Lessons Learned from Vernacular Architecture Toward Sustainable Human Settlements: Insights from Praigoli Village, West Sumba, Indonesia

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Abstract

Undeniably, vernacular architecture contributes to sustainability and harmonious cultural life. One of the 2030 Sustainable Development Goals (SDGs) is to make human settlements inclusive, safe, resilient, and sustainable. Therefore, there is a need for in-depth studies related to vernacular architecture looking particularly at how they contribute to sustainability.

This research examines the sustainability of vernacular architecture at Praigoli Village, Wanukaka District, West Sumba Regency, East Nusa Tenggara Province, Indonesia. The objective is to explore vernacular architecture for sustainable human settlements. The research used the naturalistic paradigm with a qualitative method through a case study research.

Based on the exploration of the tangible and intangible evidence, the paper concludes that the concepts of vernacular architecture of Praigoli village reflect a unity between humans and the universe. Central to it is the respect for the characteristics of the Sumba Nature, the embodiment of Marapu culture, and respect for the position of women as mothers and the universe. Community members produce vernacular architecture in the Praigoli traditional village based on the knowledge and skills possessed as traditional heritage from their ancestors and the transfer of knowledge and expertise from generation to generation. The paper demonstrates that several aspects influence sustainability of vernacular architecture: socio-culture, economics, and environment.

Keywords: Vernacular Architecture; Sustainable Human Settlement; Praigoli Village; Sumba Architecture

Introduction

The study of vernacular architecture is important to stimulate senses and give sensitivity to be parts of society. However, in the 21st century, they need to go beyond just documenting the embodiment of vernacular architecture. Studying it in relation to the issue of sustainability and deriving theoretical knowledge of vernacular architecture is useful for future generations. The built environment conceives meanings that represent the dignities chosen, determined, and owned by the society that cannot be separated from Nature since they are relevant (Rapoport, 1982). This is in line with the idea that vernacular architecture is well-adapted to the geographical context, the society inhabiting, and the environmental contexts.

There is plenty of research on vernacular architecture in Indonesia, but only some of them relate to sustainability issues. Nguyen et al., (2019) had carried out a comprehensive study on sustainable features of vernacular architecture in different regions across the world. Their study aimed to clarify the contents and issues raised in the studies on vernacular architecture and the knowledge and recommendations that can be derived from them. Analysis amongst 127 studies within the last three decades demonstrates that the annual number of studies has shown a sharp increase since 2007. This indicates a greater interest in sustainable features of vernacular architecture and their potential applications among the building research community. It reveals the high concern for the issues of sustainable design and for ensuring indoor conditions of vernacular buildings in the modern age. Moreover, vernacular architecture across the world offers a diverse panorama of human response to the natural environment, reflecting the natural, cultural, and social context of the varied sites (Nguyen et al., 2019). The use of available materials and technologies and the employment of local labor from within the settlements consistently contribute to sustainability (Dayaratne, 2018). Many scholars have confirmed that the social, cultural, and heritage values of vernacular architecture are important; thus these need to be protected and preserved in order to maintain the diversity of the culture of each region/country and the whole of humankind (Ghaffarian Hoseini & Dahlan, 2012; Özdeniz et al., 1998). Many recent studies have demonstrated both the value and appropriateness of learning from vernacular for sustainability; therefore, learning lessons from vernacular is not an option anymore, but a necessity (Wahid, 2012).

Indonesia is an archipelago consisting of many islands. It is rich in cultural diversity. This is reflected in the traditions, arts, and culture in each region, including its traditional vernacular architecture. There are a number of early studies on Indonesian vernacular architecture from the point of view of links between culture, natural resources, climate, and architecture which have become meaningful references in future sustainability studies (Sumintardja, 1978; Sato, 1987a; Waterson, 2009- first published in 1990). Koji Sato, a Japanese ethnologist has carried out extensive and detailed documentation of Indonesia's vernacular architecture since 1986 and has documented them online together with other documentations of Austronesian houses. His works are often referred to as a great resource for other scholars who conduct research on Indonesian vernacular architecture. A number of Indonesia researchers such as Yulianto Prihatmadji, Yuswadi Saliya, and Prijotomo have conducted studies on vernacular architecture. Their research focuses on Nusantara architecture while Widiastuti & Vedamuthu (2009) have studied Minangkabau architecture. Similarly, Gantini et al. (2014) focus on Balinese architecture while Santoso (2019) has studied Javanese traditional houses.

Furthermore, other vernacular architecture studies in Indonesia emphasize transformations and sustainability. Schefold et al., (2003) mentions that a hundred variety of house forms in Indonesia reflect creativity in adapting to regional circumstances and social changes. More importantly, they show how to understand the past and modern developments in the vernacular architecture of Indonesia and their transformations. Another study conducted by Idham (2018) explains how environmental synchronization connected with vernacular sustainability can be accomplished based on regional diversity. Similarly, a research conducted by Kurniawan et al. (2020) focuses on analyzing the intersection of space, people, and power in relation to the spatial intervention that threatens insight into sustainability from Korowai culture. Meanwhile, some studies elaborate on the development and sustainability of ecological, social, cultural, economic, and political life of the vernacular society in order to understand the intertwined idea of global vernacular and tourism (Indrawati, 2016; Solikhah, 2020)

Sumba Island is one of the islands in Indonesia with a rich in cultural diversity as lessons of vernacular architectural discourse. There exist a lot of research focused on culture, society, and anthropology on the island of Sumba. Among them, many focus on settlement structures concerning *Marapu* beliefs and their impact on the concept of space (Waterson, 2009; Mross, 2000). The *Marapu* belief system cannot be separated from the culture of the people of Sumba.

Marapu is defined as the spirit of the ancestors who have united with the Creator, who is then considered as a link between humans and the Creator (Bamualim, 2017). Then, Gunawan et al., (2018) discuss the variations and classifications of Sumba architectural encounters with their topography and the impact on the meaning of the encounter with the objects in the Weelewo Village, West Sumba. The other study by Mross (1995) raised the issue of how the Sumba settlement design responds to thermal conditions. This research in Wanokaka aims to provide information about how humans made dwellings that have links between culture, natural resources, climate, and architecture, especially in Sumba. Hariyanto et al. (2012) have examined the relationship of spatial attributes, forms, and meanings in traditional west Sumba Architecture and focuses on the relationship between space, shape, and cosmological influence on the shape of traditional Sumba houses in Tarung and Ratenggaro villages. Meanwhile, Winandari et al., (2006) presents samples of several traditional houses representing coastal and mountainous areas in West Sumba and East Sumba. The aspects observed included the morphology, interior, building materials, construction, and megalithic culture of Sumba.

One of the manifestations of vernacular architecture in Sumba Island, Indonesia that has not been widely studied is Praigoli Village (Fig. 1).

a. Praigoli village during the Dutch colonial period

b. Kajiwa, a stone grave over 250 years old in Natara

c. House Construction Process (August 2019)

Fig. 1: The Embodiment of Vernacular Architecture in Praigoli Village
Sources: (a) Tropenmuseum Collection; (b & c) Author, 2019

People of Praigoli Village are currently facing several adjustments. One of these arises from their contact with outsiders and the introduction of newcomers (tourists, researchers, etc.). At the same time, its sustainability has begun to develop over time to reflect the cultural, environmental, social, and economic, as well as history.

This research is an effort of conservation activities motivated by facts about the sustainability of vernacular architecture in Praigoli Village. With the evaluation of sustainability, it is hoped that the vernacular architectural concepts can be derived from Praigoli Village, as they relate to the concepts of sustainability. This goes along with goal number 11 of the 2030 SDG's which is to make cities and human settlements inclusive, safe, resilient, and sustainable (United Nations, 2015). This paper aims to explore the basic concepts of vernacular architecture of Praigoli Village through acuity in reading the phenomenon of architectural artifacts, cultural behavior, and the condition of its surrounding natural environment as the lessons learned toward Sustainable human settlements.

Vernacular Architecture and Sustainability

The issues encompassing the potential, utility, and importance of vernacular architecture in the 21st century are complex and expansive. Therefore, studies related to vernacular architecture are not only limited to documenting it but also far more important is the study of its sustainability. Sustainability has arisen as one of the most significant global standards, particularly in architecture as a time of consistent cycles and not only an emphasis on energy conservation, renewable resources, or building materials but also a way of life; thus the cultural identity of society (Ozkan, 2006; Salman, 2018; Dayaratne, 2018). Sustainability in architecture is a fundamental part to determine

the identity of architectural regionalism (Hidayatun et al., 2015). Supporting this view, Susetyarto (2013) states that vernacular architecture develops over time to reflect the cultural, environmental, social, and economic contexts, as well as the history in which and during the period in which the architecture was built. Moreover, Susetyarto (2013) argues that the most significant aspect of the sustainability of a vernacular society and its architecture is the development and accretion of their local wisdom. The local wisdom of the community has an important role in the sustainability of human synergy with the built environment, especially for historical areas. Vernacular architecture has responded to geological, environmental resources geographical conditions, and use of material and local technologies. Furthermore, the technologies and techniques adopted in vernacular settlements invariably contribute to sustainability (Dayaratne, 2018).

Sustainability of vernacular architecture is greatly influenced by several aspects, including socio-culture, economics, and nature-environments. *Sustainability Model Theory* by Pillai (2013) is often employed to discuss sustainability. It includes 3 aspects, namely socio-culture (organized efforts towards cohesion, security, and dignity), economics (review production and consumption for local need), and environment (use of natural environment and local resources). There is no doubt that changes that disregard the ideas of the social and climatic aspects bring about an unsustainable architecture. Hence, the main challenge of vernacular architecture is the continuity of harmonious natural and cultural life.

Research Methodology

This research employed a paradigm that utilized a naturalistic method with a qualitative strategy through a case study research. A case study research is the study of a case within a real-life contemporary context or setting and emphasizes an important aspect to be studied. Creswell & Poth (2018) recommends that the researcher first considers what type of problem and case study is most promising and useful.

Collecting data began by examining the literature on vernacular architecture and settlements and then selecting case studies to carry out field surveys. Researchers explored some vernacular settlements in Sumba Island such as the Ratenggaro Village and the Praijing Village from January 31st, 2019 to February 5th, 2019, and at the same time with Pasola Lamboya (one of the important ceremony by Sumbanese society). Then on August 15-22, 2019 author lived close to Praigoli village and followed the construction of *Uma Tabina Deta* (One of Praigoli's custom houses). Furthermore, on March 13-17, 2020, authors held a field survey focused on Praigoli village settlements and attended the *Pasola series* of events.

During the field survey, authors made field notes, sketches, and documentation as the main sources of information. Further, the authors carried out unstructured interviews with the people of Praigoli Village (2 customary leaders and 10 villagers), local government (Head of Culture and Tourism Office, West Sumba Regency, and 2 stakeholders), and visitors. Those above-mentioned informants were selected using purposive sampling.

The analysis was done in an exploratory manner in two-phases. Firstly, exploration of vernacular architecture in Praigoli Village by reading the phenomenon such as the history of the Praigoli Village, kinship system, belief System (*Marapu)*, traditional village arrangement, and the conceptions of spatial ownership. Secondly, sustainability of the Vernacular architecture was examined using the Sustainability Model theory by Pillai (2013). This included the three aspects: namely socio-culture, economics, and environment.

The boundaries of the study area are Praigoli Village, Waihura Village, Wanokaka District, West Sumba Regency, East Nusa Tenggara Province (Fig.2).

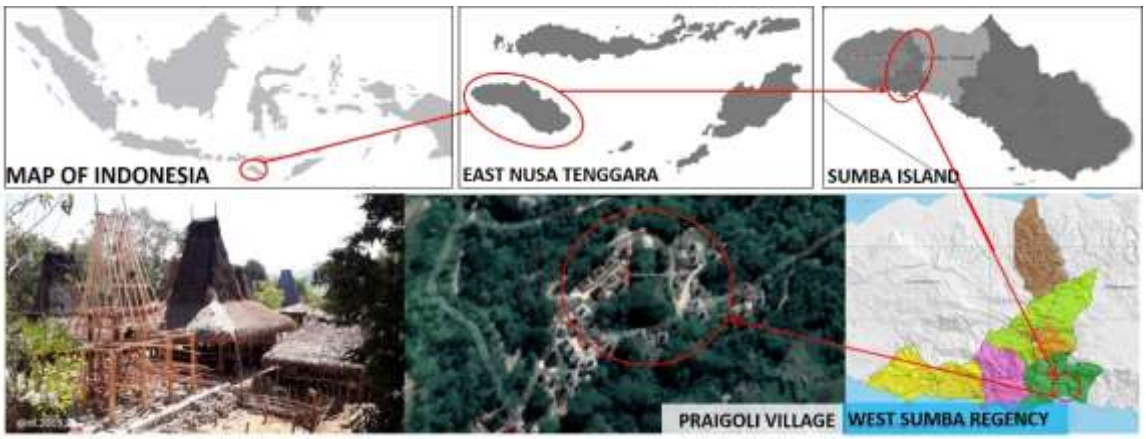

Fig. 2. Location of Praigoli Village, West Sumba, East Nusa Tenggara, Indonesia
Source: Author, 2019

Findings and Discussion

a. Vernacular Architectural Concepts of the Praigoli Village

Praigoli means a village formed by the ancestors in the *Pingi Goly* forest (*Tepuk Pucuk Tree*/ a type of lontar). Once upon a time, one of the biggest sacred Pingi Goly trees was cut down and at the end, the customary village was named the traditional village Praigoli. (Interview, 2020 and Pira (2015) (Fig. 3).

Fig. 3. Interview with Customary Chief and The Villagers
Source: Authors, 2019 and 2020

Formally, the Sumba kinship group is known as the *Kabisu* (Klan), which is a patrilineal kinship group (lineage from the male side) which is based on the common ancestry of their ancestors and their entire inheritance. Each *Kabisu* has been led by a *Rato.*

Based on an Interview with Anderias Laiya Pira, a customary chief of Praigoli, (Interview, 2020 and Pira, 2015). Praigoli traditional village is divided into 4 kinships, namely: Kinship/ *Kabisu Uma Bakul* and *Kabisu Uma Ka-Hi* (Both *kindships* are located in the traditional village of Praigoli), Kindship/ *Kabisu* Waiwuli and *Kabisu* Marapahi (both *kindships* are located outside the traditional village of Praigoli). Although membership in a kindship is inherited from father to children (*patrilineal kindship),* what legalizes membership is marriage or dowry *(belis).* People of Sumba believe that flesh and blood are only inherited from the mother *(matrilineal kindship)* or commonly known as Ole Dadi. The difference is that if the patrilineal kingship has a clear name as identity (*Kabisu*), then the matrilineal kingship is not visible in the name that is carried.

Initially, the number of houses in Parigoli Village was 11, but currently (in 2020) there are 8 houses occupied. Meanwhile, 3 houses were damaged and not yet built. Other space elements in Praigoli village are 5 gravestones. The names of the traditional houses are *Uma Bakul, Uma Hara, Uma Tagauru, Uma Taribang, Uma A'a Gallu, Uma Mawu Jirik, Uma Tabina Deta, Uma Tabina Wawa, Uma Ka-Hi, Uma Lahi Pewu, Uma Praihaloru*. The names of the smell of graves in Praigoli

Village are *Kajiwa Megalithic Stone, Taribang Megalithic Stone, Catala Pepper Megalithic Stone, Todi Kabunu Megalithic Stone, Uma Ka-Hi Megalithic Stone* (Solikhah & Fatimah, 2020).

Praigoli village is a traditional village (*wanno kalada)* inhabited by two Kingships/*Kabisu*, namely *Kabisu* Uma Bakul and *Kabisu Uma Ka-Hi*, each of which has one clan house *(Uma Bakul* and *Uma Ka-Hi).* The houses in Praigoli Village are lined up around an open area where megalithic stones are placed which serve as family graves or commonly known as *Natara (Fig.4)*. During traditional events, the *Natara* area becomes a sacred place for the implementation of traditional rituals (animal slaughter, offerings). However, on weekdays, the Natar area becomes a place for profane activities, such as drying the crops (corn, rice), drying clothes, and drying woven fabrics (Fig.5). There is a slight difference regarding the sacred-profane concept between Praigoli village and other traditional villages in West Sumba. Even though all the houses are oriented to the *Natara*, in some traditional villages in West Sumba (such as in Tarung Village) there are areas in the *Natara* that are sacred (cannot be passed and entered carelessly) at all times. Meanwhile, *Natara* in Praigoli village has no restricted areas all the time and everyone can pass it. Nevertheless, *Natara* always has a religious function as an offering area at traditional ritual events (Solikhah & Fatimah, 2020).

Praigoli village is surrounded by a large-diameter trees, which also serve as a boundary with the outer areas. Praigoli village can be reached through the main access to the southwest flanked *by Uma Tabina Deta* and *Uma Tabina* Wawa who are believed to be the gatekeepers of the Praigoli village (Fig.4).

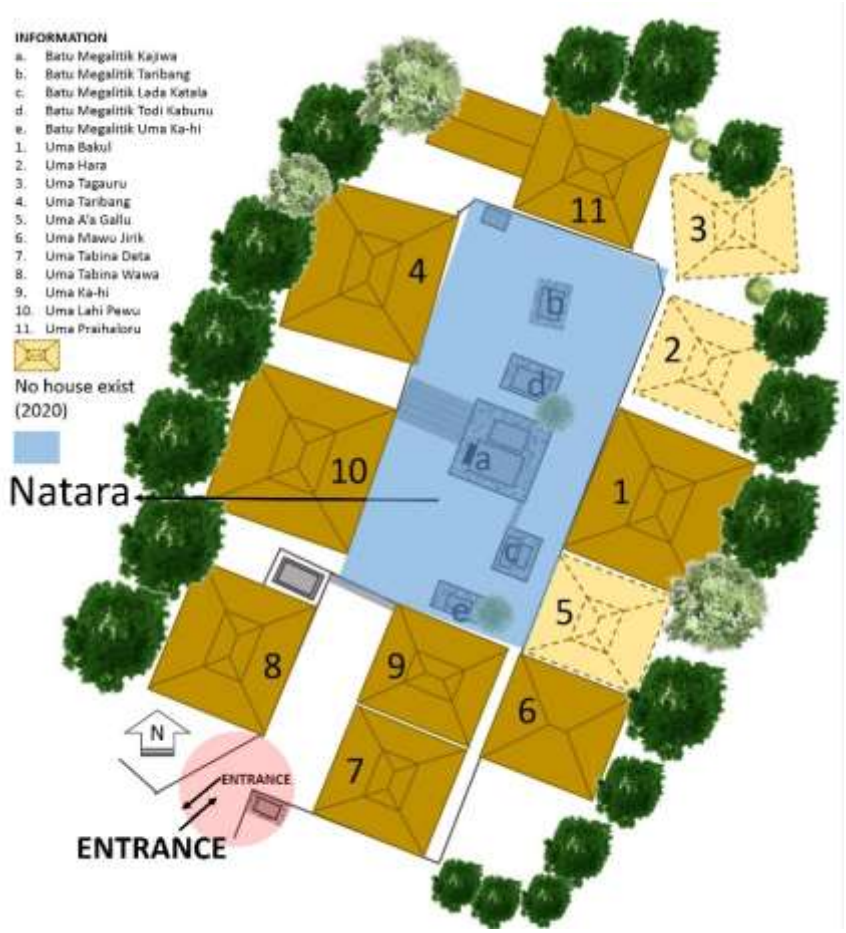

Fig. 4. The Sacred Court (*Natara*) in Praigoli Village
Source: Authors, 2020

Fig. 5. Activities at the Sacred Court (*Natara*) in Praigoli Village
Source: Author, 2020; Solikhah, 2019

A traditional house in the Praigoli village has the concept of a three realm house and a symbol of the unity of the human body and the universe. This can be seen from the distribution of the three parts of the house representing the human body (Fig. 6), namely: *Toko Uma* (The Head), *Bei Uma* (The Body), *and Kali Kabunga* (The Feet). One of the main considerations in producing the formation of a residence in Praigoli village is an adjustment to natural factors. To address its natural characteristics which are relatively contoured and barren and for functional reasons, a traditional house in Praigoli village takes the form of stilts. The under part is used as a cage for livestock (pigs, horses, dogs, chickens) and for storing firewood.

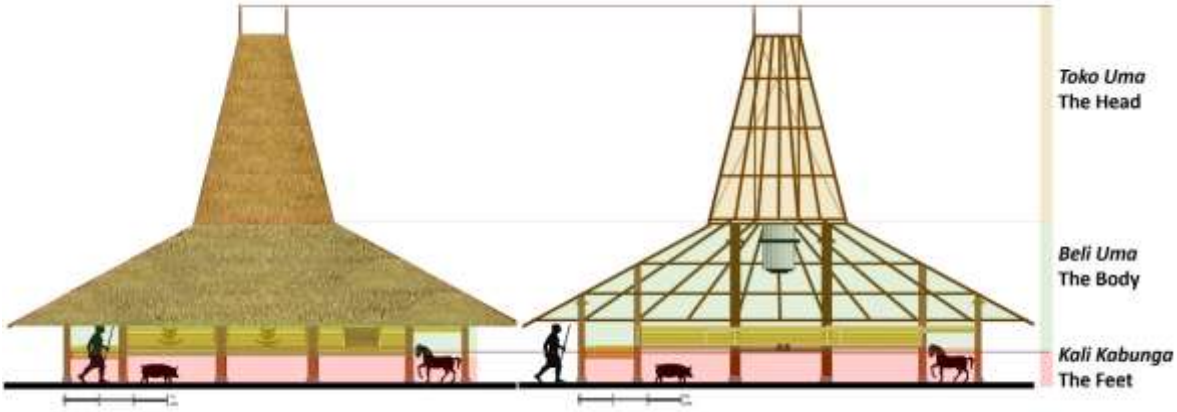

Fig. 6. Symbol of the unity of the human body and the universe in the Traditional House of Praigoli Village
Source: Solikhah, 2019

The interior arrangement also represents the human body (Fig.7). The main layer that lies in the kitchen is the furnace *(robukadana)* and traditional stove located in the centre of the house. Meanwhile, the storage hanging above the stove (*Hedi/Leki/para-para)* is identified with the human heart. The second layer is the interior of the house. *Halibar* is a place to dress up a bride, give birth to a baby, and rest for a sick family member. In the men's area, there are *Kiripani* where Rato sits during traditional events, and daily as a place to store crops. On the right side of *Kiripani*, there are *Pani* to put the corpse before burial. In front of the kitchen, there are *Hadoka* as warehouse/ storage for crops or it can be used as a bed for parents/children who are married. Across *Hadoka* is *Heda Kabalimata* as a place of worship related to traditional ceremonies such as marriage, birth, and harvesting. The third layer is *the lenang/* hall that surrounds the outside of the house.

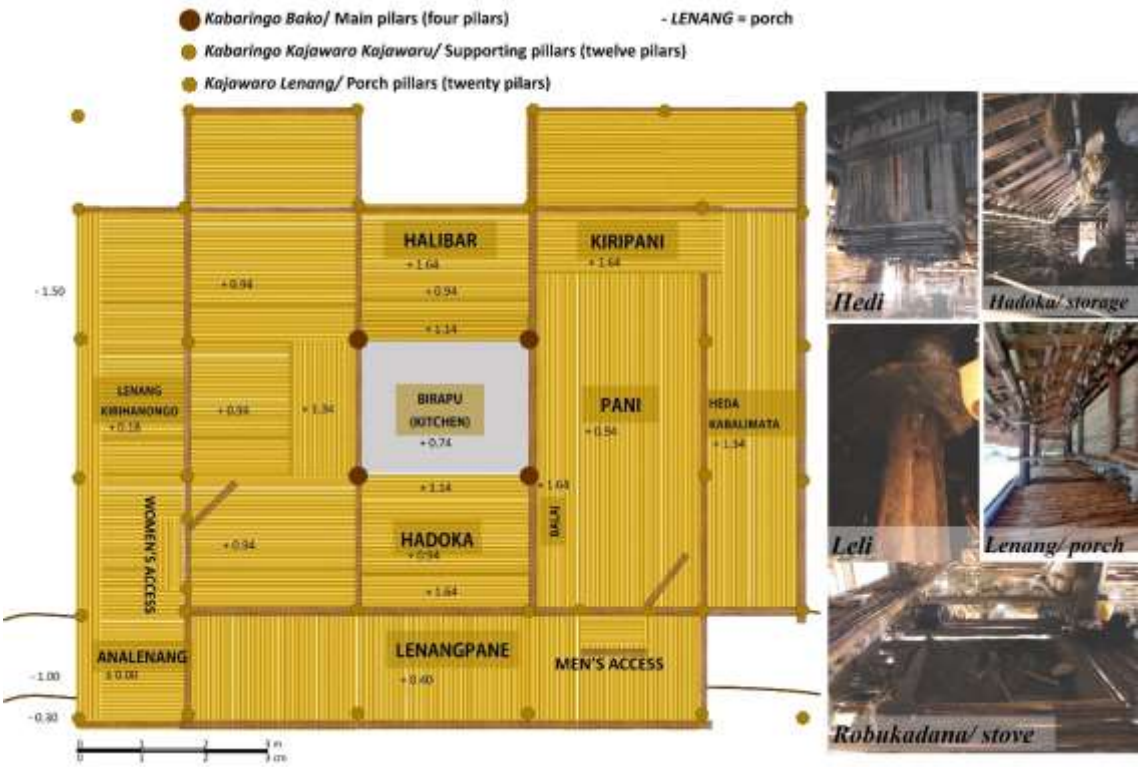

Fig. 7. The Layout and part of the Traditional House in Praigoli Village
Source: Authors, 2019 and 2020

The front, back, left, and right axis originating from the human body also play a role in determining the floor plan in Praigoli Village (Fig. 8). This is following the theory of *"the Pre-eminence of the right hand"* proposed by Hertz (2013). In most societies, the right hand is always considered superior to the left hand. On Sumba island's houses, the right side of the house is men's area who strive for ritual activities. Men's areas are public, sacred, and masculine as a place to welcome guests and carry out ceremonies. In contrast, the left side is the territory of women and children and is used for private purposes such as daily cooking and sleeping. The right and left directions refer to the entrance (Sato, 1987b).

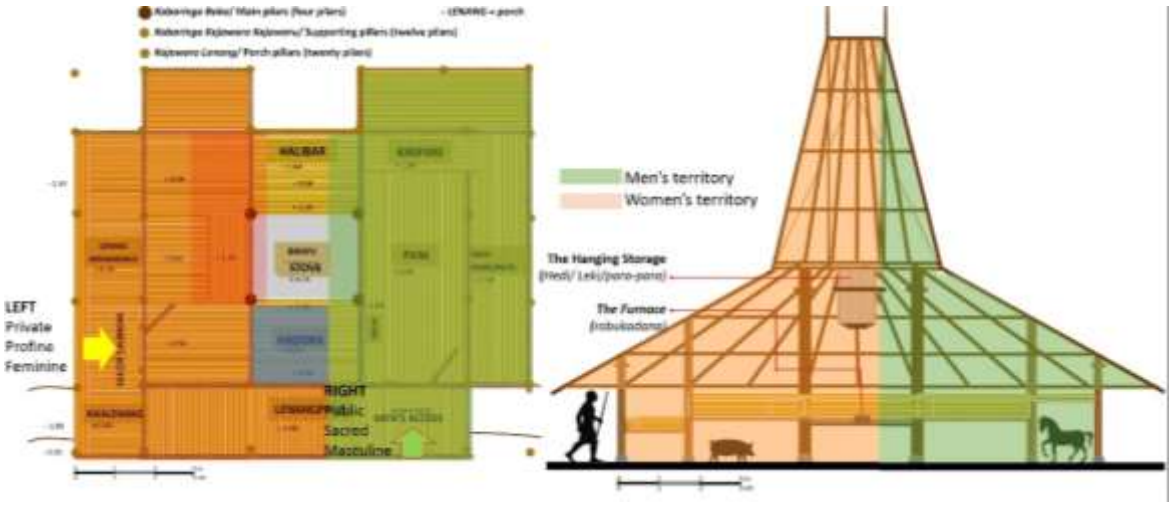

Fig. 8. The Conception of Right-Left on Praigoli Houses
Source: Authors, 2020

b. Lessons from Vernacular Architecture Toward Sustainable Human Settlements: Insights from Praigoli Village, West Sumba, Indonesia

Sustainability of vernacular architecture is influenced by several aspects, including socio-culture, economics, and the nature-environment. To discuss sustainability, Sustainability Model approaches by Pillai (2013) will be used. This includes three aspects, namely socio-culture, economics, and environment

Lesson 1: Socio-Culture

Praigoli village is a traditional village that functioned as a core village of a tribe (kinship/ *kabisu*). With a limited number of houses (11 houses) and no longer possible to increase, the relationship to the environment is not only with the physical environment, but also intangible non-physical relationships. Even though some family members live in a farmland house outside the core village, the people of Praigoli village still obey the traditional customs and rituals that take place in the Praigoli traditional village, including if there is a rebuilding of one of their traditional houses.

As a reflection, Praigoli village still holds fast to their belief in *Marapu* (the ancestral spirit who is believed to be the liaison with the creator). Their adherence to *Marapu* is manifested by the practice of customs, rituals, and traditional values in their daily lives. This is also a strong tie for Praigoli residents to always relate to their traditional village, even though some of the residents live in farmland houses in Pahola Village (Fig 9).

establishment of traditional houses with transfer knowledge between generation *Pasola* *Jaga Ngara*

Fig. 9. Some cultural activities held by Villagers
Source: Authors, 2019 and 2020

Currently, the people of Praigoli Village still adhere to their customs and traditional values in their daily lives: both the older generation and the younger generation. Customary rituals are still carried out and become actions to transfer knowledge between generations. Adjustments to the development of the era are made without reducing the essence of the meaning of the local values that are held; For example, the use of electricity, cell phones for communication, and so on. Children and adolescents also go to school and receive a formal education, but they still maintain the prevailing customary values.

Lesson 2: Economics

Villagers of Praigoli, especially men, usually farm and raise livestock to meet their daily needs. While women weave and make crafts from dried *pandanus* leaves (Fig 10). The survival of the Praigoli community cannot be separated from their economic capacity. The economic needs to sustain life, carry out ritual ceremonies, pay for maintenance, and rebuilding traditional houses are numerous and demanding.

Fig. 10. Economics activities by Praigoli women

Source: Authors, 2019 and 2020

Many traditions of the Sumba people are expensive, including providing materials (wood, palm fiber, bamboo) and sacrificial animals for ceremonies (pigs, horses, dogs, or other livestock) which are equivalent to tens to hundreds of millions of rupiah (Fig. 11). However, the ceremony is still carried out by the community because of the close kinship and spirit of mutual help. When a villager is to carry out a cultural event, the family and also other residents will donate (usually in the form of livestock). This goes on like a cycle. Therefore, when someone has to carry out a celebration, he doesn't need to worry because his family, relatives, and close friends will make a donation according to what he has given, or even more.

Fig. 11. Materials and sacrificial animals for ceremonies
Source: Authors, 2019 and 2020

Currently, Praigoli Village is starting to attract tourists and has become a tourist destination, although it has is not yet been well-managed. There is no special agency that deals with tourism activities, even though it can actually be managed properly and can increase sources of income for the local community and help maintain cultural-environmental sustainability.

Lesson 3: Environment

The preservation of Nature, the environment, and the surrounding area is an important factor in the cultural sustainability of Praigoli Village. One of the main elements of sustainable human settlement is availability of water. Therefore, a management system is needed to maintain its sustainability.

One of the main elements of sustainable human settlements is water availability. Even though Kampung Praigoli is located in the driest area in Indonesia, the availability of water for the residents of Praigoli village is quite good, since it is supported by a well-preserved ecosystem. As seen in Fig. 12, the position of Kampung Praigoli is located between a natural spring, river, and the beach.

People take water from the natural springs *(Mata Wei Teikapilit)* for their daily needs and activities. Praigoli Village also receives assistance from the government in the form of pump wells for clean water. Irrigation of rice fields, and cornfields utilizes the Wanokaka River flow which originates from the Manupeu Tandaru National Park and runs down to the Indian Ocean.

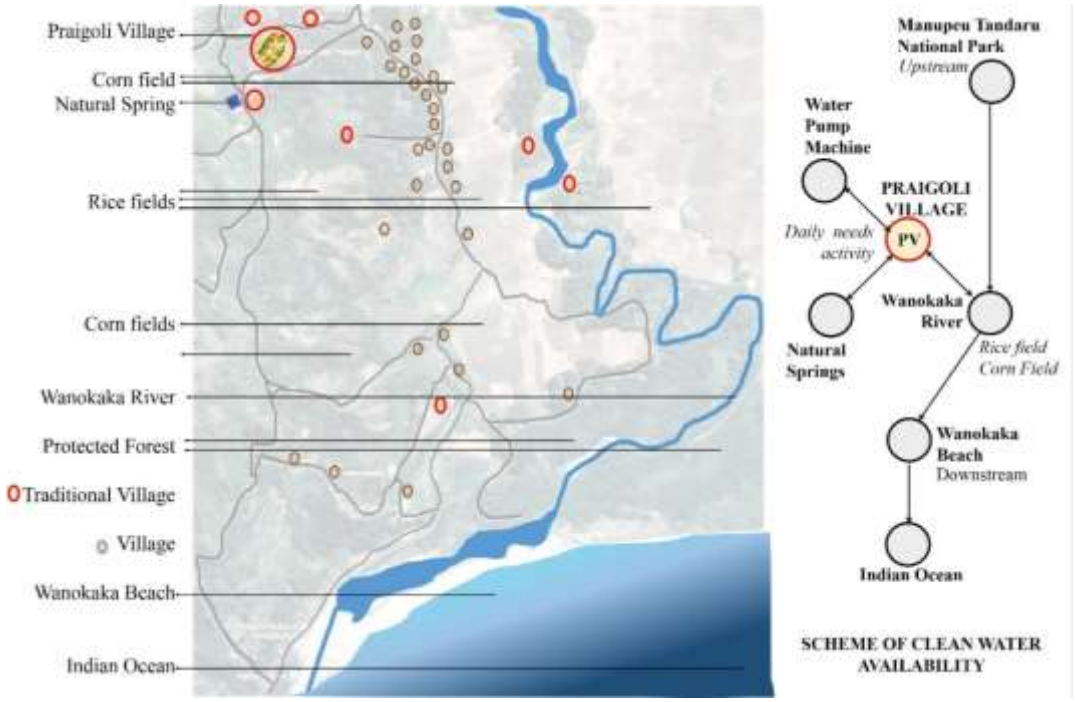

Fig. 12: Scheme of Water Availability in Praigoli Village
Source: Author, 2020

In terms of natural resources, the architecture of traditional houses in Praigoli Village only uses natural materials such as reeds, wood, bamboo, rattan, grass, and stone. To ensure the sustainability of the vernacular architecture in Kampung Praigoli, it is important to ensure the availability of the aforementioned materials. The existence of natural resources greatly affects the future sustainability of the vernacular buildings of Kampung Praigoli. Currently, not all sources of materials are near the village, some have to be imported from other areas, thus increasing transportation costs.

The traditional house as the residence of the people of Praigoli village has several functions at once, including a place to live and live life, a place to carry out ritual activities, a place to store assets and crops, a place to raise livestock, and so on. This is in line with what was conveyed by Santoso (2018), a researcher of Indonesian architecture, associated with a multifunctional role and a residential building (house) as a dwelling. Furthermore, Santoso (2018) explains that in the humid tropical archipelago, humans can live all day long outside their houses without the need to go into the buildings. Instead, they utilize the veranda to do some activities during the daytime such as doing household chores, socialization, taking a rest, etc. The role of residential buildings is not merely for shelter, but sometimes it plays other important roles. This is also in line with ideas from Norberg-Schulz (1962) who states that a building should fulfill the the tasks including physical control, social milieu, functional frame, and cultural symbolization. In this building tasks concept, the traditional house building in Praigoli Village meets these four criteria. The traditional house building functions as a physical shelter from the weather and climate as a place to socialize with family and fellow members of the tribe/ *kabisu*, as a functional framework for the Praigoli traditional village unit, and as a cultural symbol of the Sumba people with their *Marapu* beliefs.

In vernacular architecture, sustainability is indicated in the design of buildings, use of materials, heritage preservation, and environmental and social consciousness (Wahid, 2012). Moreover, the use of available materials and technologies and the employment of local manpower from within the settlements consistently contribute to sustainability (Dayaratne, 2018). In Praigoli Village, almost all materials used to build their houses are natural materials taken from the surrounding environment without the fabrication process, so that they are more environmentally friendly. Thus, the community is required to preserve their surrounding natural environment around it as part of the sustainability of the system, not only as a source of building materials but also as a

source of livelihood and also setting for the implementation of customary values and traditions. This is the manifestation of people, place, and culture relationship for a sustainable human settlement.

West Sumba is one of the driest areas in Indonesia. The Praigoli community responds to its natural characteristics which tend to be barren and the air temperature tends to be hot with good layout and construction systems. Smoke from the kitchen's activity spread throughout the room and strengthen the roof material (reeds). The raised construction *(panggung)* is used to protect the house from humidity, insect, and respond to contours. However, some houses are starting to use solar panels as a source of electrical energy (Fig 13).

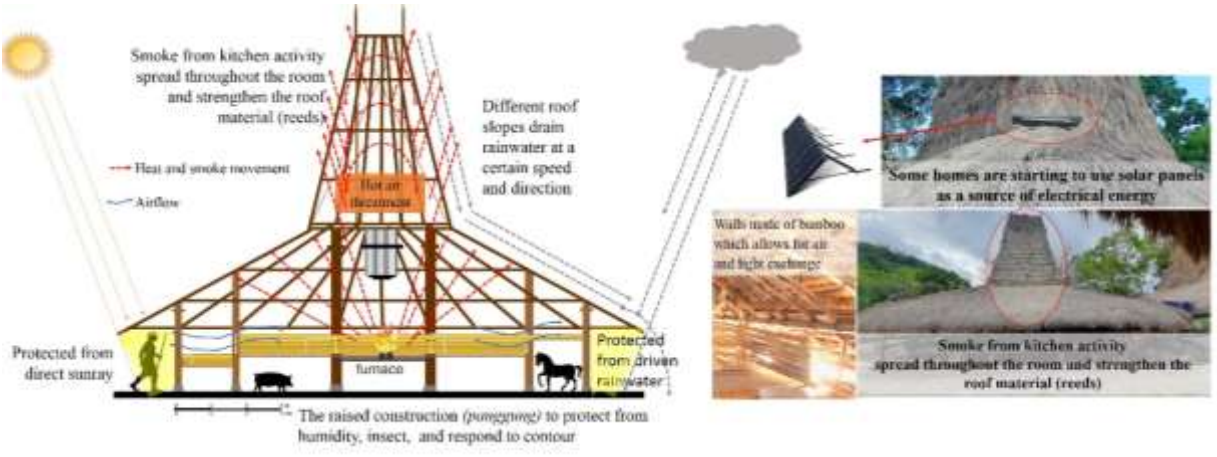

Fig. 13. Environmental responses from Praigoli houses
Source: Authors, 2020

As Paul Oliver mentioned in Rogi (2011), vernacular architecture is the architecture of and by the people, grows and develops in societies with certain cultures, and naturally fostered settings. So far, the knowledge of construction techniques in vernacular architecture has been passed down through oral traditions. Furthermore, Susetyarto (2013) states that issues related to the sustainability of vernacular architecture are tradition it-self, conservation it-self, self-builder, legalistic aspects, ethical issues, as well as bringing together issues of contemporary life needs and cultural sustainability. Therefore, it needs to be supported by documentation so that it would not disappear. This is important to be carried out as a form of knowledge: transfer knowledge between generations. As suggested by Kurniawan et al., (2020), the lack of traditional knowledge amongst the youth signifies the erosion of the cultural values to preserve their own traditional culture and the environment.

Praigoli traditional village only consists of eleven houses. Due to the limited area of the village and the number of houses that cannot be increased again, the young generation of married Praigoli villagers will build their houses on other lands (usually referred to as farmland houses) located in Keiku Ahu and Hoba Lolu villages in Pahola Village, which is about 2 km from Praigoli traditional village. Currently, there are 18 houses inhabited by 24 families. Thus, although physically the area of this traditional village is only small, in effect it covers an even larger area.

Apart from that, in terms of rituals and traditions, many rituals were carried out outside the village; for instance, the implementation of the annual Pasola event. Pasola is a traditional ceremony to welcome the traditional Sumba New Year as well as the harvest season. The Praigoli traditional village has an important role in the implementation of the Pasola series in Wanukaka. Pasola in Wanukaka has a series of interrelated rituals, namely: Purung Laru Loda, Pati Rahi, Madidi Nyale, Nyale, Pasola on the Beach, and Pasola at Wanukaka Field. Thus, the Praigoli traditional village has a close connection with the surrounding area, especially the places that are often used in a series of traditions and traditional rituals. Fig. 14 below shows the relationship of Praigoli Village with its surrounding environment as the place for living where they cultivate the farmland for livelihood, a resource for building materials, as well as social and cultural space to perform some traditional rituals.

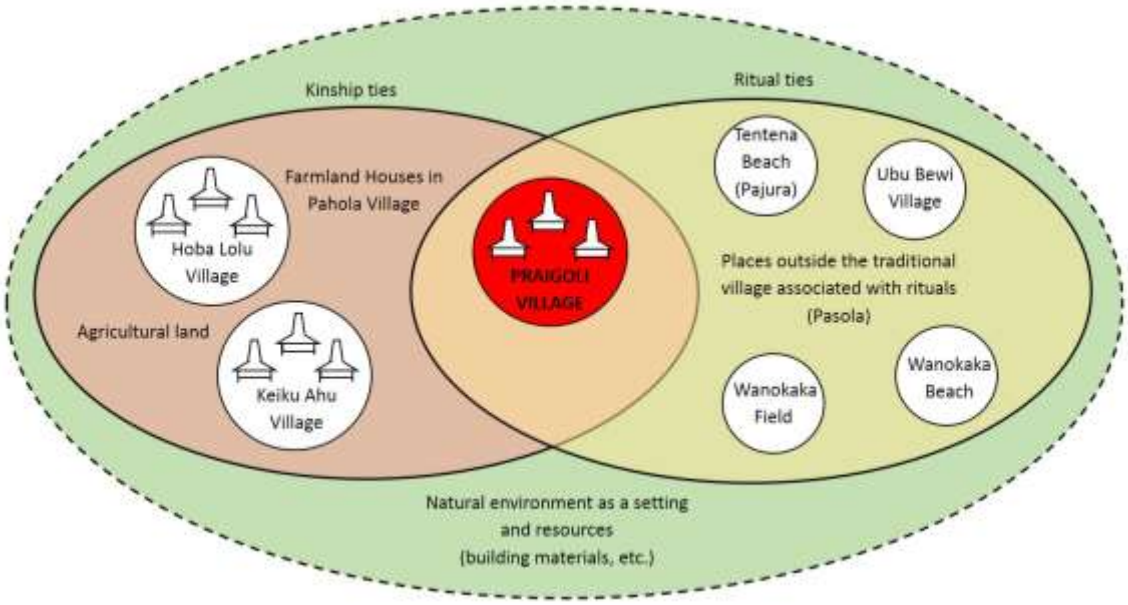

Fig. 14. The Relationship Scheme of Praigoli Village with the surrounding natural environment
Source: Authors, 2020

Conclusions

Praigoli Village is a manifestation of Nature and culture in West Sumba, which holds a strong belief in *Marapu*. The spatial conception and the entire traditional procession (house construction, birth, marriage, death, Pasola) represent a cycle of human life from birth to death. This has made residential dwellings and buildings to support daily living needs, and ritual activities of traditional customs, which are the traditional inheritance of the people of Praigoli village from generation to generation.

Based on the exploration of the tangible and intangible cultures of Praigoli village, it can be said that the concepts of vernacular architecture of Praigoli Village represent the unity between humans and the universe and respect for the position of women as mothers for humans and the universe. The sustainability of the vernacular architecture of Praigoli Village has both opportunities and challenges. The result of the studies demonstrates how vernacular architecture of Praigoli village contributes to sustainability and the continuity of harmonious cultural life related to tradition, and conservation; as self-building, legalistic aspects, ethical issues, physical control, social milieu, functional frame, and cultural symbolization as well as bringing together issues of contemporary life needs and cultural sustainability.

Lessons that can be learned and implemented towards sustainable human settlements in Praigoli village and in other vernacular settlements around the world are as follows.

a. *Maintaining religious elements (belief systems) as a binder of society for cultural sustainability.*
   Insight from Praigoli's villagers, their adherence to *Marapu* is manifested by the practice of customs, rituals, and traditional values in their daily lives.
b. *Creating human settlements to be autonomous: sufficient in daily livelihoods for their residents and resources needed, including economic activities, providing materials, and sacrificial animals for ceremonies.*
   From Praigoli's insight, house materials and traditional ceremonies are expensive. Therefore, they prepare by planting trees for building materials and dyeing cloth, raising animals (pigs, horses, dogs) as savings.

c. *Creating settlements responsive to natural characteristics.*

West Sumba is one of the driest areas in Indonesia. The Praigoli community responds to its natural characteristics which tend to be barren and the air temperature tends to be hot with good layout and construction systems. Smoke from the kitchen's activity spread throughout the room and strengthens the roof material (reeds). Raised construction *(panggung)* is used to protect the house from humidity, insect, and responds to contour; the use of bamboo on the walls and the roof covering material of reeds creates a breathable building.

d. Maintaining the concept of a buffer village to maintain cultural sustainability, even though the area of traditional villages is limited.
Praigoli's Villagers keep interconnected with its surrounding environment as the place for living (farmland house as buffer village) where they cultivate the farmland for livelihood, a resource for building materials, as well as social and cultural space to perform some traditional rituals.

e. Controlling the transformation of natural materials and technology used.
During the establishment of traditional houses in Praigoli, transfer of knowledge between generation took place: such as craftsmanship, history, philosophy to avoid the lack of traditional knowledge among the younger generation which can erode their own cultural values and environmental wisdom.

f. Preparing for sustainable settlement planning.
From the perspective of Kampung Praigoli, currently, settlements are starting to develop along the main road and shrinking the area of agricultural land. Therefore, it is necessary to make arrangements so that settlement development does not damage the ecosystem, especially to maintain the availability of clean water.

g. Implementing modern technologies in vernacular buildings, so that they can meet the current standard of living without changing its shape and/or basic characteristics.
Insight from Praigoli is the use of solar panels as an energy source located on the top of the roof.

h. *Preparing for the concept of sustainable tourism.*
From the insights of Praigoli; they are starting to be known to the public and attracting tourists. However, there has been no preparation of human and natural resources. Tourism can actually be managed properly and can increase sources of income for the local community and maintain cultural-environmental sustainability.

Acknowledgments
This research is funded by LPPM Universitas Tarumanagara (Research's Agreement Number 1994-Int-KLPPM/UNTAR/XI/2019). We would like to express our gratitude to all parties for their contribution and help during the data collection: Anderias Laiya Pira (Customary chief of Praigoli village), Villagers of Praigoli village, Ministry of Cultural and Tourism West Sumba Regency, Shelus Kanu, Ningtyas Rambu Nawu, Frans, and Sekolah Tukang Nusantara (SETON).

References
Bamualim, A. U. (2017). *Mengenal Sumba Barat: The Next Travel Destination*. Waikakubak: Regency Culture and Tourism Office of West Sumba.
Creswell, J. W., & Poth, C. N. (2018). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches* (4th ed.). California: Sage Publications, Inc.
Dayaratne, R. (2018). Toward sustainable development: Lessons from vernacular settlements of Sri Lanka. *Frontiers of Architectural Research*, *7*(3), 334–346. https://doi.org/10.1016/j.foar.2018.04.002
Gantini, C., Prijotomo, J., & Saliya, Y. (2014). 'Gerenceng bale banjar adat': change and continuity in Balinese architecture. *International Journal of Academic Research*, *6*(1), 143–

148. https://doi.org/10.7813/2075-4124.2014/6-1/a.19
Ghaffarian Hoseini, A., & Dahlan, N. (2012). The essence of Malay vernacular houses: towards understanding the socio-cultural and environmental values. *ISVS E-Journal*, *2*(2), 53–73.
Gunawan, Y., Gunawan, U., & Umbu, J. C. (2018). *Konsep Tempat pada Arsitektur Sumba Barat (Studi Kasus: Arsitektur Desa Weelewo)*. http://repository.unpar.ac.id/bitstream/handle/123456789/7708/lpdsc226_Yenny_Konsep Tempat Pada Arsitektur-p.pdf?sequence=1&isAllowed=y Retrieved on August 29, 2019
Hariyanto, A. D., Asri, A., Nurdiah, E. A., & Tulistyantoro, L. (2012). *Hubungan Ruang, Bentuk Dan Makna Pada Arsitektur Tradisional Sumba Barat*. http://repository.petra.ac.id/16223/ Retrieved on August 29, 2019
Hertz, R. (2013). The preeminence of the right hand: A study of religious polarity. *Journal of Ethnographic Theory*, *3*(2), 88–108. https://doi.org/10.4324/9781315632292
Hidayatun, M. I., Prijotomo, J., & Rachmawati, M. (2015). Sustainability is Important Part of the Identity in the Dimension of Regionalism Architecture. *Applied Mechanics and Materials*, *747*, 145–148. https://doi.org/https://doi.org/10.4028/www.scientific.net/amm.747.145
Idham, N. C. (2018). Javanese vernacular architecture and environmental synchronization based on the regional diversity of Joglo and Limasan. *Frontiers of Architectural Research*, *7*(3), 317–333. https://doi.org/10.1016/j.foar.2018.06.006
Indrawati, K. P. (2016). The Sea around "Alor Kecil" Vernacular Society: A critical threshold for ecological and cultural survival. *ISVS E-Journal*, *4*(2), 1–15.
Kurniawan, K. R., Suhanto, K. A. G., & Angelia, D. P. (2020). From Boluf to Kampung : Spatial Changes in The Korowai Traditional Settlements. *ISVS E-Journal*, *7*(1), 12–20.
Mross, J. (1997). Wanukakan (Sumba, SW). In P. Oliver (Ed.), *Encyclopedia of Vernacular Architecture of the World* (pp. 1100–1101). Cambridge: Cambridge University Press.
Mross, J. W. (1995). Environmentally Responsive Design in the Settlement of the Cockatoo. *1st International Symposium on Asia Pacific Architecture: The East-West Encounter*.
Mross, J. W. (2000). Cultural and Architectural Transitions of Southwestern Sumba Island, Indonesia. In H. Davis & L. Findley (Eds.), *ACSA 2000 International Conference-Cross Currents Trans-Cultural Architecture, Education, and Urbanism* (pp. 260–265). https://www.acsa-arch.org/proceedings/International Proceedings/ACSA.Intl.2000/ACSA.Intl.2000.37.pdf
Nations, U. (2015). *The 2030 Agenda For Sustainable Development*. (Report) https://sdgs.un.org/goals
Nguyen, A. T., Truong, N. S. H., Rockwood, D., & Tran Le, A. D. (2019). Studies on sustainable features of vernacular architecture in different regions across the world: A comprehensive synthesis and evaluation. *Frontiers of Architectural Research*. https://doi.org/10.1016/j.foar.2019.07.006
Norberg-Schulz, C. (1962). *Intentions in Architecture*. Cambridge: The MIT Press.
Özdeniz, M. B., Bekleyen, A., Gönül, I. A., Gönül, H., Sarigül, H., Ilter, T., Dalkiliç, N., & Yildirim, M. (1998). Vernacular domed houses of Harran, Turkey. *Habitat International*, *22*(4), 477–485. https://doi.org/10.1016/S0197-3975(98)00027-7
Ozkan, S. (2006). Traditionalism and vernacular architecture in the twenty-first century. In L. Asquith & M. Vellinga (Eds.), *Vernacular Architecture in The Twenty-First Century: Theory, education and Practise* (pp. 97–109). London and New York: Taylor & Francis.
Pillai, J. (2013). *Cultural Mapping: A Guide to Understanding Place, Community and Continuity* (1st ed.). Selangor: Strategic Information and Research Development Centre (SIRDC).
Pira, A. L. (2015). *Kampung Adat Praigoli. Pendataan Kampung Adat Praigoli*. (Report-Unpublished)
Prihatmadji, Y. (n.d.). *Sekolah Tukang Nusantara*. Universitas Islam Indonesia. https://seton.uii.ac.id/
Rapoport, A. (1982). The Meaning of the Built Environment: A Nonverbal Communication Approach. In *The University of Arizona Press*. https://doi.org/10.1016/0197-3975(84)90014-6
Rogi, O. H. A. (2011). Arsitektur Vernakular: Patutkah Didefinisikan? *Sabua*, *3*(2), 32–39.

https://ejournal.unsrat.ac.id/index.php/SABUA/article/view/242
Salman, M. (2018). Sustainability and Vernacular Architecture: Rethinking What Identity Is. In K. Hmood (Ed.), *Urban and Architectural Heritage Conservation within Sustainability* (pp. 1–16). Intech Open. https://doi.org/10.5772/intechopen.82025
Santoso, R. B. (2018). *Akar-Akar Arsitektur Indonesia*. Jurusan Arsitektur dan Perencanaan, Universitas Tarumanagara.
Santoso, R. B. (2018). *Akar-Akar Arsitektur Indonesia*. Public Lecture on History of Architecture, Department of Architecture and Planning. Jakarta: Universitas Tarumanagara.
Sato, K. (1987a). *The Heart of Austronesian Houses: Sumba*. http://www.sumai.org/asia/sumba.htm Retrieved on August 29, 2020
Sato, K. (1987b). *The Heart of Austronesian Houses*. http://www.sumai.org/ Retrieved on August 29, 2020
Schefold, R., J.M.Nas, P., & Domenig, G. (2003). *Indonesian Houses Tradition and Transformation in Vernacular Architecture* (Reimar Schefold, G. Domenig, & P. J.M.Nas (eds.)). Singapore: Singapore University Press.
Solikhah, N. (2019). *Residensi Pembangunan Rumah Adat Kampung Praigoli (Sekolah Tukang Nusantara)*.(Report-Unpublished)
Solikhah, N. (2020). Ethnic tourism and sustainable of vernacular settlement in Cibeo Village, Baduy Dalam. *IOP Conference Series: Earth and Environmental Science*, *452*(1). https://doi.org/10.1088/1755-1315/452/1/012021
Solikhah, N., & Fatimah, T. (2020). *Keberlanjutan Arsitektur Vernakular di Kampung Praigoli, Kabupaten Sumba Barat, Provinsi Nusa Tenggara Timur*.(Report-Unpublished) Jakarta: Research and Community Service Universitas Tarumanagara
Sumintardja, D. (1978). *Kompendium Sejarah Arsitektur (Jilid 1)*. Bandung: Yayasan Lembaga Penyelidikan Masalah Bangunan.
Susetyarto, M. B. (2013). *Arsitektur Vernakular: Keberlanjutan Budaya di Kampung Bena Flores*. Sukoharjo: Padepokan Seni Djayabhinangun.
Wahid, A. (2012). Adaptive Vernacular Options for Sustainable Architecture. *ISVS E-Journal*, *2*(2), 74–87.
Waterson, R. (2009). *The Living House: An Anthropology of Architecture in South-East Asia*. Singapore: Tuttle Publishing.
Widiastuti, I., & Vedamuthu, R. (2009). A comparative study of vernacular settlement and dwelling culture: A case study in Kerala, South India, and Minangkabau in Sumatra, Indonesia. *International Journal of Interdisciplinary Social Sciences*, *4*(2), 15–30. https://doi.org/10.18848/1833-1882/CGP/v04i02/52833
Winandari, M. I. R., Machdijar, L. K., Topan, M. A., Winardi, B. L., & Sofian, I. (2006). *Arsitektur Tradisional Sumba*. Jakarta: Penerbit Universitas Trisakti.

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