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Settlement Pattern of Levo Lamalera in Lembata Regency, East Nusa Tenggara

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A B S T R A C T

Levo Lamalera is a vernacular coastal settlement in Lembata Regency, East Nusa Tenggara, renowned for its traditional whale-hunting culture that has shaped its spatial organization and built environment. This study aims to analyze the settlement pattern of Levo Lamalera and identify the influence of cultural traditions and environmental conditions on its formation. A qualitative approach was employed through field observations, interviews with local informants, literature review, and documentation, with data analyzed descriptively. The findings reveal a distinctive settlement pattern characterized by coastal adaptation, clustered residential arrangements, and a central village node marked by the intersection of village and ritual axes symbolized by the Gudi tree. The settlement reflects a strong integration of cultural values, social organization, and environmental adaptation in sustaining vernacular spatial structures.

INTRODUCTION

Vernacular architecture constitutes an important part of cultural heritage, representing the dynamic relationship between humans, the environment, and social systems that evolve across generations. In the global context, vernacular architecture is not merely understood as a physical manifestation of buildings and settlements but also as an expression of cultural identity, local knowledge, and environmental adaptation. Recent studies have emphasized the significance of vernacular architecture in preserving cultural sustainability and strengthening community identity amidst rapid urbanization and modernization processes (Fuentes Pardo, 2023; Cao et al., 2024; Zong et al., 2024). Consequently, the study of vernacular settlements has become increasingly important as a means of understanding the cultural values embedded within traditional built environments.

Indonesia is recognized for its rich diversity of vernacular architecture, which reflects the cultural and environmental characteristics of its numerous ethnic communities. This diversity is manifested in traditional settlements that have developed through the interaction of local culture, social organization, indigenous technology, and environmental conditions. Vernacular settlements are often regarded as spatial representations of community values and lifestyles, shaped by local traditions and adaptive responses to geographical contexts (Khomsatun & Kusdiwanggo, 2024). Furthermore, the spatial organization and orientation of traditional settlements are commonly influenced by belief systems, economic activities, and the relationship between communities and their natural surroundings (Wijaya & Dwijendra, 2021). Therefore, vernacular settlements possess not only historical and cultural significance but also contribute to the preservation of local identity and sustainable built environments.

One of the distinctive vernacular settlements in Indonesia is Levo Lamalera, located in Lembata Regency, East Nusa Tenggara Province. Levo Lamalera is internationally renowned for its traditional whale-hunting culture, which has been practiced and transmitted across generations. This cultural tradition serves as a fundamental component of the community's social and economic life while also influencing the spatial structure and environmental organization of the settlement. Within the context of vernacular architecture, coastal communities frequently develop unique spatial adaptations in response to maritime activities and environmental conditions (Li et al., 2020). As a result, Levo Lamalera presents an important case for examining the relationship between maritime culture and vernacular settlement formation.

Previous studies on Lamalera have predominantly focused on socio-cultural aspects, traditional whale hunting, community identity, and cultural tourism development. Research conducted by Keraf (2020) and Duli et al. (2023) highlights the significance of whale-hunting traditions in shaping the social and cultural life of the Lamalera community. However, these studies largely emphasize cultural and social dimensions, while architectural and spatial aspects remain underexplored. However, these studies largely emphasize cultural and social dimensions, while architectural and spatial aspects remain underexplored. In particular, limited attention has been given to the settlement pattern and

spatial organization of Levo Lamalera as expressions of the interaction between culture, coastal environments, and community structures. Meanwhile, studies on traditional settlement morphology have demonstrated the importance of spatial patterns in understanding community identity and adaptation processes (Asriana et al., 2024; Thane, 2024).

This condition indicates a research gap concerning the spatial characteristics of Levo Lamalera from a vernacular architectural perspective. Existing studies have not sufficiently examined how maritime traditions, social structures, and geographical conditions contribute to the formation of settlement patterns that persist today. Understanding these spatial characteristics is essential because vernacular settlements embody not only physical arrangements but also cultural values, collective memory, and adaptive strategies developed by local communities over time (Rong & Bahauddin, 2023). Therefore, a comprehensive investigation of Levo Lamalera's settlement pattern is necessary to enrich the discourse on vernacular architecture and traditional coastal settlements.

Based on this gap, the present study aims to analyze the settlement pattern of Levo Lamalera and identify the influence of cultural traditions, social organization, and coastal geographical conditions on its spatial formation. The study focuses on settlement morphology, residential clustering, spatial orientation, and key architectural elements that characterize the vernacular environment of Levo Lamalera. Theoretically, this research contributes to the advancement of vernacular architecture studies by providing insights into the relationship between maritime culture and traditional settlement patterns. Practically, the findings are expected to support cultural heritage preservation, sustainable settlement conservation, and culturally sensitive tourism development while maintaining the authenticity and identity of Levo Lamalera as a significant vernacular settlement in Indonesia.

LITERATURE REVIEW

Vernacular Architecture

Settlement patterns are fundamentally reflections of cultural identity, social structure, and environmental adaptation developed by the communities inhabiting them (Brannan & Birch, 2016). In this context, vernacular architecture serves as an important framework for understanding the relationship between culture and the built environment. Generally, vernacular architecture refers to indigenous, tribal, folk, or traditional architecture that evolves through local knowledge and community practices rather than formal architectural design (Oliver, 1987). Vernacular architecture emerges from ethnic traditions and is constructed using local materials, techniques, and experiential knowledge developed through generations of trial and error. Consequently, vernacular buildings represent direct responses to environmental conditions while remaining open to transformation and adaptation over time (Turan, 2024).

The concept of vernacular architecture is closely associated with cultural continuity and collective knowledge. According to Rapoport (1969), vernacular architecture develops through a process of models and variations, in which communities continuously refine existing forms while maintaining shared cultural frameworks. Such developments result in architectural forms that are deeply understood and accepted by local communities. As cultural products, vernacular buildings are influenced by multiple factors, including environmental conditions, technological capabilities, and socio-cultural systems. Environmental factors encompass geography, climate, and natural resources, whereas cultural influences include belief systems, social organization, family structures, and economic activities (Altman & Chemers, 1984).

Vernacular architecture originates from what is often described as "folk architecture," which evolves according to local customs, traditions, and environmental contexts. The architectural characteristics of a community are shaped by cultural norms and collective values that influence how people interact with their surroundings. Consequently, vernacular architecture reflects not only physical adaptation but also cultural and ecological considerations (Wiranto, 2004). Papanek (1995, as cited in Satar et al., 2018) further argues that vernacular architecture possesses ecological and architectural values because it is developed in accordance with local climatic conditions, cultural practices, and community needs. Recent studies reinforce this perspective by emphasizing that vernacular architecture represents a sustainable form of development that integrates cultural identity, environmental adaptation, and resource efficiency (Fuentes Pardo, 2023; Zong et al., 2024).

Oliver (1987) identifies several characteristics that distinguish vernacular architecture. These include its association with rural settlements, the use of locally available materials, responsiveness to climatic conditions, accommodation of everyday human activities, and the incorporation of cultural meanings, symbols, and decorative elements. These characteristics demonstrate that vernacular architecture functions not merely as shelter but as a cultural system embedded within the physical environment. Such perspectives are particularly relevant for understanding Levo Lamalera, where the built environment has evolved through a long-standing interaction between maritime culture, local traditions, and environmental conditions.

Human Settlements and Settlement Patterns

The concept of settlement has been extensively discussed within the framework of human settlements proposed by Doxiadis (1977). Human settlements refer to territories organized by people to support and sustain their daily lives. According to Doxiadis, settlements consist of both physical and social dimensions, encompassing not only buildings but also the communities inhabiting them. Therefore, settlements should be understood as integrated systems composed of physical spaces, social relationships, and environmental interactions. Human settlements range from individual buildings to larger territorial scales and are shaped through continuous interactions between people and their surroundings.

Doxiadis (1977) further explains that human settlements are structured through five interconnected elements: nature, humans (anthropos), society, shells (buildings and dwellings), and networks (circulation and infrastructure systems). These elements collectively determine the spatial organization and functional characteristics of a settlement. The arrangement of buildings, public spaces, circulation routes, and communal facilities reflects the ways communities adapt to environmental conditions while organizing social and economic activities. Consequently, settlement patterns can be interpreted as physical manifestations of social structures, cultural values, and environmental responses.

Within the discipline of Ekistics, Doxiadis (1970) proposed several principles governing settlement formation. These principles emphasize maximizing interaction between people, nature, and built facilities while minimizing the effort required for movement and communication. Human settlements also seek to provide adequate protection, privacy, and comfort while maintaining balanced relationships among natural, social, and built environments. The ultimate objective is to achieve an optimal synthesis of these elements, resulting in a harmonious and sustainable living environment. Contemporary studies similarly suggest that settlement morphology reflects long-term processes of adaptation, social organization, and cultural practices embedded within community life (Asriana et al., 2024; Thane, 2024).

In vernacular settlements, spatial organization is often shaped by cultural traditions, kinship systems, economic activities, and environmental conditions. Settlement patterns therefore become important indicators of how communities structure their social relationships and interact with their surroundings. This perspective is particularly relevant to Levo Lamalera, where traditional whale-hunting activities, maritime culture, and coastal environmental conditions are believed to have significantly influenced the formation and persistence of its vernacular settlement pattern. Through this framework, the spatial characteristics of Levo Lamalera can be examined as expressions of both cultural identity and environmental adaptation.

METHODOLOGY

Research Design

This study employed a qualitative research approach using a phenomenological design to explore and interpret the manifestation of vernacular settlement patterns in Levo Lamalera, Lembata Regency, East Nusa Tenggara. A qualitative approach was considered appropriate because the study aimed to obtain an in-depth understanding of spatial patterns, cultural values, and environmental adaptations embedded within the settlement through the perspectives and experiences of local communities. Phenomenological research enables researchers to examine how individuals perceive and construct meanings related to their lived environment and cultural practices (Creswell & Poth, 2024). The study focused on identifying the spatial characteristics of the settlement, the organization of residential clusters, public spaces, and cultural elements that contribute to the formation of the vernacular settlement pattern.

Population and Sampling

The population of this study consisted of residents of Levo Lamalera who possess knowledge, experience, and historical understanding of the settlement and its cultural traditions. Informants were selected using a non-probability purposive sampling technique, which allows researchers to identify participants who are considered capable of providing rich and relevant information regarding the research topic (Campbell, Greenwood, Prior, Shearer, Walkem, Young, Bywaters, and Walker, 2020). A total of 10–15 key informants participated in the study, including customary leaders, village elders, community leaders, and long-term residents of Levo Lamalera. These participants were selected because of their direct involvement in community activities and their extensive knowledge of the historical development, cultural practices, and spatial organization of the settlement.

Data Collection Techniques

Data were collected through four complementary techniques: field observation, in-depth interviews, literature review, and documentation. Field observation was conducted to identify the existing physical characteristics of the settlement, including residential layouts, public facilities, circulation networks, and significant cultural landmarks. In-depth semi-structured interviews were conducted using interview guidelines developed based on concepts of vernacular architecture, settlement morphology, and human settlement theory derived from Oliver (1987), Rapoport (1969), and Doxiadis (1977). Documentation included photographs, sketches, field notes, and maps of settlement elements. Literature review was undertaken to obtain theoretical and empirical insights related to vernacular settlements, maritime culture, and spatial organization. To enhance the trustworthiness of the findings, data triangulation was conducted by comparing information obtained from observations, interviews, documents, and literature sources (Moser & Korstjens, 2024).

Research Procedure

The research was conducted through several sequential stages. The first stage involved identifying research problems and reviewing relevant literature concerning vernacular architecture, settlement patterns, and maritime cultural landscapes. The second stage consisted of preliminary field observations to understand the physical and socio-cultural characteristics of Levo Lamalera. The third stage involved collecting primary data through direct observations, interviews with selected informants, and documentation of settlement features. Subsequently, all interview recordings were transcribed and organized alongside field notes and visual documentation. The final stage consisted of data interpretation and synthesis to identify recurring spatial characteristics, cultural influences, and environmental adaptations that shape the settlement pattern of Levo Lamalera.

Data Analysis

Data analysis was performed using qualitative thematic analysis. Interview transcripts, observational notes, and documentation records were systematically coded to identify themes, categories, and patterns related to settlement morphology, cultural values, and environmental adaptation. The analysis followed the stages of data reduction, data display, interpretation, and conclusion drawing as proposed in qualitative research frameworks (Braun & Clarke, 2022). The findings from different data sources were continuously compared through triangulation to improve analytical rigor and credibility. NVivo 14 software was utilized to assist in organizing, coding, and categorizing qualitative data, while Microsoft Excel was used to support data management and field-record organization. This analytical process enabled the identification of relationships between cultural traditions, spatial organization, and the vernacular settlement pattern of Levo Lamalera.

RESEARCH RESULT

Profile of Levo Lamalera

Astronomically, Lembata Regency is located between 8.04°–8.40° South Latitude and 122.38°–123.57° East Longitude. The regency is situated on Lembata Island, one of the islands in East Nusa Tenggara Province, Indonesia. Geographically, Lembata Regency is bordered by the Flores Sea to the north, the Sawu Sea to the south, East Flores Regency to the west, and Alor Regency to the east. These geographical characteristics position Lembata as a coastal and maritime region with strong interactions between its communities and the surrounding marine environment.

Figure 1. Levo Lamalera
Source: Author

Administratively, Levo Lamalera is officially designated as Lamalera B Village, located within Wulandoni District, Lembata Regency, East Nusa Tenggara Province, Indonesia. Geographically, Lamalera is situated between two prominent capes, namely Cape Vovolatu and Cape Nubivutun, at the coordinate point 51 L 0545725, 9051853 UTM, with an elevation of approximately 26 meters above sea level. The settlement is characterized by a terraced and undulating topography, with surrounding elevations ranging between 400 and 500 meters above sea level. The area is predominantly composed of Grumusol soil, which originates from limestone parent rock and volcanic tuff. This type of soil is generally alkaline and contains limited organic activity. Nevertheless, its

relatively high level of stability and hardness makes it suitable for settlement development, despite the land slope ranging from 30% to 40%.

According to local oral traditions narrated by customary elders, the people of Lamalera are believed to have ancestral roots linked to the Bugis ethnic group. This historical narrative is preserved through a traditional chant known as Lia Asa Usu, which recounts the origins and migration history of the Lamalera people. The story has been transmitted orally from generation to generation and remains an important component of the community's cultural identity. The ancestral migration described in the narrative is often referred to as a "journey under the guidance of spirits," reflecting the spiritual beliefs and worldview that have shaped the historical development of the Lamalera community and its cultural traditions.

Settlement-Forming Zones of Levo Lamalera

The settlement of Levo Lamalera is divided into several spatial zones consisting of residential areas and supporting facilities that reflect the community's social structure and patterns of daily activities. These zones include the Big House Zone, Pledang House Zone, Fishermen's House Zone, and Public Facilities Zone. The spatial distribution of these zones contributes significantly to the distinctive settlement pattern of Levo Lamalera as a vernacular maritime community.

Big House Zone

The Big House serves as the traditional clan house of the indigenous groups that have inhabited Levo Lamalera since the establishment of the settlement. The land on which these houses stand was historically granted by the customary landowners of Lamalera. Consequently, the existence of the Big Houses represents not only a residential function but also a social bond between the traditional landowners and the clans residing within the settlement. This arrangement reflects the importance of kinship, customary authority, and social organization in shaping the spatial structure of Levo Lamalera.

A total of nineteen Big Houses were identified within the settlement, namely: *Langu Bela Hariona, Lango Bela Tapaona Solo Langu, Langu Bela Tapaona, Langu Bela Lamaniva, Langu Bela Bataona Klake Langu, Langu Bela Bediona Marilangu, Langu Bela Bediona Miku Langu, Langu Bela Oleona, Tapaona, Manalangu, Tapaona Saja Langu, Langu Bela Sulaona, Langu Bela Lamakera, Langu Bela Bataona Kifa Langu, Lango Bela Lewolein, Langu Bela Batafor Kajalangu, Langu Bela Batafor Kadelangu, Lango Bela Bataona Ola Langu, Langu Bela Bataona Java Langu, and Langu Bela Atagorang*. The distribution of these Big Houses throughout the settlement constitutes one of the defining characteristics of Levo Lamalera's settlement pattern, as they function as important socio-cultural landmarks and represent the historical presence of various clans within the community. Their spatial arrangement contributes to the formation of residential clusters and reinforces the traditional social organization that continues to shape the settlement today.

Figure 2. Spatial Distribution of Big Houses
Source: Author, 2024

Pledang House Zone

Levo Lamalera is internationally recognized for its traditional whale-hunting culture, which has been practiced for generations and remains an integral part of the community's livelihood and cultural identity. Consequently, a significant proportion of the local population works as traditional whale hunters, known as *lamafa*. The whale-hunting tradition requires specialized boats and equipment, which are traditionally constructed by community members using indigenous knowledge and local craftsmanship.

The traditional whale-hunting boat is known as a *peledang*, a distinctive wooden vessel specifically designed to support whale-hunting activities. Each *peledang* is assigned a unique name to signify ownership and identity. Examples include *Usu Teti Lepe Hau Simbol Mata, Mei Tou, Hamalepe, Java Tene, Kebako Puke, Lepâ Batâ, Go Ganere Asa Bata, Hulu Sapang, Teti Heri, Stella Matutina, Santa Rosa, Nara Tene, Koppo Paker, Kolopo*, and *Fedhfsad*. As the *peledang* serves as the primary means of livelihood for whale hunters, it holds considerable economic and cultural significance within the community.

To protect and store these boats, fishermen construct dedicated storage structures known as *Pledang Houses (Rumah Peledang)* or *naja*. Field observations identified a total of 36 Pledang Houses (*naja*) located along the coastal area of Levo Lamalera. These structures are used to accommodate both the main *peledang* vessels and smaller supporting boats utilized during maritime activities. The linear arrangement of the *naja* along the shoreline forms a distinctive visual and spatial element of the settlement. As a result, the concentration of *Pledang Houses* along the coast constitutes one of the defining characteristics of the settlement pattern of Levo Lamalera, reflecting the strong relationship between the community's maritime culture and its spatial organization.

Figure 3. Peledang (Naja) House Zone
Source: Author, 2024

Fishermen's House Zone

The Fishermen's Houses (Rumah Nelayan) are generally located behind the Pledang Houses (naja) and are distributed around the Big Houses (Rumah Besar) throughout the settlement. As a result, the Big House of each clan, the Pledang House, and the Fishermen's Houses are integrated within the same residential cluster. This spatial arrangement reflects the close relationship between kinship structures, maritime activities, and daily life in Levo Lamalera.

Most Fishermen's Houses are oriented toward the village's main road, providing direct access to circulation routes and communal spaces within the settlement. However, houses situated near the coastline exhibit a distinctive spatial configuration, featuring rear terraces that face the beach and the Pledang Houses (naja). These rear terraces serve multiple functions, supporting various household and fishing-related activities while also providing a vantage point from which residents can observe maritime activities along the coast.

Field observations indicate that the location and orientation of Fishermen's Houses are closely associated with the occupational needs of the community. Their proximity to both the shoreline and the Pledang Houses facilitates easy access to fishing equipment, boat maintenance activities, and coastal resources. Consequently, the Fishermen's House Zone represents an important component of the settlement structure, linking residential life with the maritime culture that characterizes Levo Lamalera.

Figure 4. Fishermen's House Zone
Source: Author, 2024

Public Facilities Zone

The Public Facilities Zone in Levo Lamalera consists of several communal and supporting facilities, including a chapel (*kapela*), homestays, a statue of the Virgin Mary, the village gateway, the beach or customary gateway, and observation towers. These facilities are distributed throughout the settlement and are closely integrated with residential areas, reflecting the interaction between religious practices, cultural traditions, tourism activities, and everyday community life.

The chapel (*kapela*) is located among the rows of Pledang Houses (naja) along the coastline. It serves as an important religious facility where community members gather for prayers and collective worship, particularly before the commencement of the annual whale-hunting season. The presence of the chapel within the maritime activity zone highlights the close relationship between religious beliefs and traditional livelihood practices in Levo Lamalera. In contrast, homestays represent a relatively recent addition to the settlement and have been developed by local residents to accommodate visiting tourists. Most homestays are adaptations of existing Big Houses or Fishermen's House, modified through the addition of guest rooms while retaining their original architectural characteristics.

A statue of the Virgin Mary is situated near the entrance to Levo Lamalera, before the village gateway. This monument symbolizes the strong Catholic faith of the local community while also reflecting the coexistence of religious values and customary traditions. The village gateway is located at the eastern end of the main village road and serves as a marker indicating entry into Levo Lamalera. Architecturally, the gateway is distinguished by decorative motifs inspired by traditional Lamalera woven textiles, with specific patterns representing women on one side and men on the other, thereby expressing local cultural identity through built form.

In addition to the village gateway, the settlement also features a beach gateway, commonly referred to as the customary gateway, which functions as a transitional entrance connecting the beach area to the residential settlement. This gateway is distinctive because it is constructed using whale bones, symbolizing the community's long-standing relationship with whale-hunting traditions. The structure also plays an important role during customary rituals conducted at the beginning of the whale-hunting season. Furthermore, several observation towers are located at elevated points within the settlement. These towers are specifically designed to monitor the appearance of *baleo* (whales) passing through the waters of Lamalera during the Leva Nuang Festival and the whale-hunting season. When observers identify a group of whales approaching the hunting grounds, they traditionally shout "*baleo*" to alert fishermen and signal the preparation for whale-hunting activities. The presence of these public facilities contributes to the spatial identity of Levo Lamalera and reflects the integration of religious, cultural, and maritime functions within the settlement pattern.

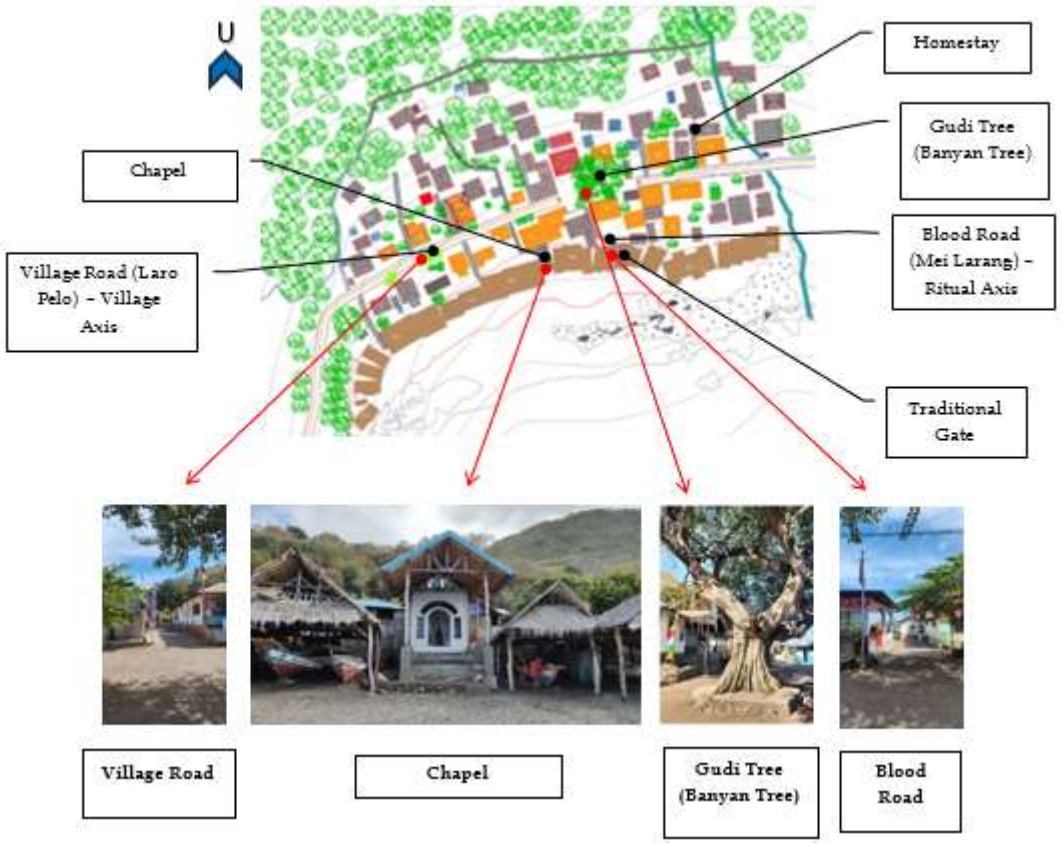

Figure 5. Public Facilities Zone
Source: Author, 2024

Settlement Pattern of Levo Lamalera

The settlement pattern of Levo Lamalera is physically formed by the spatial arrangement of circulation networks, Big Houses, Pledang Houses, Fishermen's Houses, and public facilities distributed throughout the village. These elements collectively create a distinctive vernacular settlement structure that reflects the community's social organization, maritime livelihood, and cultural traditions.

Levo Lamalera is primarily accessed through a main road located on the southern side of the settlement, running parallel to the residential area and the coastline. This road serves as the principal transportation route connecting Lamalera with neighboring villages and other parts of Lembata Regency. Access to the settlement begins from Wulandoni Port, which is approximately 6.8 km from the village administrative office. From the village office, the settlement area of Levo Lamalera is located approximately 3.8 km away and can be reached within 15–20 minutes by road. As the only major access route to the settlement, this road plays a crucial role in supporting daily community activities, inter-village mobility, and transportation to the regency capital.

Field observations indicate that the main road functions not only as a circulation corridor but also as a primary spatial axis that organizes the settlement structure. Residential buildings, public facilities, and communal spaces are generally oriented toward or connected to this route, making it an important reference point for spatial orientation within the village. The concentration of activities along the main road further reinforces its role as a central organizing element in the settlement pattern.

In addition to facilitating movement and accessibility, the main road contributes to the spatial cohesion of the settlement by linking various functional zones, including residential clusters, maritime activity areas, religious facilities, and public spaces. Consequently, the circulation network constitutes one of the fundamental components shaping the physical form and spatial organization of Levo Lamalera, while simultaneously supporting the continuity of social, economic, and cultural activities within the community.

Figure 6. Linear Settlement Pattern of Levo Lamalera
Source: Author, 2024

The road pattern of Levo Lamalera can be observed through its circulation network and the daily activities of the community. A linear circulation pattern is evident along the main road, which extends from east to west and connects Levo Lamalera with neighboring villages. This road functions as the primary transportation corridor and serves as the principal axis of the settlement. Consequently, the overall settlement pattern develops in an elongated east–west direction, with the main road acting as the dominant organizing element of the village structure.

In contrast, an organic circulation pattern is found within the residential areas. These pathways consist of narrow paved alleys, approximately 1.2–1.5 meters in width, formed by the arrangement of residential buildings. The pathways function as local circulation routes connecting neighboring houses and providing access to the main road. Their configuration follows the spatial distribution of the housing clusters and is generally oriented toward both the hills and the sea. In addition to facilitating movement between residences, these organic pathways also provide access to the beach and connect peripheral houses to the broader settlement network. Together, the linear and organic circulation systems contribute to the distinctive spatial organization of Levo Lamalera and support the integration of residential, social, and maritime activities within the settlement.

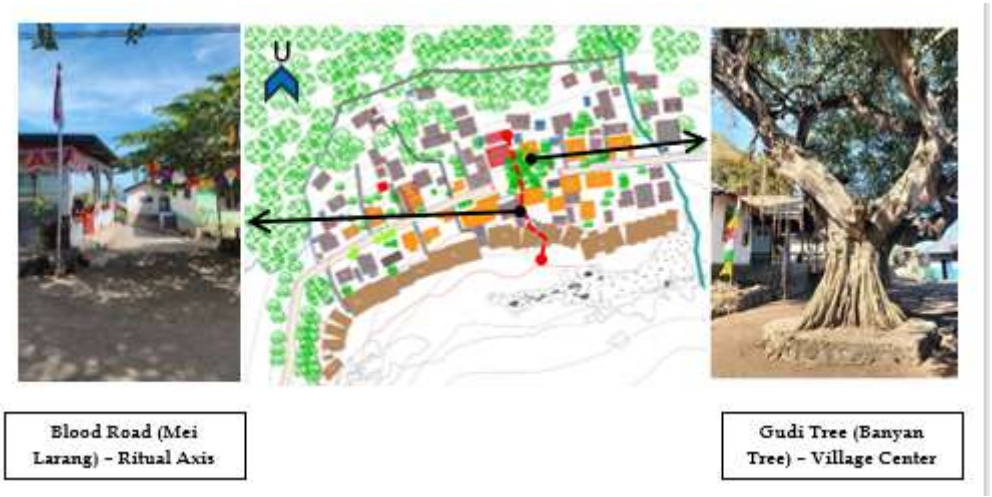

Figure 7. Ritual Path and Gudi Tree as the Center of Levo Lamalera Settlement

Source: Author, 2024

Furthermore, one of the circulation routes located in the center of the village functions as a ritual pathway connecting the customary house of the traditional landowner, situated on the hillside, to the beach where ritual activities are conducted. This ritual route extends from the shoreline, passes through the customary gateway, and continues toward the Gudi Tree (*Ficus benjamina*), which is located at the center of the settlement, before proceeding uphill through several residential areas. Physically, there are no specific markers distinguishing the ritual pathway from ordinary circulation routes. However, local residents recognize its cultural significance and traditionally use it only during ritual occasions and certain periods of the day. Community members generally avoid

using the route during the late afternoon and evening, reflecting customary beliefs associated with the pathway.

The ritual pathway forms a ritual axis that intersects with the village's primary east–west axis. This intersection constitutes a significant spatial feature within the settlement and is physically marked by the presence of the Gudi Tree, which functions as the central node of Levo Lamalera. Beyond serving as a landmark, the tree acts as an important communal space where residents gather for discussions, social interaction, and customary ceremonies. Field observations indicate that the intersection of the village axis and the ritual axis creates a spatial center that organizes both the physical structure and cultural activities of the settlement. As a result, the Gudi Tree represents not only a geographical focal point but also a symbolic center that embodies the social and ritual identity of Levo Lamalera.

DISCUSSION

The findings demonstrate that the settlement pattern of Levo Lamalera is not solely the result of environmental adaptation but is also strongly influenced by cultural traditions, social organization, religious beliefs, and maritime livelihoods. This condition reflects the fundamental characteristics of vernacular architecture, which develops through a long process of interaction between communities and their physical and socio-cultural environments. According to Rapoport (1969), vernacular environments are shaped not only by environmental factors but also by cultural values, social systems, and collective beliefs. Similarly, Oliver (2006) argues that vernacular architecture represents the accumulated knowledge of local communities in responding to environmental conditions while maintaining cultural continuity. The settlement of Levo Lamalera exemplifies this concept, as its spatial organization reflects the integration of coastal geography, traditional whale-hunting practices, and customary institutions.

One of the most significant findings is the existence of two intersecting spatial axes: the village axis extending from east to west and the ritual axis extending from north to south. The village axis corresponds to the main circulation route that follows the coastline and functions as the primary organizing element of the settlement. Meanwhile, the ritual axis connects the customary house of the traditional landowner to the beach, where ritual activities related to whale hunting are conducted. The intersection of these two axes forms the symbolic center of the village, marked by the presence of the Gudi Tree (*Ficus benjamina*). This finding supports the argument of Norberg-Schulz (1980) that meaningful places emerge through the interaction between physical space and cultural symbolism. The Gudi Tree functions not only as a geographical landmark but also as a social and ritual center where communal gatherings and customary activities take place. Similar spatial arrangements have been identified in several traditional settlements in Southeast Asia, where sacred spaces serve as central nodes organizing both social and spatial structures (Wijesuriya et al., 2022).

The spatial configuration of Levo Lamalera also demonstrates the influence of maritime culture on settlement formation. The linear arrangement of the settlement along the coastline reflects the community's dependence on marine resources and its orientation toward the sea. This finding is consistent with the concept of cultural landscape, which emphasizes that human settlements are shaped by long-term interactions between people and their environments (United Nations Educational, Scientific and Cultural Organization, 2021). In Levo Lamalera, the sea functions not only as an economic resource but also as a cultural space associated with rituals, collective identity, and traditional knowledge. Consequently, the settlement pattern cannot be understood solely through environmental determinism; rather, it must be interpreted as a manifestation of cultural adaptation and social continuity.

Another important finding concerns the distribution of residential typologies, namely Big Houses, Pledang Houses, and Fishermen's Houses. The existence of these three building types illustrates the close relationship between kinship systems, occupational specialization, and spatial organization. Big Houses function as clan houses and symbolize the historical presence of ancestral groups within the settlement. Their distribution reflects traditional social structures and customary authority. This finding aligns with Doxiadis' (1977) concept of human settlements, which emphasizes the interaction between society, built forms, and spatial networks in shaping settlement patterns. Similarly, recent studies have demonstrated that vernacular settlements often maintain spatial arrangements based on kinship and customary institutions, even amid modernization pressures (Amole et al., 2023; Turan, 2024).

The presence of 36 Pledang Houses along the coastline represents another distinctive characteristic of Levo Lamalera. Unlike ordinary fishing villages, where boats are commonly stored in open spaces, the community has developed dedicated structures for housing *peledang* boats, reflecting the cultural significance of traditional whale hunting. These structures serve not only practical functions but also symbolize the collective identity of the community. The finding supports recent research indicating that vernacular architecture often embodies intangible cultural heritage through the physical organization of space and buildings (Correia et al., 2021). The concentration of Pledang Houses along the shoreline further reinforces the strong connection between maritime activities and settlement morphology.

The study also reveals that public facilities play a significant role in reinforcing cultural identity within the settlement. The chapel, customary gateway constructed from whale bones, observation towers, and religious monuments collectively demonstrate the coexistence of Catholic beliefs and traditional customs. This coexistence illustrates the concept of cultural hybridity, whereby communities integrate external religious influences while preserving indigenous traditions. Similar patterns have been documented in other vernacular settlements across Indonesia, where religious institutions coexist with customary spatial practices (Sutrisno & Rahmawati, 2023). In Levo Lamalera, this integration contributes to the resilience of local cultural identity despite increasing exposure to tourism and modernization.

From a theoretical perspective, the findings contribute to the discourse on vernacular architecture by demonstrating that settlement morphology is shaped by multiple interrelated factors, including environmental adaptation, social organization, cultural beliefs, and economic activities. While classical theories of vernacular architecture often emphasize environmental adaptation (Oliver, 2006; Rapoport, 1969), the case of Levo Lamalera suggests that cultural and ritual dimensions may exert an equally significant influence on spatial formation. The identification of the ritual axis and the symbolic role of the Gudi Tree expands current understanding of how intangible cultural values are translated into physical settlement structures.

Practically, the findings provide valuable insights for heritage conservation and sustainable tourism development. The distinctive settlement pattern of Levo Lamalera represents an important cultural asset that requires preservation in the face of modernization and increasing tourism activities. Conservation efforts should therefore focus not only on individual buildings but also on maintaining the broader spatial relationships among residential clusters, ritual pathways, public facilities, and coastal activity zones. Preserving these relationships is essential for safeguarding the authenticity and integrity of the settlement as a living cultural landscape.

Despite its contributions, this study has several limitations. The research primarily relied on qualitative observations and interviews conducted within a limited timeframe, which may not capture the full complexity of historical transformations in the settlement pattern. Furthermore, the analysis focused mainly on spatial and cultural aspects, while economic, demographic, and environmental change factors were not examined in detail. Future research could employ mixed-method approaches incorporating spatial analysis, geographic information systems (GIS), and longitudinal studies to investigate settlement transformation over time. Comparative studies involving other vernacular coastal settlements in Indonesia and Southeast Asia would also provide a broader understanding of the relationship between maritime culture and settlement morphology.

CONCLUSIONS AND RECOMMENDATIONS

This study concludes that the settlement pattern of Levo Lamalera represents a distinctive manifestation of vernacular architecture shaped by the interaction between coastal environmental conditions, cultural traditions, social organization, religious beliefs, and the community's maritime livelihood. The settlement is characterized by two intersecting spatial axes, namely the east–west village axis and the north–south ritual axis, whose intersection is marked by the Gudi Tree as the symbolic and spatial center of the village. Furthermore, the spatial distribution of Big Houses, Pledang Houses, and Fishermen's Houses reflects the kinship system, traditional authority, and whale-hunting activities that continue to influence daily life and settlement formation. These findings contribute to the understanding of the relationship between culture and spatial organization in vernacular settlements and provide practical implications for cultural heritage conservation and sustainable tourism development. Therefore,

future planning and conservation efforts should prioritize the preservation of both the physical elements and the cultural values embedded within the settlement structure to maintain the authenticity and continuity of Levo Lamalera as a living cultural landscape.

ADVANCED RESEARCH

Although this study provides important insights into the settlement pattern of Levo Lamalera, several limitations should be acknowledged. The research primarily employed qualitative methods and focused on the spatial and cultural dimensions of the settlement within a specific period, which may not fully capture its historical transformation and contemporary challenges. Future studies are therefore encouraged to adopt mixed-method approaches incorporating Geographic Information Systems (GIS), spatial mapping, and comparative analyses with other vernacular coastal settlements in Indonesia and Southeast Asia. Further research may also examine the impacts of tourism development, climate change, demographic shifts, and modernization on the sustainability and preservation of vernacular settlements, thereby contributing to a more comprehensive understanding of cultural landscapes and settlement resilience.

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