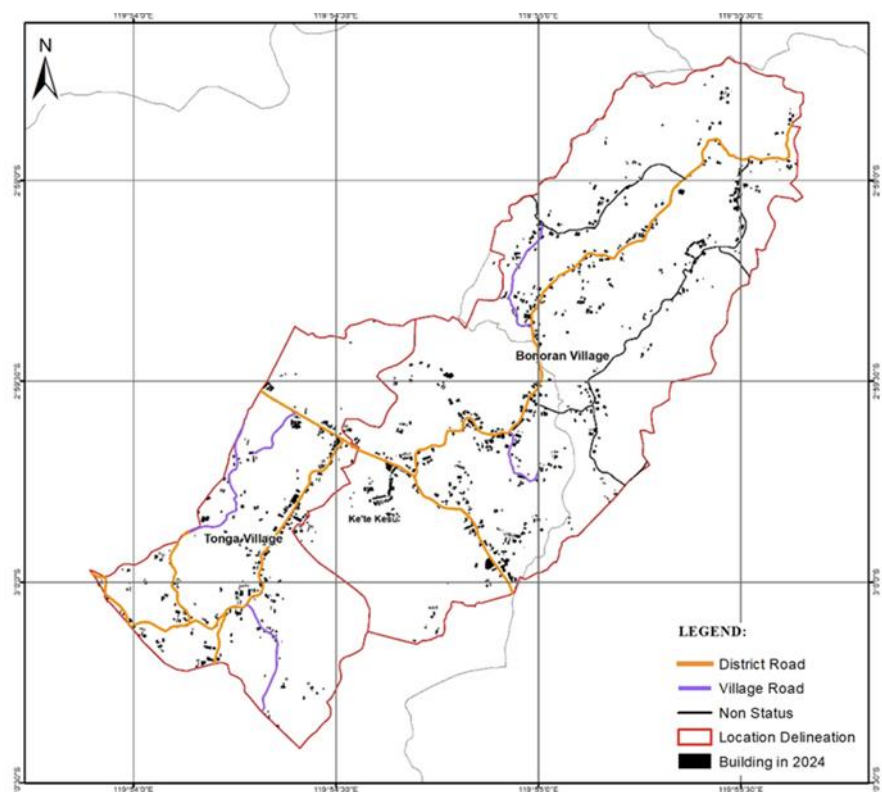


Figure 10. Mapping Physique Tourist Panta'nakan Lolo Village Settlement in 2024

4. Elemen Tourist Village Settlement Lolo's Panta'nakan

The determination of Panta'nakan Lolo as a Tourism Village and the development of tourism within residential areas have prompted the formation of tourism-related elements in the settlement. To identify the existing tourism elements, it is necessary to conduct a review over several periods to understand the developments and changes. The tourism elements formed in the study area, specifically in the Tourism Village of Lolo's residential area, can be analyzed across three periods: before and after the village was designated as a Tourism Village. The following table (Table 4) presents these periods.

Table 4. Elements Tourism in Village Tourism Settlement Lolo's Beach

Element Tourism	2012	2018	2024
Attractions Tour	Focus on natural beauty (mountains, valleys, rice fields)	Management of natural tourism (trekking routes)	Trekking tourism and natural photo spots become more popular, with better-organized trails.
	Tongkonan culture and customary rituals for local visits.	Culture begins to include performances.	Promotion of Rambu Solo's culture.

Element Tourism	2012	2018	2024
	No artificial attractions.	There are no significant artificial attractions.	Artificial attractions such as a cultural reading garden and selfie areas.
Accessibility	Limited roads (dirt/stone). Only private vehicles.	Improvement of main roads, though not entirely paved. Village transport is available.	Paved road access. Local travel agencies are present.
Amenities	No tourism facilities (accommodation, restaurants, toilets).	Beginning of homestays, small shops, parking areas, and toilets.	Homestays, small hotels, traditional restaurants, large parking, complete facilities.
Ancillary Service	There are no information centers, souvenir shops, or tour guides.	Local guides are available, and small souvenir shops and traditional Toraja fabrics begin to appear.	Complete services (information center, travel agents, vehicle rentals); large souvenir shops with regional products.

Source: Research Results, 2024

From Table 4 above, we can see that in 2012, Panta'nakan Lolo Village had not yet been set up as a tourist village, so elements of tourism had not yet been formed in settlements. Conditions during the period show that potential tourism villages have not yet been optimized, and residents focus more on activities daily without paying special attention to the development sector tourists ([Eka & Hudiono, 2020](#)).

Two thousand eighteen significant changes began after Panta'nakan Lolo Village was designated as a tourist village. This designation became the main driving force behind the development of tourism elements within the settlement. Various tourism elements, such as natural, cultural, and artificial, emerged and were managed by the local community. ([Adrianus S. Girikallo, 2023](#)). Additionally, infrastructure improvements, including the development of roads, accommodation facilities, and parking areas, supported the creation of a more conducive environment for tourism activities. These changes attracted the attention of domestic and international tourists, contributing to the growth of the local economy.

By 2024, tourism elements in Panta'nakan Lolo Village had developed rapidly. The increasing number of tourist visits encouraged the community to continuously enhance the quality and variety of tourist attractions. Supporting facilities, such as accommodations, restaurants, and other tourism services, experienced significant improvements in both

quantity and quality. This synergy between the local community, government, and business has transformed the village into an increasingly attractive tourism destination.

The formation of tourism elements within the settlement has influenced spatial changes, particularly with the emergence of tourist attractions. These attractions have led to the formation of new spaces or buildings designated for tourism purposes at various locations within the settlement. This spatial distribution reflects changes in settlement patterns, adapting to the needs of tourists.

Tourism development has also impacted accessibility within the settlement. Improvements to road access have been one of the most significant changes, supporting the mobility of both tourists and the local community. These accessibility improvements have also encouraged the construction of new houses along existing transportation routes, creating settlement spatial patterns that align with the transportation network.

The existence of tourism contributes to the development of amenities that support tourism facilities. Buildings such as homestays, dining areas, parking lots, and toilets are constructed to meet the needs of tourists and enhance the tourism infrastructure within the settlement. Furthermore, tourism encourages establishing additional services, such as formal tourism information centers, local travel agencies, and vehicle rental services. In addition, there has been a rise in well-organized souvenir shops that sell various local products, including handcrafted items, traditional clothing, and Toraja coffee. This development has, in turn, influenced the spatial structure of the settlement, with the emergence of new areas designated to support tourism activities.

5. Activity Settings Tourist Village Settlement Lolo's Panta'nakan

The determination of Panta'nakan Lolo Village as a Tourism Village has led to significant changes in settlement activities. Tourism development in this area has created new activity patterns directly related to tourism. To understand the dynamics and development of these activities, this study examines the settlement activities in Panta'nakan Lolo Village over three periods: before and after the village's designation as a tourism village. Below is a brief description of the development of these activities across the three periods:

a. Period 2012: Before the Establishment of Panta'nakan Lolo Village as a Tourist Village

1) Perpetrator Activity

- a) Most activities are carried out by native residents of Panta'nakan Lolo Village, with minimal involvement from migrant residents. Migration rates are relatively low, maintaining these activities' traditional and local nature.
- b) The number of tourists visiting the village remains minimal, as tourism activities have yet to develop significantly.

2) Types of Activities

- a) The primary activities are agrarian, including farming, gardening, raising livestock, and participating in traditional Toraja ceremonies.
- b) Residents also preserve the traditional environment, such as maintaining the Tongkonan houses and ancestral graves.

- c) minimal commercial activities, with only a few small roadside stalls catering to residents' basic needs.
- d) The number of Tourists visiting the village is generally tiny and primarily comes for cultural or educational purposes.

3) Activity Schedule

- a) Most daily activities occur from morning to afternoon, aligning with the agrarian work patterns and traditional lifestyle.
- b) Tourism-related activities happen sporadically, depending on tourist arrivals, usually during the daytime.
- c) Cultural and ceremonial activities are incidental, taking place according to the schedule of traditional ceremonies.

b. Period 2018: After the Establishment of Panta'nakan Lolo Village as a Tourist Village

1) Perpetrator Activity

- a) In addition to the original population, newcomers, including migrants from neighboring villages and other areas who are actively involved in the tourism sector, are participating increasingly.
- b) The number of domestic travelers has risen, driven by the designation of Panta'nakan Lolo Village as a Tourism Village.

2) Types of Activities

- a) Development of tourism-supporting facilities, such as accommodations, restaurants, parking areas, and souvenir shops.
- b) Growth in trade activities, including selling handcrafted items, local specialty foods, and souvenirs.
- c) Traditional customs continue, but some have been repackaged as tourist attractions.

3) Activity Schedule

- a) Tourism activities occur from morning until evening, with peak activity on weekends or holidays.
- b) Public activities are increasingly integrated with tourism, creating a lively atmosphere throughout the day.
- c) Activity schedules have become more dynamic compared to previous periods.
- d) Traditional customs, once performed privately, are now frequently showcased and aligned with tourist schedules.

c. Period 2024: Development of the Tourism Village

a. Perpetrator Activity

- a) The activities of stakeholders are becoming increasingly diverse, involving residents, migrants, and business operators from outside the area.
- b) Large-scale investors are starting to establish businesses in the accommodation sector, such as hotels, restaurants, and tourism-related industries.
- c) Original residents are increasingly involved as workers, local guides, and managers of cultural attractions.
- d) Migration from outside the village rapidly increases, including foreign residents who marry locals and open businesses there.

- e) The number of domestic and international travelers visiting the area has significantly increased, particularly during cultural events and festivals.
- b. Types of Activities
 - a) Tourism attractions are becoming more varied, including cultural art performances, trekking, and educational cultural activities.
 - b) Local economic activities, such as homestay rentals, professional tour guide services, and tour package management, have improved.
 - c) Traditional customs and cultural activities remain important but are increasingly commodified to meet the needs of tourists.
- c. Activity Schedule
 - a) Tourism activities now occur almost throughout the day, from morning until evening, with increasingly tight schedules to meet the demands of both domestic and international travelers.
 - b) A more structured activity pattern has emerged, with permanent attraction timetables supported by online tourism promotions.

The development of tourism destinations significantly impacts the formation of activity patterns in settlements. These activity patterns directly contribute to spatial changes in the Panta'nakan Lolo Tourism Village. The activities involve three main groups: the local community, tourism village managers, and tourists or visitors.

The types of tourism activities in the settlements encompass diverse categories, including natural attractions, artificial attractions, and cultural tourism. These activities drive the need for new spaces or buildings to support them. For instance, the development of supporting facilities such as accommodations, information centers, dining areas, and cultural performance venues has been essential.

Tourism activities and visits also exhibit specific time distributions, occurring during the morning, afternoon, and evening. This time division shapes the rhythm of life in the settlements, aligning with the needs of tourists and the daily routines of the local community.

Consequently, forming distinct activity patterns in the settlements has triggered spatial changes. These changes are realized by developing newly designed spaces for various tourism activities. This transformation has resulted in significant alterations to the spatial structure of the Panta'nakan Lolo Tourism Village.

B. Factors Influencing Spatial Changes in the Panta'nakan Lolo Tourism Village Settlement

Based on data analysis from 2012, 2018, and 2024, several factors have contributed to spatial changes in the Panta'nakan Lolo Tourism Village settlement. These factors include:

1. Tourism Development

- a. Ke'te Kesu has become a cultural and historical tourism destination that attracts domestic and international visitors. Data indicates a consistent increase in tourists in 2012, 2018, and 2024. This rise in tourism necessitated the development of

supporting facilities such as accommodations, restaurants, and parking spaces, leading to changes in land use within the settlement area.

- b. In 2018, Panta'nakan Lolo was officially designated as a Tourism Village, resulting in a surge in tourist visits. This development prompted the construction of new facilities and infrastructure, including accommodations, restaurants, information centers, and transportation networks. These changes transformed land use patterns, converting agricultural land and customary areas into residential and commercial spaces.

2. Formation of Tourism Attractions Within the Settlement

- a. Panta'nakan Lolo's scenic environment, characterized by rice fields, mountains, and hills, has been utilized to develop trekking and cultural tourism attractions. The designation as a Tourism Village encouraged the local community to establish tourism facilities and attractions, leading to significant changes in settlement layouts.
- b. The development of tourism attractions within the settlement has led to the creation of new spatial patterns. Tourism buildings are distributed across the area, requiring the construction of access roads to connect these locations. Residential buildings are now clustered around tourist attractions and aligned with the new road networks, resulting in a more structured and grouped settlement pattern.

3. Land Use Transformation

Since Ke'te Kesu was recognized as a cultural heritage site and nominated for the Anugerah Pesona Indonesia (API) award ([Barumbun & Ridha, 2017](#)), there has been a transformation in land use in Panta'nakan Lolo. Agricultural fields, customary forests, and grasslands have been converted into residential, commercial, and tourism areas. The increasing demand for tourism-supporting facilities in the vicinity of Ke'te Kesu. Drives this shift (Bura & Ando, 2024).

4. Economic Growth

Panta'nakan Lolo has become a hub of economic activity due to its tourism potential. The ease of starting tourism-related businesses has attracted migrants who have established accommodations, restaurants, and tourism services. This economic growth has spurred new developments, impacting spatial patterns within the settlement.

C. Policy Implications on Land-Use Changes in Panta'nakan Lolo Village

Land-use changes in Panta'nakan Lolo Tourist Village are influenced by economic and social factors and government policies related to tourism village development. These policies affect how local communities and external investors utilize, manage, and allocate land. The following are some policy implications contributing to spatial transformations in this village:

1. Policy on Tourism Village Designation and Land-Use Regulations

The designation of Panta'nakan Lolo as a tourism village in 2018 marked the beginning of significant land-use transformations. This policy has shifted from land predominantly

used for agriculture and customary land to residential areas and tourism facilities. The land-use regulations implemented after this designation allowed for the construction of accommodations, restaurants, and other supporting infrastructure.

However, the lack of strict spatial planning has led to rapid land conversion without optimal control. This is evident in the increase of homestay developments and the reduction of agricultural land, which strict zoning regulations have not always accompanied.

2. Infrastructure and Accessibility Policies

Local and national governments have focused on developing infrastructure in tourism areas such as Panta'nakan Lolo. Improvements in road access, public transportation provisions, and the expansion of public facilities such as parking lots and commercial areas have influenced spatial utilization patterns.

While these policies aim to enhance tourism appeal and facilitate visitor mobility, their impact on spatial changes is substantial. The better an area's accessibility, the higher the potential for land conversion from agricultural or forested areas to commercial and residential zones.

3. Investment Policies and Private Sector Participation

Government policies that open investment opportunities for the private sector in tourism village development have attracted external capital to Panta'nakan Lolo, accelerating the construction of various tourism facilities. However, this policy also presents challenges in controlling land ownership.

The influx of migrants from other regions and the involvement of large-scale investors have altered the traditional communal land ownership structure, shifting it toward individual or corporate ownership. As a result, land prices have surged, creating pressure on local communities to maintain their land ownership.

4. Cultural and Environmental Conservation Policies

As a region of high cultural value, policies on cultural and environmental conservation in Panta'nakan Lolo play a crucial role in regulating land use. The government and cultural organizations have implemented regulations to preserve the village's authenticity and protect cultural sites such as Tongkonan houses and traditional burial grounds.

However, despite these regulatory efforts, rapid tourism growth sometimes conflicts with conservation goals. For instance, converting traditional burial grounds into open-access tourist attractions highlights the dilemma between cultural preservation and economic exploitation.

5. Impact of Regulations on Local Communities

Tourism-related policies have directly impacted the lives of local communities. On the one hand, these policies create new economic opportunities for residents, including accommodation businesses, tour guiding services, and the trade sector. On the other hand, without effective spatial regulations, communities face challenges such as:

- a. Reduction of productive agricultural land due to conversion to tourism-related developments.
- b. Rising land prices make it difficult for locals to acquire land for housing or businesses.
- c. Social shifts due to the influx of large investors and an increasing number of migrants.

Conclusion

Tourism plays a significant role in driving spatial changes in the Panta'nakan Lolo Tourism Village settlement. After its designation as a tourism village, physical and non-physical transformations have emerged, shaping the settlement's development. The influence of tourism can be categorized as follows:

1. Physical Changes in the Settlement

Tourism has directly contributed to noticeable physical transformations, including:

a. Expansion of Built-Up Areas

Tourism has increased the settlement's population density, encouraging the construction of new houses and other structures in and around the Panta'nakan Lolo Tourism Village. This has led to significant development in building construction.

b. Formation of Tourism Elements

Tourism has introduced specific elements to the settlement, such as creating new spaces designated for tourist attractions and developing supporting facilities like accommodation, restaurants, and recreational areas.

c. Land-Use Transformation

d. The rising number of tourist visits has driven the demand for additional infrastructure and facilities, including transportation, information centers, and hospitality services. These changes have altered the settlement's land-use patterns, with agricultural and customary areas converted into residential and commercial spaces.

2. Non-Physical Changes in the Settlement

Tourism has also influenced non-physical aspects of the settlement, such as:

a. Development of Activity Settings and Tourism Management

Integrating tourism into the settlement has resulted in new activity settings, including spaces for tourism-related events and activities. Additionally, the emergence of tourism management practices has shaped the organization of these activities, fostering a more structured approach to accommodating visitors and enhancing the overall tourist experience.

Recommendations

In response to the pressures resulting from tourism development, local governments and tourism village managers must implement strategic actions to ensure the sustainability of cultural preservation and environmental management. Below are several recommendations that can be applied:

1. Cultural Preservation

- a. Develop regulations that protect cultural sites and local traditions to prevent degradation due to tourism commercialization.
- b. Encourage the community to continue practicing customs and traditions, including religious ceremonies and cultural arts, as part of authentic tourist attractions.
- c. Provide incentives for residents who maintain traditional houses and historical sites.
- d. New developments must follow local architectural styles to maintain visual harmony in the settlement.

2. Environmental Management

- a. Implement zoning policies for tourism to prevent the expansion of settlements and tourist facilities that could damage the natural ecosystem.
- b. Promote sustainable tourism practices, such as improved waste management and the use of eco-friendly energy in homestays and restaurants.
- c. Limit the number of visitors to specific areas to reduce environmental impact, especially in culturally and ecologically sensitive sites.
- d. Enhance community participation in environmental management, including greening programs and community-based waste management initiatives.

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