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# "Model of the Traditional Village of Nagari Sijunjung: "Study of Disaster Typology and Mitigation Based on Local Wisdom"

Haryana,
Bung Hatta University
irharyanimtp@bunghatta.ac.id,

## 1. Background

Indonesia is one of the countries with a high level of vulnerability to natural disasters, such as earthquakes, volcanic eruptions, floods, and landslides. According to BNPB (2022) data, the frequency of disasters in Indonesia continues to increase, particularly in areas experiencing land-use changes that are inconsistent with the physical characteristics of the area. In this context, technology-based mitigation approaches often require significant resources and may not be appropriate for local conditions.

Conversely, many indigenous communities in Indonesia have long developed local knowledge systems as a means of adapting to environmental risks. One form of this local knowledge is the customary spatial planning system, which not only functions to regulate the structure of settlements, agricultural land, and conservation areas, but also plays a crucial role in naturally and sustainably reducing disaster risk. This system is formed through the accumulation of experience, observation of nature, and a philosophy of life passed down through generations (Wiersum, 2004; Hiwasaki et al., 2014; Haryani, 2020).

The Sijunjung Traditional Village in West Sumatra reflects traditional Minangkabau spatial planning, rich in social and ecological values. The sustainability of this traditional village is determined not only by sociocultural aspects but also by the region's preparedness to face geospatial risks such as floods and landslides. Therefore, slope analysis (a physical aspect) is crucial for understanding potential risks and determining safe and sustainable spatial utilization zones.

In Minangkabau society, the principle*"Nature is a teacher"*serves as the foundation for village spatial planning. This principle teaches communities to read natural signs when selecting residential locations, cultivating crops, and determining protected areas. Studies by Iskandar (2010) and Haryani (2020) show that traditional Minangkabau settlements are generally built on ridges or highlands to avoid flooding, with houses oriented according to wind direction and water flow. The construction of stilt houses also serves as an adaptation to flooding and earthquakes.

Hiwasaki et al. (2014), Haryani (2020) stated that the customary spatial planning system can function as*early warning system* and disaster mitigation strategies that are resource-efficient because they do not require high technology. This system is part of the approach*Community Based Disaster Risk Reduction* (CBDRR) relies on local capacity to identify, assess, and respond to disaster risks. In this context, customary spatial planning is a crucial tool in strengthening communities' socio-ecological resilience to environmental disturbances.

However, along with social change, development pressures, and weak recognition of indigenous peoples' rights, traditional spatial planning structures have shifted. Modernization processes often ignore local principles and replace them with technocratic approaches that may not be appropriate.

with local cultural and environmental contexts (Saptomo, 2010; Sutanta et al., 2013). This research is crucial for exploring and assessing how customary spatial planning systems, such as those found in the Nagari Sijunjung Traditional Village, are maintained and utilized as a form of adaptation to disaster risks. It also aims to explore the relevance of these systems in the context of modern risk-based spatial planning and disaster impact reduction.

## 2. Research methods

16 This research uses a qualitative and quantitative descriptive approach with integration between spatial analysis and local wisdom approaches (*indigenous knowledge).* The aim is to understand how the structure and pattern of Minangkabau traditional spatial planning in the Nagari Sijunjung Traditional Village reflects a disaster mitigation strategy based on local wisdom and the biophysical conditions of the region.

1. Spatial Approach

A spatial approach is used to map, analyze, and evaluate the relationship between customary spatial structures and physical environmental characteristics such as topography, slope, and potential disaster risk. The stages in this approach include:

a. Spatial data collection: Satellite imagery (Landsat/Sentinel), Elevation data (DEM/SRTM), Slope, geology, and land cover maps, Administrative map of Sijunjung Traditional Village.
b. Spatial data processing using QGIS software:
   - Slope analysis to assess land suitability for flood and landslide risks.
   - Overlay between the land use map of traditional villages and disaster prone zones.
   - Buffering against important natural features such as rivers, cliffs, and natural evacuation routes.
c. Spatial analysis:
   - Suitability room based on principle mitigation disaster (e.g., settlements on hill ridges).
   - Correlation between the distribution of traditional houses in traditional villages with the contour and direction of water flow.
   - Landslide Disaster Risk Assessment Parameters

| No | Parameter | Class/Category | Mark | Weight |
|---|---|---|---|---|
| 1 | Soil Type | Aluvial, Latosol, Grumosol | 1 | 1 |
| | | Mediterranean, Podsolik, Glei Humus | 2 | 1 |
| | | Regosol, Andosol | 3 | 1 |
| 2 | Land Use | Lakes, Rivers, Ponds, Fish Ponds | 0 | 2 |
| | | Check the Bushes | 2 | |
| | | Rice fields, fields, plantations, Mixed Garden | 4 | |
| | | Settlements, Mines, Fields | 5 | |
| | | Swimming pool | 3 | |
| 3 | Rainfall | 2001–2500 mm (Low) | 3 | 3 |
| | | 2501–3000 mm (Medium) | 4 | |
| | | 3001–3500 mm (Height) | 5 | |
| | | >3500 mm (Very High) | 5 | |
| 4 | Slope | 0–2% | 1 | 4 |
| | | 2–15% | 2 | |
| | | 15–25% | 3 | |

| | | | | |
|---|---|---|---|---|
| | | 25–40% | 4 | |
| | | >40% | 5 | |
| 5 | Geology | Sedimentary rocks (easily weathered: clay, conglomerate, shale) | 3 | 3 |
| | | Volcanic rocks (medium strong: tuff, breccia, lava) | 2 | |
| | | Igneous/metamorphic rocks (strong: granite, basalt, marble) | 1 | |

*Source: BNPB (2019), Paimin et al. (2017)*

## Landslide Susceptibility Classification

| Class Vulnerability | Interval Shoes Landslide | Information |
|---|---|---|
| Low | 1.5 – 2.3 | Not too prone, but still necessary supervision during the rainy season |
| Currently | >2.3 – 3.1 | Potential for landslides if rainfall is heavy high or there is slope interference |
| High | >3.1 – 3.7 | Very prone to landslides, mitigation measures are needed and special handling |

- Flood Disaster Risk Assessment Parameters

| No | Parameter | Class/Category | Score | Weight |
|---|---|---|---|---|
| 1 | Land Use | Lakes, ponds, rivers, mines, Open Land, Settlements, Swamps | 5 | 2 |
| | | Swimming Pool, Irrigated Rice Fields, Rice Fields Wetlands, Shrubs/Brushes | 4 | |
| | | Plantation Forest, Dryland Forest Primers/Seconds | 3 | |
| | | Mixed Gardens, Rubber Gardens, Coconut Palm oil | 2 | |
| | | River Basin | 1 | |
| 2 | Rainfall | >3500 mm (Very High) | 5 | 3 |
| | | 3001–3500 mm (Height) | 4 | |
| | | 2501–3000 mm (Medium) | 3 | |
| | | 2001–2500 mm (Low) | 2 | |
| | | <2000 mm (Very Low) | 1 | |
| 3 | Height | 0–25 meters above sea level | 5 | 2 |
| | | 26–50 meters above sea level | 4 | |
| | | 51–100 meters above sea level | 3 | |
| | | 101–250 meters above sea level | 2 | |
| | | >250 meters above sea level | 1 | |
| 4 | Slope | 0–2% | 5 | 1 |
| | | 2–15% | 4 | |
| | | 15–25% | 3 | |
| | | 25–40% | 2 | |
| | | >40% | 1 | |
| 5 | Soil Type | Aluvial, Latosol, Grumosol | 5 | 2 |
| | | Regosol, Andosol | 3 | |
| | | Mediterranean, Podsolik, Glei Humus | 2 | |
| | | Lithosol | 1 | |

*Source: Mustofa (2016), Wulan & Hidayati (2018)*

## Flood Vulnerability Classification

| Vulnerability Class | Flood Score Interval | Information |
|---|---|---|
| Very Low | 2.4 – 3.0 | Not significant |
| Low | >3.0 – 3.6 | Potential for light flooding |
| Currently | >3.6 – 4.2 | Moderate risk during heavy rain |
| High | >4.2 – 4.8 | Very vulnerable, needs mitigation |

2. Local Wisdom Approach

This approach aims to explore and understand local knowledge which forms the basis for decision-making in the spatial planning of traditional villages, through the following methods:

a. In-depth interviews with Ninik mamak (traditional leaders), Tuo kampuang (village elders), residents of the traditional house and local community.
b. Participatory observation; directly observing the orientation patterns of traditional buildings, the selection of locations for houses, barns, and communal facilities, and spatial planning systems based on traditional functions (houses, rice fields, forbidden forests).
c. Documentation studies, through traditional books, tambo, or local narratives related to village history, traditional maps or sketches of traditional spaces, narrative analysis, to interpret the ecological, spiritual, and social values inherent in Minangkabau traditional spatial planning (philosophy)*"Nature is a teacher"*and a ban on clearing land in vulnerable areas).

3. Integration Analysis

Spatial approaches and local wisdom are analyzed in a complementary manner through:

a. Data triangulation, by comparing the results of spatial analysis with the results of interviews and observations.
b. Identification of traditional spatial function zones that have proven effective in disaster mitigation based on scientific studies and local understanding.
c. Narrative-spatial mapping that describes how customary values are reflected in the spatial configuration of the village (e.g., prohibitions on building at the foot of steep hills or near large rivers).

Expected results

a. The spatial planning model of the traditional village of Nagari Sijunjung which functions as a natural disaster mitigation system.
b. An integrative model between local knowledge systems and spatial data in risk-based traditional village spatial planning.
c. Recommendations for policies on preserving customary spatial planning as part of a disaster risk reduction (DRR) strategy.

## 3. Literature Review

### a. Risk-Based Spatial Planning and Local Cultural Values

Risk-based spatial planning (*risk-based spatial*) is an approach that prioritizes the identification, mapping, and mitigation of natural disaster risks in spatial planning and management processes. This approach aims to reduce the vulnerability of regions and communities to disaster threats by considering physical spatial characteristics such as slope, land cover, soil type, and the socio-cultural aspects inherent in an area (BNPB, 2021).

A risk-based approach is crucial to prevent the use of space that endangers the safety of communities in traditional villages, such as traditional traditional houses and barns, which hold significant cultural value. Spatial analysis using GIS (Geographic Information Systems) tools enables mapping of risk zones and supports safer and more sustainable spatial planning decisions.

One of the main elements in this approach is the integration of spatial data that includes: a) slope, which determines the potential for hazards such as landslides or flash floods, b) land cover, which affects the rate of surface flow (runoff), erosion, and environmental resilience to disasters. The results of the spatial analysis are in the form of potential disaster zones, which are developed through spatial analysis using geographic information systems (GIS) and risk modeling. One method commonly used in risk-based spatial planning is the integration of Geographic Information Systems (GIS) to overlay regional physical data with regional vulnerability and capacity data. Through this approach, accurate disaster-prone area zoning can be formulated and can be used as a basis for spatial planning decisions (Mileti, 1999).

Recent research developments show that the effectiveness of spatial planning (especially traditional villages) is not only determined by the accuracy of spatial data and technical analysis, but also by the extent to which the spatial planning accommodates local values that have long been practiced by the community, including traditional spatial planning and customary settlement patterns.

According to Saptomo (2010), spatial planning that ignores local social and cultural dimensions often fails in implementation. In various regions of Indonesia, indigenous communities have developed spatial planning systems based on local wisdom and ecological principles. These systems, while not always formally documented, have proven adaptive to long-term environmental risks.

Spatial planning will be more effective if it is adapted to traditional settlement patterns and spatial planning systems based on local culture. In the Indonesian context, indigenous communities have spatial systems that have been passed down through generations and have proven adaptive to environmental risks (Saptomo, 2010). This local wisdom encompasses not only knowledge of the place itself, but also the environment.

safe and unsafe to live in, but also includes how to build, choose building materials, and form communities that look after each other.

Philosophy public takambang Minangkabau, that is the principle of “nature "Become a teacher" implies that nature is a source of knowledge that must be used as a basis for building settlements and managing space. This is reflected in the placement pattern of traditional houses, which avoid steep slopes, are close to water sources, but still maintain a distance from potential floods and landslides. The Minangkabau people apply the principle of "alam takambang jadi guru" as a philosophy of life that makes nature a source of knowledge. This philosophy reflects the close relationship between society and its environment, including in the careful selection of settlement locations based on topography, resource availability, and disaster risk considerations.

The principle of "nature as a teacher" is the basis for spatial planning that harmonizes with natural conditions. This philosophy encourages communities to consider environmental elements when constructing settlements: site selection, house orientation, distance from rivers or slopes, and the relationship between social function and the spatial location of traditional houses, prayer rooms, rice fields, and forests.

Saptomo (2010) emphasized that traditional spatial planning systems, such as those found in the Sijunjung Traditional Village, are not the result of chance, but rather the result of long-term adaptation to environmental threats. These patterns are often more efficient in reducing disaster risk than modern spatial planning systems that ignore local context.

The concept of cultural landscape, as developed by UNESCO (2003), emphasizes the importance of the reciprocal relationship between humans and nature. Within this framework, space is viewed not only as a physical object but also as a social and cultural entity with symbolic and historical value. Therefore, risk-based planning needs to consider the preservation of cultural landscapes as part of a comprehensive community protection system.

The theory related to risk-based spatial planning and local cultural values is as follows.

1. Resilience Thinking (Walker & Salt, 2006)

   This approach emphasizes the importance of building socio-ecological resilience through adaptation to change and risk. Integrating local values into spatial planning is part of the effort to build community-based resilience.

   Walker and Salt's (2006) concept of socio-ecological resilience provides a framework for understanding how indigenous communities like those in Sijunjung build systems that can absorb disturbances while maintaining their primary functions. Traditional houses are constructed with earthquake-resistant architecture (flexible joinery), residential areas are defined by natural elements such as streams and forest slopes, and land management is carried out collectively based on the sako-pusako (heritage system).

2. Theory of Place Attachment (Altman & Low, 1992)

   Explaining that space holds emotional meaning and cultural identity for its inhabitants. Therefore, spatial planning that considers the community's attachment to traditional spaces will be more easily accepted and implemented. Community attachment to space plays a crucial role in the success of planning and policy implementation. Spatial planning that ignores local values often faces resistance because it conflicts with the community's collective identity.

In the context of Sijunjung, the community's attachment to the traditional house (rumah gadang), traditional hall, and tapian (traditional bathing place) is not only a social symbol, but also an instrument for risk management. For example, rumah gadang is traditionally not built on steep slopes or flood plains, demonstrating a form of local wisdom in risk avoidance passed down through generations.
This reinforces the notion that spatial planning cannot be separated from its cultural context. Risk-based planning that fails to accommodate local place attachments and values has the potential to fail socially because it is perceived as disrupting established systems.

3. Cultural Landscape Theory (UNESCO, 2003)
Stating that cultural landscapes are living heritages that reflect the interaction between humans and nature. Risk-based spatial planning requires respecting and preserving cultural landscapes as part of a proven mitigation system. Traditional spatial planning is the result of historical interactions between humans and nature, resulting in living spaces that are not only functional but also rich in symbolic meaning. The Sijunjung Traditional Village can be categorized as a living cultural landscape because it still serves ecological and social functions to this day.

Integration of local cultural values into risk planning impacts a) zoning designs that take into account historical sites and traditional areas, b) disaster mitigation models based on local knowledge (*local knowledge*) and c) higher community participation due to the alignment between technical and cultural planning.

- Area zoning can be adjusted to the boundaries of customary areas and traditional land use systems.
- Community-based disaster mitigation is easier to implement because it draws on historically proven local knowledge.
- Preserving cultural landscapes is part of a long-term adaptation strategy to environmental risks.

Based on the theories above, the conceptual framework used in this study is that the structure and spatial patterns of traditional villages not only reflect local social and cultural systems but also represent a form of ecological adaptation to natural hazards. Therefore, analysis of house typology, residential zoning, and spatial relationships between functions within the village must be interpreted through the lens of cultural resilience and spatial adaptation to risks.
Thus, the integration of a spatial-rational approach (disaster data, slope, land cover) with a cultural-participatory approach (customary values, local practices, and social order) is very important for understanding and formulating a sustainable spatial management model.

**b. Local wisdom in choosing village locations**

Many indigenous communities in Indonesia, including the Minangkabau people, have traditionally demonstrated local wisdom in selecting village locations that take into account geomorphological conditions and the risk of natural disasters. One prominent adaptive strategy is selecting village locations on highlands or hill ridges that are relatively safe from the dangers of flooding, waterlogging, and landslides. This position allows for natural control of rainwater flow while also providing protection against land and settlement damage due to erosion or surface water runoff (Iskandar, 2010; Syarif et al., 2016).

Indigenous communities typically choose their village (nagari) sites not haphazardly, but through ecological, spiritual, and social considerations. Minangkabau traditional villages are generally built on stable, elevated ground, such as hill ridges or slopes with slight to moderate gradients. This is evident in the traditional village of Nagari Sijunjung, where the placement of traditional houses (rumah gadang) follows the topographic contours, avoiding steep valleys, and maintaining a safe distance from main rivers and tributaries (Yulizal Yunus, 2002; Fitriani et al., 2018).

The stilt houses, a hallmark of Minangkabau architecture, also serve as a form of disaster mitigation, such as flooding and surface water flow. Stilt houses, supported by wooden pillars, minimize the risk of flood damage and allow air circulation and water flow beneath the house (Nasrul, 2011). Furthermore, the orientation of traditional buildings often follows cosmological principles and the direction of water flow. Rumah gadang typically faces the street or town square (square), while the rear faces a water source or agricultural land, demonstrating the integration of ecological and social functions (Alfisyah et al., 2021).

Spatial zoning in traditional village areas also shows a clear division between residential areas, agricultural land, and protected areas or prohibited forests (*forbidden forest*or *forbidden jungle*These forest areas are typically located upstream or on steep slopes that are not cleared for cultivation, serving as water catchment areas and ecosystem buffers. This spatial planning model reflects local wisdom that considers water flow direction, wind patterns, land slope, and soil and water conservation (Zulfi et al., 2015; Salim & Yonariza, 2017).

**c. The traditional village spatial planning system as an early warning system and disaster mitigation strategy based on local wisdom.**

The spatial planning system of traditional villages is the result of accumulated experience, traditional ecological knowledge, and long-term adaptation of local communities to their environmental conditions. In the context of Minangkabau Traditional Villages, including Nagari Sijunjung, the division of space, which includes the traditional house (rumah gadang), courtyard (yard or courtyard), agricultural land (rice fields and fields), and forest and river areas, is not only based on functional needs, but also contains implicit disaster risk mitigation principles.

The selection of residential locations that tend to be on sloping land and far from areas prone to landslides or flooding reflects a form of*early warning system* based on the environment and inherited experiences. Indigenous communities recognize natural signs (such as changes in animal behavior, changes in water color, or shifts in vegetation) as indicators of potential danger, so their spatial planning naturally avoids high-risk locations (Hiwasaki et al., 2014; Mercer et al., 2009).

Unlike modern systems that rely on high-tech devices and electronic sensor systems, traditional spatial planning systems are more resource-efficient because they don't require complex infrastructure. Their reliability lies in the harmony between humans and their environment through local wisdom passed down through generations. This makes them sustainable and easily implemented by the wider community.

Local wisdom such as philosophy*"Nature is a teacher"*Minangkabau culture emphasizes learning from nature as the basis for spatial decision-making. This principle encourages communities to read natural signs as a guide in building homes, clearing land, and protecting forest areas as a natural buffer against disasters such as flash floods or droughts (Nasrullah, 2020; Haryani et al., 2018).
Research by Hiwasaki et al. (2014) shows that integrating local knowledge into disaster risk reduction systems significantly contributes to community resilience, particularly in developing countries. This strategy not only strengthens risk awareness but also builds autonomous and contextualized local capacity.
It can be concluded that the spatial planning system of traditional villages not only has social and cultural functions, but also plays an important role in regional resilience. It functions as*non-electronic early warning system*and ecosystem-based disaster mitigation strategies that are efficient, inclusive, and rooted in local wisdom.

**d. Disaster Mitigation, Spatial Planning, Local Wisdom, and Spatial Adaptation**
Disaster mitigation requires not only a technocratic, high-tech approach but also recognizes the importance of a spatially and culturally based approach. In many traditional villages, traditional village spatial planning systems have long integrated disaster risk mitigation principles through the creation of spatial patterns responsive to local biophysical conditions. Placing traditional houses on flat land away from steep slopes, separating cultivated areas from protected forest or river zones, and establishing open spaces in the center of the village are forms of structural mitigation born from a deep understanding of the characteristics of the surrounding natural environment.
This approach is in line with the concept*land-based disaster risk reduction* which emphasizes the importance of using spatial planning as a primary tool for reducing disaster risk (UNDRR, 2015). The customary spatial planning system, in this case, functions as a form of ecosystem-based mitigation, which utilizes natural environmental conditions as a risk buffer. Customary forest areas are maintained as*forbidden jungle*, for example, ecologically functions as a landslide barrier and rainwater absorber, thereby reducing the risk of seasonal flooding and drought (Haryani et al., 2018).
This approach also contains dimensions*local wisdom* which is the basis for forming sustainable spatial adaptation. The principle*nature takambang becomes a teacher*In Minangkabau culture, knowledge serves as an ethical and epistemological framework for communities to interpret natural signs and adaptively manage their living spaces. This knowledge encompasses understanding land morphology, wind direction, water sources, and vegetation dynamics, all of which inform spatial decision-making. In other words, these local practices have formed a mitigation system that is holistic, contextual, and historically proven (Hiwasaki et al., 2014; Mercer et al., 2009).
In the context of modern regional planning, it is crucial to accommodate these local wisdom-based mitigation strategies through an integrative approach. This can be achieved by combining spatial data generated by technologies such as GIS/GIS (Geographic Information Systems) and satellite imagery with local knowledge to identify disaster-prone zones, redesign spatial zoning, and develop community-based contingency plans. This integration will

strengthening regional resilience while ensuring that mitigation strategies do not neglect local values that have proven effective.
Thus, disaster mitigation based on customary spatial planning in Nagari Sijunjung demonstrates that regional planning based on spatial adaptation and local wisdom is not only relevant but also crucial for building sustainable community resilience. Moving forward, recognition of local knowledge must be incorporated into formal policies for regional planning and disaster risk reduction.

## 4. Results and Discussion

The area of the Nagari Sijunjung Traditional Village Cultural Heritage Area by the West Sumatra Cultural Heritage Preservation Center (BPCB) is 157.1 hectares in which there are 77 traditional houses inhabited by 9 main tribes namely, Chaniago, Piliang, Malayu, Tobo, Bodi, Panai, Patopang, Bendang, and Malayu Tak Timbago. In addition, there are also Batu Tabonek and the Traditional Vow Place which are also designated as cultural heritage areas. The determination of an area as a cultural heritage area is accompanied by the process of protection, development and utilization. The area is in accordance with the Cultural Heritage Law no. 11 of 2010. According to the Law of the Republic of Indonesia Number 11 of 2010, protection is defined as efforts to prevent and overcome damage, destruction, or destruction by means of Rescue, Security, Zoning, Maintenance, and Restoration of Cultural Heritage.

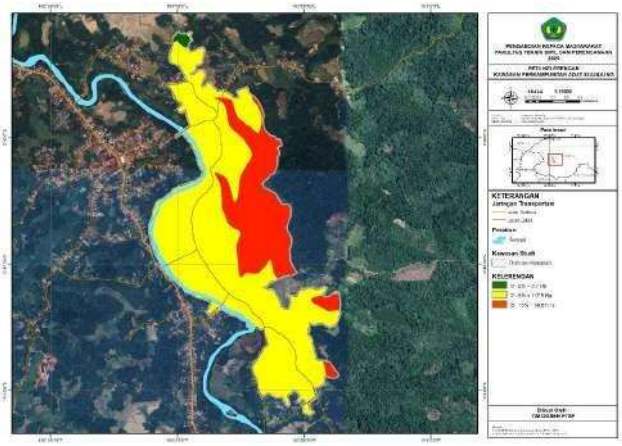
### 1. Slope Analysis with the Concept of Nagari Formation

From the analysis of the slope map of the Sijunjung Traditional Village area, it can be classified into three slope classes based on the percentage of slope, namely it can be classified into 3 slope groups.

a. 0–2% (green/flat) covering an area of 0.7 Ha
b. 2–8% (yellow/sloping) covering an area of 117.5 Ha
c. 8–15% (red/fairly steep/hilly) with an area of 38,67 Ha

From the classification of the slope map, it is linked to the concept of nagari formation. It is necessary to link the typology of traditional villages with physical geographical conditions, especially slopes, because this influences the choice of location, spatial planning, and socio-cultural functions of a nagari in Minangkabau.
The concept of forming a nagari as a Minangkabau traditional settlement unit has the following considerations/requirements.

a. Proximity to natural resources such as the availability of clean water, fertile land for agriculture or the availability of forest products.
b. Accessibility and connectivity (especially by roads and rivers).
c. Supportive topography: flat or sloping areas are preferred because they are safe from disasters such as landslides and make it easier to build traditional houses and communal facilities.
d. Cosmological and customary considerations; site selection is also based on local beliefs, relationships with ancestors, and spatial symbolism.



From the analysis of the slope map of the Sijunjung Traditional Village area in relation to the concept of Nagari formation, the following analysis can be carried out.

1. Flat-sloping zone (0–8%, green and yellow)

   The flat-sloping zone, approximately 118.2 hectares in size, is the most ideal area for establishing traditional settlements. Rumah Gadang (Gadang House) and Balai Adat (Custom Hall) are generally built here due to easy access and development. Rice paddy fields are also abundant in this area. In accordance with the principles of Nagari formation, the main settlements are built on flat to gently sloping land to ensure security, social function, and cosmological significance.
2. Hilly zone (8–15%, red)

   The hilly zone, approximately 38.67 hectares in size, is a more rugged area, typically located outside of settlement centers. It is more suitable for secondary uses such as restricted forests, shifting cultivation, or conservation areas. In customary contexts, this zone can store natural resources or form part of the natural boundaries of the village. While this location is not prioritized for primary settlement, it remains important within the overall spatial structure of the village.
3. Linkages to rivers and road networks

   The river flows in the western part of the area, surrounded by flat to gently sloping areas. Local and collector roads are concentrated in the gently sloping areas, reinforcing the location of settlements and socio-economic activities. The river serves not only as a water source but also as a cosmological and symbolic reinforcement of natural boundaries within the nagari structure.

Based on the slope classification and the concept of nagari formation, the majority of the Sijunjung Traditional Village area is located in a gentle zone (2–8%), supporting the formation of a settlement center. The steep/precipitous zone (8–15%) functions as a buffer or protective zone, not the main settlement area. The spatial layout of the Sijunjung Traditional Village demonstrates consistency with cosmological principles and is adaptive to physical geographical conditions and is in line with the theory of nagari formation in Minangkabau.

From the analysis of the slope map of the Sijunjung Traditional Village area by linking the concept of the formation of Minangkabau nagari as a whole, especially according to the principle of alam takambang jadiguru which is a Minangkabau philosophy meaning that humans must learn and organize life by imitating and adapting to the natural order. In the context of nagari formation, this means that the Minangkabau people choose locations and organize space based on natural suitability, not forcing their will on nature. This philosophy is reflected in the following principles.

- Utilize land according to its slope (do not build on steep areas).
- Maintaining a balance between the upstream-middle-downstream space.
- Combining natural elements such as rivers, plains, and forests as one living entity.
- Placing settlements, agricultural land and forests hierarchically and functionally.

From the analysis of the slope map of the Sijunjung Traditional Village area by linking the concept of the formation of nagari in Minangkabau, especially according to the principle of nature takambang jadi guru.

1. Philosophical Context: Nature Becomes a Teacher

The Minangkabau philosophy, "alam takambang jadi guru," means that humans must learn and organize their lives by imitating and adapting to the natural order. In the context of nagari formation, this means that Minangkabau people choose locations and organize spaces based on natural suitability, rather than imposing their will on nature. This philosophy is reflected in the following principles:

- Utilize land according to its slope (do not build on steep areas).
- Maintaining a balance between the upstream-middle-downstream space.
- Combining natural elements such as rivers, plains, and forests as one living entity.
- Placing settlements, agricultural land and forests hierarchically and functionally.

2. Spatial Interpretation of Slope Maps

Based on the map, the Sijunjung traditional village area is divided into three slope classes.

| Slope Class | Color | Area (Ha) | General Function (based on customs & philosophy) Minangkabau) |
|---|---|---|---|
| 0–2% | Green | 0.7 Ha | Fertile plains, ideal for wet rice fields and core settlements |
| 2–8% | Yellow | 117.5 Ha | Sloping zone: traditional settlements, social activities, and agriculture |
| 8–15% | Red | 38.67 Ha | Steep slopes: protected forests, conservation, water resources, space reserves |

3. The Concept of Nagari Formation

The structure of the Minangkabau nagari was formed by taking into account:

- Friendly topography, especially slopes <8% for settlements.
- Access to water (rivers, springs) as a vital element of life.
- Social and physical connectivity through roads and rivers.
- Cosmological and customary considerations (hierarchical location of the traditional house, traditional hall, rice fields and forests).

From the topographic analysis in the Sijunjung traditional village, it shows that:

- Traditional settlements are concentrated in the sloping zone (2–8%), which is very much in accordance with the principles of nagari formation.

- Limited flat zones (0–2%) are used efficiently, perhaps for major buildings or intensive areas.
- Steep zones (8–15%) are not used as primary settlement locations, but rather function as ecosystem and resource protectors (such as customary forests or "rimbo larangan").

4. Synthesis: Integration of Minangkabau Slope, Custom, and Philosophy
The formation of nagari in Minangkabau, especially in this area, shows harmony between humans and the environment:

- Nagari was formed not only based on ease of access, but also considering ecological stability and traditional values.
- The structure of the nagari space does not stand alone, but is the result of reading nature, as the philosophy of nature takambang jadi guru teaches us to:*"Walk in the steep valley, rice fields in the fertile plains, live on the banks of the river, village in the beautiful site" (*walking in a sloping valley, rice paddies in a fertile plain, housing by the river, a village on a good site).

In other words, nature teaches people to live in balance: building in suitable places, protecting forests, and honoring water.
The conclusion drawn from the analysis of the slope map of the Sijunjung Traditional Village area shows that the spatial structure of this nagari is aligned with the Minangkabau philosophical principle (nature is the teacher) and the technical conceptualization of nagari formation according to Haryani. Spatial zoning has taken into account slope factors, ecological functions, and the socio-cultural aspects of the community. This proves that traditional nagari spatial planning is a form of local wisdom.*(local wisdom*) which is adaptive to local geographical and spiritual conditions.

**2. Analysis potential for landslides and floods with the Concept of Nagari Formation/Minangkabau Philosophy**

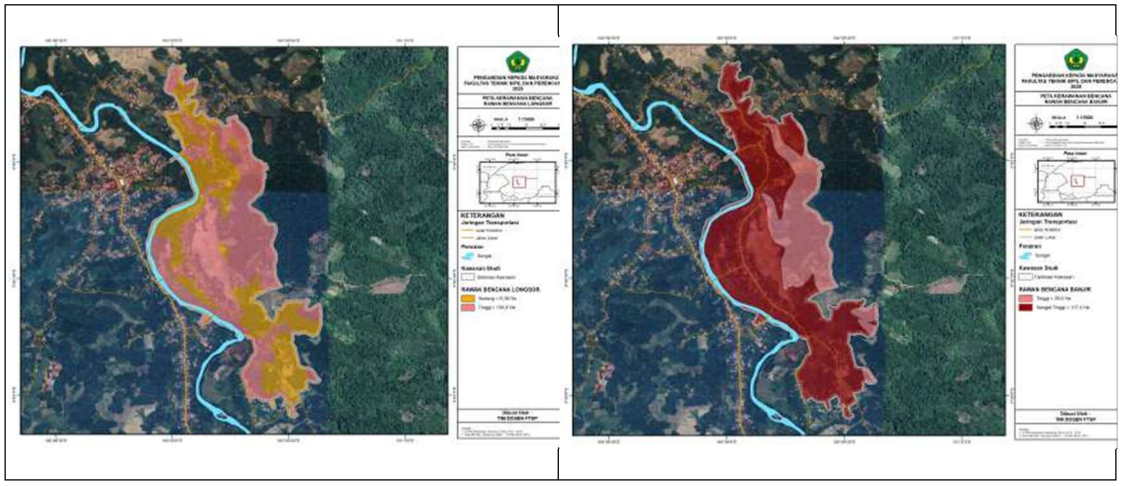
The relationship between the concept of nature as a teacher and the potential for landslides and floods in the Sijunjung Traditional Village based on slope maps in the context of disaster mitigation is as follows.
The philosophy of "Alam Takambang Jadi Guru" as an adaptive strategy for disasters. The Minangkabau philosophy of alam takambang jadi guru emphasizes that humans must:

- Reading and understanding the signs of nature,
- Adapting development and living activities to the natural character of the environment, and
- Placing the function of space according to its potential and risks.

In the context of vulnerability to disasters such as floods and landslides, this philosophy serves as a local framework for risk mitigation. Indigenous communities adapt and shape space by considering biophysical conditions, including topography and water flow.
Based on the slope map, the potential for landslide disasters in the Sijunjung Traditional Village can be classified as follows.

- Zones with a slope of 8–15% (red) are landslide-prone areas, especially if the vegetation cover is damaged or there is interference from human activity.
- Philosophy *nature takambang becomes a teacher*teaches: "Don't build on slippery ground, don't disturb the buffer forest."

In the Sijunjung Traditional Village, the red zone is not used as a residential area by the indigenous community, but rather is protected as a forbidden forest (rimbo melarang) as a reserve. This demonstrates local wisdom in avoiding landslide risks, in line with the principles of environmental adaptation.
Meanwhile, based on spatial analysis of flood potential based on topographical location and river flow, a large river flows along the western side of the village, with a flat to gently sloping area (0–8%) surrounding it. This area is vulnerable to waterlogging and seasonal flooding, especially if upstream vegetation is damaged.



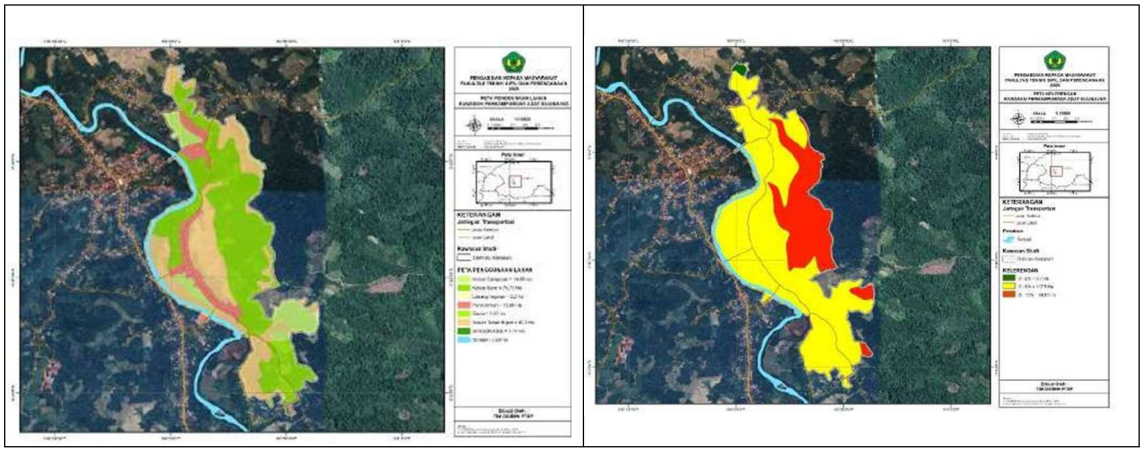
However, the people of the Sijunjung Traditional Village have proven to have adapted to their environment. The main settlements are not located directly on the riverbank, but on slightly higher and more stable land. Traditional drainage systems such as ditches and tapians also strengthen flood resilience. The adage says: "Nan di hilia ndak ditabam, nan di hulutahan" (Those downstream are not retained, those upstream are not retained). This means that water management has been traditionally understood to prevent excessive flooding by maintaining the upstream, not cutting down slopes, and wisely regulating the use of lowlands. The integration of local wisdom in risk mitigation efforts in the Sijunjung Traditional Village is as follows.

| Potential Disaster | Area Based on Map | Traditional Strategy (Takambang Nature Becomes Teacher) |
|---|---|---|
| Landslide | Red zone (8–15%) | Not used as a settlement, maintained as a forest, avoid logging on slopes |
| Flood | Flatlands & riverbanks (0–2%, 2–8%) | Settlements are somewhat moved away from the riverbank; community-based water management and local wisdom |

From the analysis above, the relationship between the potential for landslides and floods is linked to the Principle*nature takambang becomes a teacher*It serves not only as a philosophical guide, but also as a framework for disaster mitigation based on local wisdom. The indigenous people of Sijunjung Village have traditionally identified landslide and flood-prone zones based on natural observations, adapted spatial use, and developed an ecologically and culturally based mitigation system. This pattern can be used as a model for disaster risk management based on local wisdom, combining modern spatial data (slope maps) with traditional Minangkabau values.

### 3. Analysis Land use of Sijunjung Traditional Village with slope map

The results of the analysis of land use maps with slope maps are then linked to the concept of "alam takambang jadi guru" and the potential for floods and landslides in the Sijunjung Traditional Village, resulting in the following results.
Utilization of existing land based on natural characteristics can be seen in the following table.



| Type of Land Use | Map Color | Area (Ha) | Notes |
|---|---|---|---|
| Settlement | Pink | 13,69 | Spread across the central plains and riverbanks |
| Rubber Plantation | Light green | 75,73 | Dominates areas with gentle to medium slopes |
| Rainfed Rice Fields | Bright green | 46,3 | Located in the lowlands and by the river |
| Mixed Garden | Light brown | 14,68 | Distributed in the central zone |
| Material | Greenish blue | 0,92 | Located near the river |
| river | Light blue | 5,29 | The main elements of the landscape |
| Farm, Bush/Bow | Very small | <1 | Scale mines |

Associated with the previous slope map, the results obtained are:

- Area flat (0–2%) And sloping (2–8%) majority used for settlements, rice fields and gardens.
- The steep zone (8–15%) is not used as a residential area, but is covered with rubber plantations or left as an area of shrubs and vegetation cover.

Analysis of land use suitability to slopes shows that indigenous communities have read the natural character well where:

- Settlements and rice fields are placed in safe and flat zones, avoiding the risk of landslides.
- Sloping land is used as a garden (especially rubber), which has strong roots to stabilize the slope.

This is very much in line with the values*"where the land is wet, there are rice fields, where the land is flat, there is a village."*
Furthermore In relation to the potential for landslides, slope zones >8% (red zones on the slope map) are not used as residential areas or rice fields but are instead used for rubber plantations which function as soil binders and natural landslide mitigation. This illustrates the principle:*"The high ground is used for the forest, not for the village square.*
Many settlements and rice fields are located near rivers. However, the layout pattern shows that settlements are not directly on the riverbank, but rather are moved slightly inland as a flood adaptation strategy. The presence of swamps and open fields near rivers allows them to function as buffer zones (absorbing seasonal flooding). Rain-fed rice fields are located in the lower reaches as natural water reservoirs, not permanent areas.
In this context,*nature takambang becomes a teacher*not just a slogan, but a practical basis for the community in determining the location of spatial functions (settlements, agriculture, conservation) as well as traditional ecological guidelines for natural and sustainable disaster mitigation.
Integration of spatial patterns (slope, water flow, land use) proves that the community maintaining resilience area to landslide And flooding, adapting economic activities (farming, gardening) without damaging soil stability, and respecting ecological boundaries by maintaining vegetation cover in vulnerable areas. Land use and slope maps demonstrate the consistent patterns of adaptation of the Sijunjung indigenous people to the natural environment. This pattern aligns with the following values:*"The earth is trampled, the sky is raised, nature is read, the country is built.* The concept of nature as a teacher is not only reflected in philosophical values, but is also manifested in the spatial structure and ecological practices of the nagari in a concrete manner.

**4. Analysis slope, land use, disaster potential, and local wisdom**

1. Slope Analysis and Land Use
Based on the overlay of slope and land use maps, it appears that the spatial use in the Sijunjung Traditional Village demonstrates a fairly high level of ecological suitability. Residential areas and primary agricultural land, such as rain-fed rice fields, are generally located in areas with slopes of 0–8%, which are classified as flat to gentle. Meanwhile, areas with steep slopes (8–15%) are not utilized for settlements, but rather function as rubber plantations or are left as mixed vegetation.
This utilization reflects the adaptive capacity of the Sijunjung Traditional Village community in adjusting spatial activities to topographic characteristics. This confirms that traditional communities have long recognized the risks inherent in the landscape and regulated spatial functions to minimize ecological and social losses.

2. Landslide Disaster Potential and Vegetation-Based Mitigation
Landslide-prone zones are generally located in areas with slopes >8%, specifically in the central and eastern parts of the study area. However, overlay results indicate that this area is not used for settlements, but rather serves as a rubber plantation (approximately 75.73 ha). Rubber plants, with their deep fibrous roots, help bind the soil and resist erosion, and therefore can be considered a vegetative-based disaster mitigation strategy.

This reflects the ecological value of the Minangkabau philosophy of "alam takambang jadi guru," which guides people to interpret natural phenomena and wisely organize spatial patterns. "Highlands are used for jungles, not for village squares."*Land in high places for forests, not for settlements*).

3. Flood Potential and Adaptation of Traditional Spatial Planning

The Sijunjung Traditional Village area is crossed by a large river that acts as a natural boundary on the west side. Areas with slopes of 0–2%, which are prone to flooding during the rainy season, are used as rain-fed rice fields and swamps, rather than as permanent settlements. Settlements are moved to slightly higher, gentler areas, creating a natural buffer against water runoff.

The presence of rice fields and swamps in this flat area allows for seasonal water storage and protects the core area of the village from the risk of flooding. This pattern further reinforces the principle of*nature takambang becomes a teacher*which emphasizes adaptation to natural conditions, not conquest. "What is in the lowlands is not planted, what is in the upstream is held back."*The water downstream is not dammed, the water upstream must be controlled).*

4. Philosophical Reflection: “Takambang Nature Becomes a Teacher” as a Spatial Strategy

The concept of "Nature Takambang Jadi Guru" (Nature Becomes a Teacher) in the context of village spatial planning is a form of ecological wisdom that integrates customary values, local knowledge, and an understanding of the natural landscape. In practice, this concept results in traditional spatial planning principles such as a) Settlements are placed in sloping and stable zones, b) Steep land is conserved as forests or vegetative gardens, c) Lowlands are utilized for agriculture and water reservoirs, and d) River flows are maintained as dynamic elements in the village spatial system. This strategy has proven adaptive in the context of disaster mitigation and can become a model for culturally and sustainably based spatial planning.

Indigenous approaches to topography and land use demonstrate that local wisdom can act as a natural, resource-efficient, and value-based disaster mitigation system. This is crucial in the context of risk-based spatial planning that integrates modern spatial data with local cultural values.

## 5. Disaster Potential Analysis, Land Use with Local Wisdom/Nagari Formation

Based on the analysis of the two slope maps and land use maps of the Sijunjung Traditional Village, in relation to the concept of "Alam Takambang Jadi Guru" and the potential for landslides and floods, it can be explained as follows.

a. The concept of "Nature Becomes a Teacher"

In Minangkabau philosophy, "Alam Takambang Jadi Guru" teaches that humans must learn from nature, understand its signs, and live in harmony with it. This means that settlements should follow the shape and characteristics of nature, land use should take into account environmental carrying capacity and risks, and space use should not disrupt the balance of the ecosystem.

b. Landslide and Flood Potential Analysis

By combining slope and land use maps, several risk indications were identified.

a) Steep Slope Area (8–15%)

The Red Zone on the Slope Map is spread across the central-eastern part of the region. Part of this zone intersects rubber plantations and fields/dry fields, and some is close to residential areas. The potential for landslides is high if the vegetation is unstable or there is excessive land clearing.

b) Flat & Sloping Zone (0–8%)

Settlements are predominantly located in flat areas, particularly near rivers and residential areas (central to southern). Flood risk increases in these areas, primarily due to proximity to rivers and reduced water catchment areas due to dense settlements.

c. Suitability of Spatial Planning to Local Wisdom

The concept of "nature as a teacher" ideally directs:

a) The settlement is on sloping land and not too close to rivers or cliffs.
b) Gardens and fields are placed on slopes, but with a terracing or erosion control system.
c) Forest or check as landslide buffer area vulnerable and water runoff control.

However, according to the map, modern interventions in the form of roads and settlements have entered steep slope zones. Some rubber plantations extend onto steep slopes without natural vegetation buffers.

4. Risk of Violating Takambang's Natural Principles

If residential and road development continues to encroach on the red zone (steep slopes), landslides can occur, especially during extreme rainfall. The lack of green open spaces and catchment areas in flat zones near rivers increases the risk of local flooding.

5. Recommendations Based on Local Wisdom

a. Settlements;Concentration in lowlands with natural drainage arrangements.
b. Steep slope areas; Vegetation rehabilitation, prohibition of new land clearing.
c. Riverbanks; Riparian conservation (riverbank vegetation), river boundaries are maintained.
d. Land use; Implement conservative farming systems (terracing, agroforestry).

## 5. Conclusion on Land Suitability and Disaster Mitigation Based on Local Wisdom in the Sijunjung Traditional Village

1. Land Use Suitability Based on Slope

The overlay results between slope maps and land use maps show that the Sijunjung Traditional Village community has implemented land use principles appropriate to topographic conditions. Residential areas and primary agricultural land, such as rain-fed rice fields, are generally located in zones with slopes of 0–8%, which are classified as flat to gentle. Meanwhile, zones with steep slopes (8–15%) are not used for settlements, but rather function as rubber plantations or are left as mixed vegetation.

The adaptive capacity of communities to adjust spatial activities to topographical characteristics. This confirms that traditional communities have long

recognizing the risks inherent in the landscape and managing spatial functions to minimize ecological and social losses.

2. Landslide Disaster Potential and Vegetation-Based Mitigation

Landslide-prone zones are generally located in areas with slopes >8%, specifically in the central and eastern parts of the study area. However, overlay results indicate that this area is not used for settlements, but rather serves as a rubber plantation (approximately 75.73 ha). Rubber plants, with their deep fibrous roots, help bind the soil and resist erosion, and therefore can be considered a vegetative-based disaster mitigation strategy.

The results of this analysis reflect the ecological values of Minangkabau philosophy.*nature takambang becomes a teacher*, which guides people to read natural phenomena and organize spatial patterns wisely. This philosophy teaches that nature is a source of knowledge and guidance for life, including disaster mitigation.

3. Flood Potential and Adaptation of Traditional Spatial Planning

The Sijunjung Traditional Village area is crossed by a large river that acts as a natural boundary on the west side. Areas with slopes of 0–2%, which are prone to flooding during the rainy season, are used as rain-fed rice fields and swamps, rather than as permanent settlements. Settlements are moved to slightly higher, gentler areas, creating a natural buffer against water runoff.

The presence of rice fields and swamps in this flat area allows for seasonal water storage and protects the core area of the village from the risk of flooding. This pattern further reinforces the principle of*nature takambang becomes a teacher*which emphasizes adaptation to natural conditions, not their conquest.

4. Philosophical Reflection: “Takambang Nature Becomes a Teacher” as a Spatial Strategy

Draft *nature takambang becomes a teacher*In the context of village spatial planning, it is a form of ecological wisdom that integrates customary values, local knowledge, and an understanding of the natural landscape. In practice, this concept produces traditional spatial planning principles such as:

- Settlements are placed in sloping and stable zones.
- Steep lands are conserved as forests or vegetative gardens.
- Lowlands are used for agriculture and water reservoirs.
- The river flow is maintained as a dynamic element in the village spatial system.

This strategy has proven adaptive in the context of disaster mitigation and can serve as a model for culturally and sustainably based spatial planning. Local Minangkabau cultural values play a positive role in resilience and disaster preparedness.

Indigenous approaches to topography and land use demonstrate that local wisdom can act as a natural, resource-efficient, and value-based disaster mitigation system. This is crucial in the context of risk-based spatial planning that integrates modern spatial data with local cultural values.