A Comparative Study on Transformation Process and Form of Traditional Houses in Sumba Island

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Abstract: In a society with no profession of architect nor engineer, the architecture transformation and the space modification constantly carried out by the local community. Through this process, the local community had been passed down their empirical knowledge, yet the tradition urged to alter its way according to the modernization of the architectural culture and people's lifestyle. This study attempts to clarify the transformation pattern of the traditional house in Sumba Island. We undertook the measurement of the houses and interviews with the villagers in six villages located in the east and west. Through the comparison of six villages, we identified clear regional differences in the transformation process and form of Sumbanese houses. The typical Sumbanese house stands on stilts and topped with the impressive hat. The house has a hearth with four main pillars surrounded by living space. In general, the transformation of the houses occurred in several phases, in response to the increasing family members that consequently trigger the necessity of the new facility. The transformation of form divided into two patterns according to their location, hilltop, and flat land. These two types characterized by vertical/horizontal expansion of space according to topographical condition, the changes of room layout in accordance with the religion of occupant, and the introduction of industrial material which slowly replaces the natural material. We found that in the midst of the transformation process, the form of high hat and the concept of the four main pillars were maintained. The villagers in Sumba put an effort on balancing between modernization need and inheritance of the traditional value. The transformation process shows a manifestation of the adaptation capabilities of traditional Sumba houses in response to the modern needs of their residents, without sacrificing the important values that strictly maintained by the local communities.

1 INTRODUCTION

The discussion on Indonesian vernacular architecture has been held in many forums both national and international. The term vernacular derived from the Latin word Vernaculus, which means native or domestic. Therefore, when it was combined with architecture and creates the term vernacular architecture, it gave the value of locality in the broad meaning of architecture. Hence vernacular architecture refers to building, which responded to the needs of the specific people and reflecting the character of the local environment. It is architecture that becomes and processed by a particular society that is located in a certain area (Allsopp, 1980).

Initially, architecture involved as an effort in the provision of shelter from the surrounding environment. However, the way architecture responding to the environment is very dependent on the knowledge and culture of the people. The culture itself has characteristics of shifting along with the passing of time, human knowledge will advance, and the way we perceive things will be different. Therefore, there will never be a static architecture. Vernacular architecture itself will face various changes in many aspects from the form, material, even the spatial layout of the building.

The purpose of this research is to observe the transformation of traditional houses by local people, which happened in Indonesia in modern days. If vernacular architecture is constantly changing, it may be possible to trace and define the pattern of changes throughout the years. It also aimed to establish a deeper understanding of how the transformation process took place in Indonesian vernacular houses, especially in Sumba island. This understanding is built on the knowledge of cultural values, which is accompanied by a process of observation and pattern-

making that will be used as a basis in the effort to translate the process of assimilating the thought process of local citizens into architectural form.

2 THEORY/RESEARCH METHOD

2.1 Theory

Pile dwelling houses in Indonesia are often thought to be originated from granaries. In Sumba case, the change from granaries to house is by adding a platform beneath its floor and enclosed by walls (Sato, 1991). In Sumatera, the Toba Batak has an old custom of converting old sopo into dwellings through a process of transformation that provided better kind of ruma (Domenig, 2003). The transformations also indicate the continuity of thought process in consideration of priority value that has to be maintained. Certain old features are still in evidence in the house of Nage, which has undergone considerable change (Forth, 2003). This suggests that the house is not a static but a dynamic object, as it undergoes change throughout the time.

2.2 Research Methods

The spatial archetype of a house can be seen by observing the relationship between existential values and the physical appearance of the interior of a house. Observation starts by analyzing the space that includes social dimensions and corresponds to a fixed spatial arrangement (Barbey, 1993). The real essence of this method is to see the relationship between house, function, meaning and time as a process of exchange between physical factors and spatial dimensions. This method was first put forward by Barbey when he saw the architect's lack of attention about how everyday life affects the organization of space, thought and arrangement of goods in it, or how all these thoughts change within a certain timeframe. Certainly, between everyday life and spatial planning has a very strong influence on one another.

In the scope of traditional society, all elements in the house have a strong influence and meaning, which is the implication of the values or norms that are always enforced. In this case, the community has first acknowledged the relationship between house elements and this understanding has kept their homes well maintained. To better understand how the people influence the form of their homes, field surveys and interviews were held with both emic and etic approach. Comparative analysis then applied to the acquired data to identify the spatial hierarchy and identify the pattern of transformation that took place in the house.

Table 1. Analysis process scheme.

Methods	Target	Obtained data	Analysis Technique	Obtained result
Interview	House owner and family members	House transformation history and cultural triggers for each transformation phase	3D conversion and comparative analysis of change through each period of time.	House transformation pattern and diagrams
Observation and measurement	Current condition of the house:	Current house form	Current house form used as a comparison basis.	Hierarchy of space and archetype, as well as the existing values of the house

3 RESULT AND DISCUSSION

3.1 Early Settlement and Distribution

Sumba is an island that belongs to the administrative region of East *Nusa Tenggara* Province in Indonesia. Stretches on the east side of Bali, the Nusa Tenggara archipelago loses its tropical lushness and becomes arid. Its proximity to Australia makes the transition between tropical and dry climate. Therefore, when other tropical islands are being characterized by its fertility and vast jungle area, the environment in Nusa Tenggara, including Sumba, tends to be dominated by extensive grassland. The island is inhabited by people with a mixture of Malay and Melanesian races and adheres to the caste system in its social structure. This condition has a major influence on the culture and beliefs of Sumbanese people, which later will intersect with their mindset that underlies the habit of building their houses.

Marapu is the form of ancestral religion practiced by the people on this island. The ancestors are believed to be closely associated both in the form of the house and the village arrangement as well. A striking feature of the village layout is the intimate connection between the dead and the living, of tombs and houses, within the same space. This connection resulting in the triadic division of space in the village, with two opposing ends mediated by center (Waterson, 1990). Therefore, every village has two

entrance point on either side, and a field in the middle with stone tombs erected on it.

Sumbanese house which called rumah adat in Indonesian language has striking features in its form; a wide thatched roof with a high towering hat in the middle. This kind of house can easily be found throughout the island, with variations in size and height depending on its location, which will be discussed in depth later on. The houses can be found mostly in the villages, usually on the top of the hill, or on the lowland near the river or beaches, depending on the age of the village itself.

Sumba is culturally and politically divided into western and eastern areas. The western part of Sumba has been divided by warring fiefdom for centuries, contrary to the east side which, although sparsely populated, is more politically dominant. (Barry Dawson, 1994). In terms of geography, Sumba island is characterized into two regions; the eastern Sumba with its vast savanna and hills, and western Sumba with its mountainous topography and dense forest. Six villages were observed in the process, and the result discussion will be focused on classification by hilltop and flatland villages.

3.1.1 Hilltop Village

The village located in the hilltop usually classified as the old and sacred one. To reach this village, it requires between 30 minutes to two hours hike to reach depending on the accessibility from the nearest road. Parewa Tana is one of the older established villages on the western side of Sumba island. According to the interview, the village was established in approximately 1850. The house layout is arranged in lengthwise in the north to the south line, following the available space in the topographic character of the site. Contrary to the character of the flatland village, the houses in hilltops are mostly arranged in parallel lines with the distance between each house being really dense due to the availability of the vacant land on the site.

The population of hilltops villages is currently declining, on average of only inhabited by 50 people or less, with mostly adults and elderly. This is due to the fact that the majority of the youngsters decided to move out of the village to the city for employment reasons or being taken as the bride for other village members. Therefore, the only remaining people who still live in the village are the one who has a certain position in the hierarchy of the village such as village leader and indigenous elders.

3.1.2 Flatland Village

Contrary to the hilltop, the flatland village is located in close proximity to big cities in Sumba. Most of the flat land village is established as an expansion settlement from the hilltop, as people came down to work in the cities. The village characterized by having a wider land area with groups of stone tombs erected on the inner circle and several houses arranged on the outer circle facing the tombs.

The majority of flatland village residents are working in the cities and much more exposed to technological progress. Therefore, their lives are exposed to the many influences brought along with the development of knowledge and technologies. The ease of access to the village also influences the change in religious belief from marapu to other religions such as Christianity or Islam. This religious transformation is one of the factors that greatly influence the transformation of form and values in the spatial hierarchy of the Sumbanese house.

Upon surveying the villages, the data is then categorized to find and highlight the connection between each village's statistics and current physical condition. Since the west Sumba was dominated by hills and mountains, it is obvious that the majority of the villages are established in the hilltop area. The opposite also is seen in the eastern part of Sumba, where the majority of villages are established on flat lowland. Furthermore, by looking at the traced house configuration image, the difference between the hilltop and lowland villages are easily distinguishable. The houses on the hilltop villages are arranged in a line and the distance between houses is very dense. The reason for this configuration can be analyzed by comparing it with the aerial images, and it is likely that the line shape is following the character of the topography, as well as in the inner circle boundaries of the surrounding forest. On the other hand, the land in the lowland villages is much wider than the hilltop one, and it can also be noted that the distance between the houses is much wider.

Table 2. Statistic data comparison between six villages

	Village Name	Established Year	Population	Aerial Image and house Configuration	Topography Classification
West Sumba	Wailolung	1984	84		Flatland
	Parewa Tana	1850	55		Hilltop
	Prai Ijing	1925	68		Hilltop
East Sumba	Praing Umalulu	1800	5		Hilltop
	Watu Puda	1986	130		Flatland
	Mburukulu	1930	93		Flatland

The differences in village characteristics are more visible when grouped into two types: hilltop and lowland villages. Topographically, the hilltop villages are dominated by differences in land contours which resulting in small areas of land that houses can be built. With a tight distance between the houses and being squeezed by ravines and forests, there is no horizontal space left in the village. However, as the population is growing, each house has a need to create additional spaces for new family members. On the contrary, the flatland villages have more spacious land area, therefore the residents have more space and freedom to develop their homes, following the demand of the population increase.

Table 3. Village grouping based on topographical characters

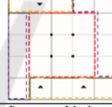| Village Name	Location	Characteristics	Images
Praing Umalulu Parewa Tana Prai Ijing	Hilltop	• Population growth slow, low expansion demand. • Narrow land, a lot of vertical spaces from topography → vertical house extensions. • Additional space mostly used as a kitchen or post-harvest working area.	
Wailolung Watu Puda Mburukulu	Flatland	• Population growth fast, high demand for new space. • Wide land area → horizontal house extensions/secondary structures. • Secondary structure functioning as a new kitchen or cooking area and sometimes bedroom for new family members.	

3.2 House Transformation Typologies

The transformation of the house of Sumbanese people is a result of the adaptation of the people in response to the changes in their daily lives and the sustainable system imposed in the house construction methods.

The system is the building method that focused on knockdown that provides easiness in assembly and disassembling, resulting in the freedom to rearrange the house configuration. The understanding of the spatial hierarchy and division of space is achieved through the conversion of floorplan into diagrams.

The comparative analysis of the diagrams of the houses from different villages showing the current forms, although different in some elements, has particular rules that apply in all of the transformation process. In the hilltop area where marapu religion is still highly believed, the core area of the house doesn't experience significant transformations. The four main pillars and inner hearth still act as sacred place with only minor transformations are allowed such as adding or removing partition walls. The walls are built to accommodate the division of space according to the numbers of family members. The space surrounding the core area is more flexible in experiencing changes in function. The house owners can easily transform semi-public space such as the veranda into private space to accommodate the need of a bedroom as the family member grows from time to time.

Table 4. Hilltop village house sampling and diagrams

	Praing Umalulu	Parewa Tana	Prai Ijing
Floor Plan			
Diagram			

- - - -	Core area of the house	Used for ceremonies and cooking
- - - -	Private area of the house	Bedrooms and in-house activity area
- - - -	Semi-public area of the house	Functioning as veranda, guest reception in ceremonies

Along with the growing number of family members, the need for space constantly increases. The limitation of the land area in the village compels the villagers to outsmart it by constructing new spaces vertically, taking advantage of land contours. Vertical transformation becomes a pattern that mainly adapted and developed over time in the hilltop villages.

Table 5. Vertical additional space in hilltop villages.

Vertical additional spaces examples	Simplified diagrams

The houses in flatland villages undergo a more varied transformation pattern compared to the hilltop villages. Land availability triggers a more varied and flexible transformation pattern, unlimited by the envelope of the main house. As the majority of the people changed their religion into Christianity or Islam, any house elements related to the marapu must be removed. This highly affects the core space of the house as the inner hearth that acts as a pivot in ceremonies is removed entirely from the house. However, the removal of the inner hearth also meant losing the cooking area, which usually responded by constructing a new kitchen outside of the main house area. The variety and flexibilities of transformation in flatland area also affected by the modernized and adaptation of new lifestyle that gradually introduced by both government programs and the increasing number of young family members who attends higher education level. Amenities such as electricity, television, piped water, cement paths, factory cut wooden materials, and corrugated iron or zink roofing is a common thing to find. Thus the transformation that occurred in the houses is more rigid and permanent, utilized in the long run.

Table 6: Flatland village house sampling and diagrams.

From the observation on flatland village extension patterns, there are three types of secondary house/structure typologies. The first type is the secondary house that connected to the main house by the floor, however, it has separate and independent roofs and structures. Although the secondary houses are built independently, it has floor connection to the main house for easy access purpose. The second type is the secondary house as extension part of the main house. This type occurs in a house where the owner of the house only have limited ownership of the land in the village. The third type is the secondary house that completely separated and structurally

independent from the main house. The third type usually established in wealthy family house where they can afford to build large kitchen areas, and sometimes also includes the addition of other room functions such as bedrooms and horse stables

Table 7. Horizontal additional space in flatland villages.

3.3 House Transformation Phase

Tracing the transformation history of houses in Sumba also implies tracing the social history of the said house. This attempts to indicate the connection of events on the particular years that influence significant transformation to the chosen house. Through the interpretation of existing construction language, combined by the stories of the owner of the houses as well as the neighbors who helped in the construction process, it can clearly be assumed that the house experienced several transformation phases in the process. From the hilltop house transformation diagrams, there are two villages with whom the house experienced major transformation. With the exception of the house in *Praing Umalulu* as the village is considered sacred and spatial transformations are prohibited by the *marapu* religious leaders. The strictness of these rules is an indicator to be considered that this house has the basic form of Sumbanese traditional house.

From the three-dimensional interpretation (figure 1 and 2) there is a difference in thought patterns between hilltop village dwellers and flatland villages in creating additional space in their houses. There are several important factors that need to be taken into account in understanding the transformation process of houses in hilltop villages. First, its topographical

characters force people to look for chance to transform while keeping in the boundaries of *marapu* rules and make use of what they already have in their environment. This means the keeping of core area intact and divert to converting space that is less influenced by religious provisions. Thus the people tend to convert the semi-public veranda into private bedroom by adding walls or creating additional platforms on the side or under the house. Secondly, the access difficulty of the village creates limitations in the distribution capabilities of materials that originated from the cities. This means the lack of external influence in the transformation process, making the ancestral knowledge of building methods intact. This can be seen on the partition walls made of natural materials such as bamboo and wooden deck floor that are made easily dismantled anytime. This method provides flexibility values that are utilized by the residents of the house to change the arrangement of space at any time as needed.

Flatland village houses on the other hand have more freedom in their transformation experience. First of all, the flatland villages are usually constructed as settlement derived from the hilltop village, as an effort to create easier access to and from the cities. Many hilltop villagers decided to move down the hill to settle in these villages. Contrary to the hilltop village, the communities in flatland villages are more open to the external influence brought in by the migrants or the citizens who study or working in the cities. This acceptance of external factors influence heavily on the development of people's mindset, including the patterns and house building methods. The decline in *marapu* religion is one of the indicators which on one hand erases a lot of values in the house, but on the other hand, becomes a substantial factor in creating opportunity for the flexibility of major changes in their homes that triggers the emergence of secondary structure.

This interesting development appears to involve a fundamental change in the way of living in Sumbanese society. The majority of secondary structures allocated as kitchen with some additional space such as other bedrooms or horse stable, depending on the needs of the homeowner. Interestingly, the building method of the structure is the combination of old knowledge with the use of modern building materials, especially for the roofing. The hearth part, still using the similar block of stone pedestal propping up the fireplace and encircled by four roofing pillars. This effort to maintain the hearth as closely related to old hearth they had removed shows that although it has been moved to a place separated from the main house, the kitchen as space

and cooking activities still regarded as closely related to their ancestral values. Other spatial functions such as food storages were moved with the same layout concept, over the hearth to ensure the benefit from smokes from the hearth. Therefore, even though the moving of the hearth from the main house also implying the moving of core activity area to the secondary structures. As the hearth removed and the activities changes, the core of the main house remains as symbolic of the culture and status shown to the general public
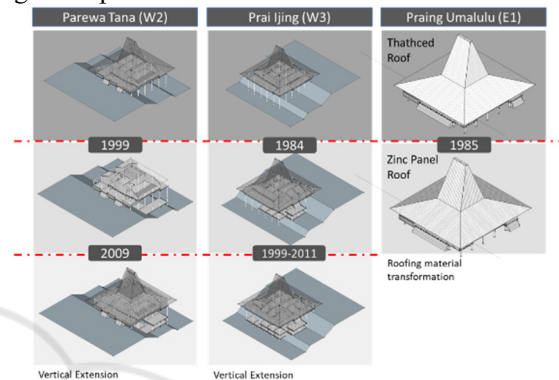

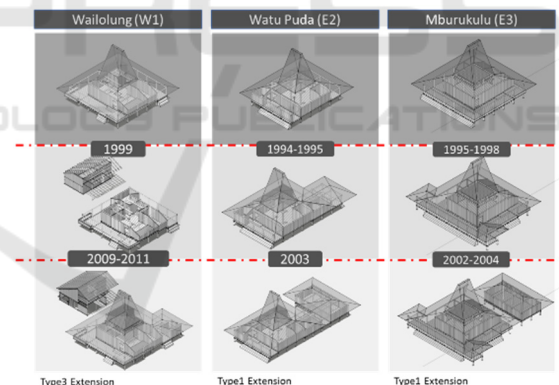Figure 1. Three-dimensional interpretations of house transformation phases in hilltop villages.

Figure 2. Three-dimensional interpretations of house transformation phases in flatland villages.

Table 8. Transformation phases informations.

	Parewa Tana	Prai Ijing	Praing Umalulu
Hilltop Village	• 1999 (Phase 1) 　1. Transforming veranda into bedroom 　2. Construct external deck under the house • 2009 (Phase 2) 　1. Transform veranda into bedroom 　2. Expand the deck, construct new deck on the other side of the house.	• 1984 (Phase 1) 　1. Construction of additional bedroom. 　2. Changing thatch roof to zinc roofing. • 1999-2011 (Phase 2) 　1. Chosen as tourist village by local government, receive development funding. 　2. Structural material change.: wooden → concrete. 　3. New bedroom construction.	• 1985 　1. Roof material change.: straw → zinc roof. Sacred Marapu village.: Extensive transformation of the house is strictly prohibited.
Flatland Village	• 1999 (Phase 1) 　1. Inner hearth removal 　2. Construction of external kitchen • 2009-2011 (Phase 2) 　1. Expanding the external kitchen area 　2. Construction of additional bedroom in the main house 　3. Construction of new storage room in the main house	• 1994-1995 (Phase 1) 　1. Construction of new room on the back of the main house 　2. Veranda deck extension as room access • 2003 (Phase 2) 　1. Inner hearth removal 　2. Construction of the external kitchen, connected to the main house.	• 1995-1998 (Phase 1) 　1. Veranda extension construction 　2. Construction of two additional bedrooms • 2002-2004 (Phase 2) 　1. Inner hearth removal 　2. Construction of external kitchen

The transformation table above indicated that there are two types of transformation in a house. Minor transformations such as maintenance and replacement of old materials that happened frequently once every three to four years were not mentioned in the table as it did not affect the house form significantly. Major change on the other hand occurs gradually and divided into several phases. It is interesting that from the 6 houses, the phases can be collected into two groups. The first phase of transformation in hilltop village occurred in the span of the 80s to the 90s where most of the transformations are making a new bedroom. This is quite contrary to the flatland villages as the majority of the new bedroom constructions occurred in the second phase. This may suggest the gap of the emergence of new generations between those villages, indicating the declining of the village population as there are no demands for the new rooms on the second phase of the hilltop village in a similar timescape.

In the flatland village, the transformation phases also can be grouped into two time frame where the first one occurred in a much longer span between 1994 to 1999 and the second phase is between 2002 to 2011. For a village that the majority of the people converted into non-marapu religion, ceremonial associated inner hearth was the main element of the house that is removed and triggers the construction of new kitchen area as replacement of cooking space. On the other hand, there are socio-economical factors that affect the transformation of flatland village as more of the young population attend to higher education and bring knowledge into the village communities. As a result, there is tension between ancestral practices

pertaining to the free but time-consuming application of natural material to modern knowledge and the idea of time-saving but money consuming prefabricated house materials.

4 CONCLUSIONS

The comparative analysis on transformation of house form in Sumba indicates the strong connection between the topographical location of the houses and the transformation pattern that occurred. The transformation in Sumba houses are divided into two axes, either vertically or horizontally, and the location of the house greatly influences the direction of change. In a hilltop village, the transformation is done vertically, creating a trade-off between the limitations on internal space modification caused by religious factor and dense layout between the houses, with flexibility utilizing empty space under the house. On the other hand, the flatland village house utilizes the abundance of land availability which enhances the flexibility in repurposing and transforms the form of the house.

The changes in socio-cultural factors on village communities also influence the type of necessities that triggers the form of newly constructed facilities. The hilltop villages focus on constructing new bedrooms to get around the growing number of family members. The persistence of marapu religion creates limitations in transforming the core part of the house, leaving it intact until current time. In flatland villages, marapu religion has faded resulting in the removal of strongly related house element especially the hearth. Thus the majority of new erected space is appointed as kitchen. Moving the kitchen from the main house to the outside also impacts the kind of activities took place inside the main house. The main house become solely used for sleeping and receiving guest, and the other family gathering activities happen around the kitchen in the secondary structure. This research implies that in a society where there is no profession such as architects, the house evolved by constant spatial modification carried out by the local community. Through this process, the knowledge of local architecture not only passed down to the newer generation but also received new values that influence the form of the house. Therefore, the research on this topic should be discussed more frequently to maintain the updated analysis on the latest form of the house.

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