

ENHANCED TREATMENT OF REEDS AS NATURAL MATERIALS FOR USE IN TRADITIONAL HOUSING AT WAE REBO VILLAGE IN FLORES

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ABSTRACT

Traditional Indonesian housing has always made use of material from surrounding forests throughout the ageing process, and natural materials are deliberately planted and maintained to sustain the life cycle of existing traditional houses. However, along with modern development, forests and gardens are turned into agricultural land or roads, reducing the availability of replacement material. As a consequence, when housing materials start to decay and need to be replaced, prices are higher because there is insufficient raw material. For this reason, the availability of materials to maintain traditional houses has become an important issue in many areas of Indonesia. Beginning from research on traditional settlement building and the threat of extinction due to the loss of green surroundings and people's behavior, this study also investigates the life cycle of buildings and its environmental function. Field studies were conducted to collect primary data on the condition of the natural environment, material distance, local climate data, and material characteristics. Wae Rebo was selected as a case study because the indigenous society living in that village use natural resources (reeds) for their traditional houses, which are known as Mbaru Niang. The study concludes that maintaining a traditional building can improve the comfort of the occupants and impacts positively on the environment by increasing soil quality for land cover wider areas.

Keywords: Natural materials; Reeds; Traditional housing; Wae Rebo

1. INTRODUCTION

According to indigenous peoples, traditional architecture is a form of relationship between man, God, and the surrounding natural environment. It also relates to cosmology, life values, hierarchy, symbols, ornaments, and architectural forms, all of which are manifested in the form of the house. Waterson (1997) explained that the house functions not only as a dwelling—it may even be unoccupied—but also as place of origin, ritual site, and as a place for storing heirlooms. The close association with ancestors can make important houses so sacred and powerful that they become almost temple-like (Waterson, 1997).

The existence of natural materials as raw materials is supported by internal knowledge about society and how the material is employed in house protection, maintenance, and utilization of traditional architectural forms. Often preserved by local traditional communities, this knowledge is mostly based on what is known about the indigenous people's life at that time; unfortunately, there is little supporting documentation. Oliver (1997) argued that "traditional wisdom and lore in a building, using renewable resources and indigenous skills, may still offer

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wisely managed, economically effective and culturally appropriate solutions to the world's housing needs” (p. xxviii).

The natural materials used in traditional architecture are an important part of architectural studies, preserving not only the architecture's traditional physical form but also the construction process. The use of traditional materials has several advantages; first, the natural material's sources are jointly owned by society. Second, they are more environmentally friendly (biodegradable) in decomposing and returning to nature. Third, as the construction joint is not rigid in the peg and tie system, it can withstand seismic and lateral loads. Finally, these materials also symbolize the pride of regional locales.

Provision of raw materials is also inseparable from the role of the community in seeking to rebuild the village tradition. Indigenous society conserves the surrounding environment in order to preserve the materials needed for traditional houses. In so doing, they also indirectly maintain the stability of the environment around the village where they live by using a material that is biodegradable and can be returned to its natural supplements. However, the availability of materials to maintain these traditional houses has become an important issue in many areas in Indonesia because of the lack of raw materials accessible in the surrounding environment. There is a need to map sources of raw materials to understand the relation between the growth rates of these materials and the amounts needed to build houses.

Traditional architecture is one of the riches of sustainability wisdom, undergoing a cycle that must be maintained not only to retain the essence of the spaces in the building itself but also to maintain the surrounding natural environment in support of the built environment. Each phase of the building life cycle requires flows of materials and resources and produces emissions to the environment (Graham, 2003). One important issue that must be addressed is that natural materials also have several disadvantages. First, they are not sufficiently durable and must be replaced every 5 to 7 years. Second, they are considered expensive because of issues of availability. Third, the use of materials in humid conditions can create unhealthy air indoors and fire hazards in the dry season. Additionally, much of the population wishes to leave the area and move to semi-modern houses.

Although apparently simple, every traditional building is characterized by a distinctive construction process and certain traditional technologies that can still be applied at any time, as long as the necessary material is available. Various studies have explained the basic concepts of traditional architecture in Flores: the process of building custom homes and buildings in terms of traditions and anthropology, cultural behaviors and communities, and the natural conditions in the vicinity. This literature can be used for general research or as a source of basic data. The present research focuses on reeds as natural materials used in traditional buildings because the land where it grows lends this material special characteristics. Reeds are often found in the area known as Lesser Sunda Islands or Nusa Tenggara, which the Indonesian Government has also identified as a potential new tourism destination.

In a study of 25 vernacular villages in Flores, Susetyarto (2013) explained the settlement patterns. Using grounded theory, these studies explore the local knowledge that informs Flores Island architecture and the various reed-based roof forms covering traditional houses. The reed roof used in traditional houses in Bena village are typical of the traditional architecture there. As well as its functional characteristics, the roof is the dominant expressive element in many buildings, some of which have no walls (Waterson, 1997). In focusing on this roof thatching, the present study explores why some traditional houses' roofs were changed from natural to other materials.

The reed roof plays a vital role in protecting the environment by virtue of its biodegradable properties and because extraction of the raw material does not consume much energy, as it is

readily available near settlements. By identifying their positive characteristics, the use of local materials can be expected to increase in both quantity and quality, optimizing the impact of sustainable traditional architecture.



Figure 1 Dry reeds as building material

The scope of this research encompasses the characteristics of the natural environment and indigenous settlements and the advantages of using reeds as a building material. The research will also consider structural engineering development and construction exploiting the advantages of these materials in a semi-modern building.

2. METHODOLOGY

Flores Island was chosen as the research setting because it is still rich in settlements whose everyday architecture continues to reflect the traditional approach, with natural resources still widely available in the vicinity. In addition, because Flores has been designated one of the top Indonesian tourism destinations, local values needed to be preserved as the key to the area's identity. The anthropologist Catherine Allerton (2013) built a subtle, cumulative picture of the potent landscape within which Wae Rebo people raise families, explaining how the gradual expansion of scale allowed them to forge alliances, plant crops, build houses, and engage with local values. Antar (2010) described the process of constructing a conical house at Wae Rebo when his team rebuilt Mbaru Niang.

The present study was conducted in the villages of Wae Rebo and Todo in Manggarai (West Flores), where the traditional houses were newer and would be rebuilt, so providing data about the community's knowledge of newer construction techniques. Groat (2002) explained the need to focus on natural settings and issues of interpretation and meaning. Micro research in Wae Rebo and Todo used qualitative methods, supported by a grounded theory strategy and employing an ethnographic approach to address the research questions concerning the use of reeds and natural materials in the traditional architecture of Flores.

Data collection also involved interviews with the architects responsible for the redevelopment of traditional houses in Wae Rebo and Todo, as well as with some of the leaders of indigenous communities. The aim was to explore how they treated nature as a source of raw material for the survival of their traditional houses and the associated traditions maintained over many years. Previous research had already been conducted on the island of Flores, especially in Wae Rebo, to ascertain the distance of sources of natural materials from traditional settlements. Through the interviews, we were able to find out about the quality of the reeds based on

experience (local knowledge) for comparison with the existing literature. We also wanted to map the location of reed plants and to understand the life cycle of reeds near the settlement, and the age of the plants when installed in traditional buildings.

We studied the treatment of the reeds after they were taken from the source and observed the period of construction. We also explored how the elders transferred their knowledge about the reeds and the treatment and about the construction method to younger people in their communities. By seeing how people nurtured the natural environment to grow the raw materials for use in their traditional houses, we were able to understand how this relationship enhanced the ecological value of the indigenous settlements.

3. RESULTS AND DISCUSSION

3.1. General Description of the Traditional Wae Rebo House

"When our homes are endangered, we feel like our ancestors are lost too."

-Fransiskus Mudir, Head of artisans rebuilding the traditional Wae Rebo house

To reach Wae Rebo village, one must travel approximately seven hours by car from the Labuan Bajo, one of East Nusa Tenggara's tourist destinations, followed by a walk of 3–4 hours through the jungle. Residents of Wae Rebo are divided into two communities or groups; one group lives on top of a hill, and the other group (known as Kombo village residents) live in the foothills, where they have been provided with various facilities including schools.



Figure 2 Conical Mbaru Niang house

The conical houses of Wae Rebo are continuous from tip to bottom and are known as Mbaru Niang. This form is common in indigenous settlements in the Manggarai Flores area. Seven houses in this village stand on a field where village people socialize and circulate in the morning and evening. The village has now entered its eighteenth generation, where one generation is 60 years.

Inside the Mbaru Niang house, functions are divided into two elements: Nolang and Ludur. There is no porch inside the cone other than a small cubicle that serves as a between space or foyer before entering the Ludur area, which is used to receive guests and to socialize. Mbaru Niang's orientation is circular; within the interior chambers at the center is a mast called the *bongkok*, which serves as the focal point of the circle plan house. Rising to the floor of the upper layer, the *bongkok*'s body is notched to store food.

In the middle of the house, there is also a hearth, which is the center of activity for the whole family. Quadrilateral furnaces placed behind the main pole are always surrounded by women taking turns to cook or keeping themselves warm. At the top, there is a shelf for firewood. The

fumigating effect of cooking activity means that the firewood dries faster. Uniquely, the rack hanging on the second layer of the house is detailed at the round end to look like a baby's head coming out of the mother's womb. Like most houses in Flores area, those in Wae Rebo were also women's homes.



Figure 3 Furnace inside the house

Over the years, houses in Wae Rebo were slowly replaced by square-roofed houses. Residents admitted that they did not have the money needed to renew the cone houses. The other reason was that materials for the cone houses were difficult to obtain. However, some Wae Rebo elders still knew how to build Mbaru Niang cone houses.

Under one of the New Order's programs, the villagers gradually moved to single houses in the village of Kombo. Unlike in Mbaru Niang, there was no longer a house used communally with other families, which threatened the preservation of this custom. The reasons for this change were poverty and the difficulty of maintaining control, but the inhabitants still wished to preserve this traditional building as a representation of the ancestral.

3.2. Use of Materials

Reeds were the most widely used material for constructing the new Mbaru Niang roof. These could be easily planted around the village and are used to protect open land which would otherwise be eroded. Rhizomes or underground roots grip the barren land, and rapid growth and dense leaf cover provides protection against landslides. Reeds are used after reaching a length of one meter. If the reed is harvested and used as a roof, the rest of the roots and leaves remain and continue to grow.

Following the laws of ecologically sustainable building, resources are consumed no faster than the rate at which nature can replenish them. The reed is very easy to renew because the period of growth and harvest is brief, taking approximately six months from start to finish. As the seeds are spread by the wind, it is fairly easy to see the period of plant distribution. At the end of their useful life, the reeds decay, providing nutrients for the soil and a natural fertilizer for the next reed plantation period.

Reeds cover the entire roof of the Wae Rebo conical house, from the low wall to the top. After preparing a series of strands of reeds in rows, the people of Wae Rebo come together to complete the installation, starting from the bottom and proceeding layer by layer until the end is reached.

3.3. Current and Future Role of Natural Materials in Traditional Housing

Conical house construction in Wae Rebo uses strands of reeds that will last for about ten years, during which time some of the straw layers need to be replaced to survive the weather. Some decades ago, reed plantations were easily grown near the village, spreading across the hills. However, as the reeds became rare, the conical houses began to decrease in number because the availability of material was also declining. One issue often expressed was the difficulty of finding a replacement material for reeds, as they did not grow near enough to the village and were quite expensive. In the past, these materials could be readily obtained, but because the conical houses needed to be renewed continuously over hundreds of years, the village could never grow enough material to meet the needs of replacement.

In recent times, reeds have had to be brought from a distant location called Mules Island, which is located near the village Dintor under the hill of Wae Rebo. Material from Mules Island was considered adequate for long-term use as roofing for the conical house. Unfortunately, although the forest is quite green, there is a lot of cultivation around it, such as coffee plantation, and the need for material to meet the needs of houses was forgotten. If reeds are planted near the village, this will reduce the amount of energy used to pick them and related emissions. When used jointly by the villagers, the reed beds are more environmentally friendly (biodegradable) and easier to decompose and return to nature, so complying with Graham's (2003) building life cycle principles.

In summary, it is important to preserve these materials for ease of use over time to preserve the roof as the dominant expressive element as discussed by Waterson (1997). It is therefore necessary to consider how to optimize the reeds' growth rate and where they are to be grown. In general, these materials should be grown near indigenous settlements to make them easier to access.

4. CONCLUSION

Given the amount of material needed over long periods of time, planting around indigenous settlements needs to be improved. This would also provide a buffer region and would maintain environmental quality more generally. In the years ahead, it will be necessary to designate specific zones in the gardens or indigenous forests in order to meet the land requirements for growing plants as a source of replacement material. Correct treatment of this material will lengthen its lifespan and will enable it to be dismantled and reused for further development. It will also be necessary to find places to grow the reeds so that people can use them for these purposes.

Proficiency in maintaining the natural environment also has positive value for the preservation of traditional buildings. As the main material used in building and maintaining traditional houses in Flores, and especially in Wae Rebo, reeds are an important resource and must be preserved. As a defining feature of local identity, the traditional house is a source of pride for the community and acknowledges the traditional values instilled by the residents' ancestors.

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