熱帯雨林集落における持続可能性を組み込んだ新たな文化遺産 保存システムの開発

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The Development of New Cultural Heritage Preservation Method that Incorporates the Sustainability of Tropical Rainforest Settlement - Case Study of Wooden Traditional Village Bawömataluo, Nias Island. Indonesia

1. Introduction

(1) Research Background

As part of the Austronesian-speaking nations, Indonesia shares a similar history and cultural experiences with its neighboring countries. However, the number of traditional wooden houses has been declining due to various factors, including the introduction of Christianity in the 20th century, the introduction of a rubber plantation and agriculture, which changed land use, post-independence agendas in 1970, the impact of 21st-century tourism, and the forces of globalization. All of these activities lead to a change in lifestyle, migration to bigger cities, and the extinction of local materials because of the change in land use. After the rapid development of human invention, the world also faces other problems such as extreme weather and multiple disasters, and many countries have started to rethink how we create sustainable life that protects the earth from destruction. In Southeast Asia, sustainable living is actually about the basics of our lives, such as our living environment, the food we eat, and the property we use for daily life. The sustainable living is actually a portrait of the local beliefs where human consumes nature in limited amounts, replanting the seeds for the repayment of the consumption, protecting the diversity of the forest by logging control system, keeping the biodiversity of the nature for making sure a balance life cycle, protecting lake and river resources, keeping the harmony relationship between human, spirit and the nature.

(2) Research Aim

This research aims to find the development of a new

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cultural heritage preservation method that incorporates the sustainability of tropical rainforest settlement. This research uses literature and on-site surveys, which were done twice in March 2023 and October 2023 at the Bawömataluo Village, Nias Island, Indonesia. Bawömataluo Village became the case representative for this research because it has the most significant number of traditional houses among rainforest settlements in Indonesia, around 52% of traditional houses are preserved (Atmanti and Uekita, 2023), many cultural feasts and activities related to the human phase of life are still practiced, the villagers still take care of their private forest, more carpenters who understand about ritual and construction phase of omo hada traditional house are still alive compared to other villages, and it featured a complete set of village settlement in Nias Island.



Figure 1. Map of traditional house of rainforest settlement in Southeast Asia

(3) Research Position

Indonesia's wooden architecture, particularly that of Nias, has been extensively discussed by several researchers, including Feldman (1974), Watersoon (1990), and Viaro (1993). Much of the research on Nias Island focuses on the omo sebua (the chief house or big house), which is regarded as a remarkable example of wooden architecture in Asia. The research on Nias omo hada and rainforest has never been conducted, and other research about Indonesia's traditional villages with the surrounding rainforest has rarely been discussed. This research provides renovation data of thirty samples omo hada (traditional houses) located in Bawömataluo Village to find out about the history of renovations, the source of renovation material, rituals during construction and renovation, and the relationship between the rainforest and Bawömataluo villagers. This research also finds out that the dualistic spatial division of the house still appears even after minor modifications, and same native wood materials for specific rooms are repeatedly used for renovation. Furthermore, this research will quantify the materials needed for each traditional house and evaluate the number of trees that should be preserved and utilized to ensure the preservation of the omo hada traditional house for a period of 100 years.

2. Living Space and Renovation History in Bawömataluo Village, Nias Island

Nias Island features distinctive architectural characteristics and is divided into three areas: North Nias, Central Nias, and South Nias. Each area has a tripartite structure consisting of an understructure, a main living area, and an upper structure or roof. Even though they share a similar space function, it has different shapes of floorplans, wall structures, masterplan types, and decorations. Bawömataluo village is located on South Nias Island, where thirty samples of omo hada are taken for on-site survey. The survey activities observe renovation activities and explore the intricate connection between the rainforest and settlement. Thirty houses were selected based on the following criteria: they are inhabited by at least 1-11 people, have renovation records, and included at type A and type B (traditional original and traditional modification), location at the upper hill, has record about their private forest, has renovation, and not a member of gana/ opposition clan and group.



Figure 2. Map of thirty samples of *omo hada* in Bawömataluo village

From thirty samples, it is also revealed that there are six types of *omo hada*. This six types of the *omo hada* are result from the different positions of the social organization in the village, the increased number of the family member makes the house owner modify the house by removing the private space *kolu-kolu* and expanding the back of the house */föröma*, and the other reason is that the family remove the traditional kitchen at the back of the house and move it into the additional reinforce concrete building at the back of the house.



Figure 3. Six types of *omo hada* found in Bawömataluo village

Fafa sifabörö refers to the situation where the bed frame or *batö* at the back of the house is parallel with the bed frame at the front of the house. This means the floor plan of *omo sebua* and *omo tuho* is *fafa sifabörö*. According to customary law *böwö*, it is recommended that the bed frame should be parallel at the back and front of the house. When the back of the house has a bed frame that is perpendicular to the front of the house, it signifies that the house owner has a lower level of paying *owasa*/feasts (Feldman, 1977).



Figure 4. Left : complete *omo hada*, Right : incomplete *omo hada* (not *fafa sifabörö*). Image source: Jerome Feldman, 1977

While according to the interview survey on 2023, the floor plan of *omo sebua* and *omo tuho* is similar because the house owner of *omo tuho* held special and higher position in the village social system.



Figure 5. Renovation activities at the thirty samples of *omo hada*

The field survey also recorded that the third most renovated part of *omo hada* are floor replacement, roof replacement, and add RC building at the back of the house which is detached from the traditional wooden building. Among all thirty samples, they also use similar material for the renovation such as using native hardwood (berua and simandraölö) for the main structure (post), while softer wood are used for supporting structure (*afoa* for wall, *siholi* wood for floor). The construction and renovation activities has similar offerings, price, and materials. From the Figure 6, it is clear that *omo hada* has seven steps of construction. Each phase need *owasa* (traditional feasts and ritual) as the price. If the house owner doesn't have enough rice or pig for the renovation, then maybe the renovation will take longer until the house owner can provide these feasts to the carpenters and other villagers. If all the materials, ritual and pig feast are ready, then one renovation phase needs around 1.5 months for construction only. When talking about the duration for the renovation or construction, Nias people always include the *owasa* (traditional feast) as part of the renovation activities.



Figure 6. Renovation activities at the thirty samples of omo hada

| Table I. | Information | for one pl | hase of rend | ovation ac | tivities |
|-----------|--------------|------------|--------------|------------|----------|
| (duration | n and price) | | | | |

| Information | Price (Nias currency) | Duration |
|------------------------|---|------------|
| 1 phase renovation | pig feast (1 phase of omo hada) | 1.5 month |
| (excluding material | 1 pig/ 4 <i>alisi/</i> 60 kg | |
| preparation and | Lead carpenter (150.000IDR/day) | |
| construction only) | carpenter (100.000 IDR/day) | |
| | 4.500.000IDR + 6.600.000IDR | |
| | 1.5 month (33 days : | |
| | Saturday, Sunday holiday) | |
| | Total : 11.100.000 (carpenters) + | |
| | 4.200.000 (pig price) : 15.300.000 IDR | |
| wood preparation | hard wood 40-50 planks /day : | 1-2 months |
| (cut and distribution) | 1.000.000 IDR | |
| | softer wood :100 planks/day : | |
| | 800.000IDR (softer wood) | |
| | woods usually stored at the ground area | |
| | (arönomo area) | |
| wood preparation | carpenter price is included carving | 1-2 months |
| (drying and carving) | | |

The 30 samples of *omo hada* document the renovation efforts since 1945.From 1945 to 2023, 449 logs are needed to renovate 30 houses. From the image below, it is shown

that *omo hada* use 2.3%-18% number of timbers for the renovation. To build one *omo hada*, it needs around 172 trees in total, while renovation only need 2.3-18% from the total number of log from the whole construction. From the field survey, it is measured that in the span 100 years, one *omo hada* need around 4-31 tree logs for renovation.



Figure 7. Percentage of log materials used for *omo hada* renovation activities

3. Bawömataluo village and The Rainforest

One aisle in Bawömataluo Village is called ndrölö halambawa because it is said that before making the Bawömataluo settlement, there was a forest full of halambawa trees. Also, ndrölö bagoa and rava/simandraölö are said there were many simandraölö and bagoa trees which are famous as a material for making Bawömataluo King's hat. Bawömataluo Village is also surrounded by forest which has diverse native trees used for building their traditional house omo hada. Some of the special trees that are used for construction of omo hada are berua, afoa, maöla, siholi, manawadanö, simandraölö, and gitö (rubber tree). These are the types of soft and hardwood. In every omo hada sample for this research, the house owner always says they have their own kebun. In bahasa/Indonesian language, kebun literally means small private garden. But for Nias people, kebun means their own private forest which is located around 500 m - 7 km from Bawömataluo Village, and it is a heritage from their family (see Figure 8). This private forest is also called as *tanah ulayat* which means it is land owned by Indigenous people who live in the area. Tanah ulayat/customary land was mentioned in Indonesia Law No. 5 of 1960 on Basic Agrarian Principles and Basic Agrarian Law (UUPA).

Both Indonesian laws recognize the existence of *tanah ulayat*.



Figure 8. Map of the private forest of Bawömataluo village.

The interview with all carpenters in Bawömataluo Village gives the writer new information about the rules for cutting down the trees at their kebun/private forest. South Nias people use a lunar calendar system (see Figure 9). The lunar calendar system is especially used for cutting down the trees and to protect the quality of wood planks. The rules for cutting down trees are as follows: lunar calendar, leaf, and ocean tide observation. Lunar observation is a crucial way to observe nature, and it is believed to be a good sign for cutting down trees. There are a total of 15 phases of the moon, and the 15th phase is the full moon. The 9th to 15th phase is a good time for cutting down the trees. The 9th phase is called simejiwa, 12th phase is called talina böhö, 13th phase (perfectly round shape) is called faofulo and 15th phase is a teo'sebua or full moon. For softer wood, the 13th phase/faofulo is a good time to cut simandraölö and siholi trees. The 15th phase is a good timing for cutting down hard and special wood such as berua, manawadanö, and afoa for traditional house construction. The three types of hardwood are usually used for beam, column, floor, wall, and door materials. The ocean tide is also important factor for wood cutting. The low tide phase is considered favorable for cutting trees because when the tree contains less water, the wood quality is better. Conversely, the high tide can adversely impact the wood quality during manaba eu/wood cutting activity due to the higher water content in the tree. If we cut the tree at the wrong time, the dried planks will be half-split and cannot be used for building components. Last, the tree leaf guides the carpenter for good quality of wood. When the leaves become brown or drier than usual, it means that the leaf has matured, and it is a good sign for the wood cutting process. It is said that the above rules for tree cutting are necessary to keep the quality of the wood. If the villagers cut the trees arbitrarily, they will get poor wood quality, and it will be a waste to cut the trees that have been growing for a long time. The rules above also help the Nias people to protect their natural resources because there are many considerations before using the resources around them.



Figure 9. Graphic of the connection between villagers, moon, and wave tidal.

4. Conclusion

This research highlighted the pressing issues faced by Indonesia, including the rapid decline of traditional wooden rainforest settlements and the lack of recorded data on preservation activities. To counter these challenges, this research draws on a combination of literature and site surveys to provide a comprehensive solution. The site surveys have yielded valuable insights and findings, which are summarized and presented in the following sections :

(1) The sustainability preservation in the wooden traditional village of Bawömataluo

This research found out that the availability of native trees is the most important part to preserve the traditional wooden house *omo hada*. From the survey, every sample of *omo hada* has their own private forest or it is also called *tanah ulayat* which was a heritage from their ancestor. One hectare of private forest can hold around 450 native trees which, in every 50 years, have the potential for hardwood materials for renovation activity while 15 years for the softer wood. After 50 years old, the hardwood is tall, wide, and mature enough to be cut, while the softer wood needs 15 years to be mature. The field survey recorded that the house renovation took place from 1945 to 2023, spanning 100 years. In total, 449 (156 hardwood and 293 softwoods) logs are needed for the entire renovation construction. Each traditional house, *omo hada*, requires approximately 2.3%-18% of logs for renovation, which is around 4-30 log woods. Upon calculation, it has been established that the renovation of thirty traditional houses necessitates 449 log woods, equivalent to 4.9 ha of land containing softwood trees and 3.5 ha of hardwood trees. Should the renovation be required for 100 years, the village that has 136 number of traditional houses, would need to allocate approximately 38 hectares of forest, comprising 2035 log trees.

Table 2. The number of tree logs, and forest area needed for *omo hada* renovation of thirty samples in 100 years span

| Information | softwood | hardwood |
|--|--------------------|-------------------|
| Log for renovation (30 samples of <i>omo hada</i>) | 293 logs | 156 logs |
| Cycle of wood | 60 trees/ 15 years | 45 trees/50 years |
| Forest area (ha) needed for 100 years span renovation | 4.9 ha | 3.5 ha |

(2) Model Plan of Future Sustainable Preservation for Rainforest Settlement

This dissertation underscores that the core element for sustainable preservation is the *omo hada*, which encompasses local materials, traditional techniques, skilled carpenters, and the involvement of the village community. Here's an explanation of each key element:

a. Omo Hada

The omo hada, or traditional house, serves not only as a home for daily activities but also accommodates homestays for tourists. These houses are deeply interwoven with the lives of villagers, fostering a sense of ownership and responsibility among all members of the household. The flexible spatial arrangements within *omo hada* allow for modifications that support homestay services. The ongoing use of *omo hada* is crucial; if left vacant, these structures are more susceptible to damage and deterioration. In contrast, regular occupancy helps to ensure their preservation and vitality.

b. Village Community

The Village Community The village community plays a vital role in maintaining the intangible heritage, including organizing cultural feasts tied to construction and renovation activities. Central to this process is the *orahu*— a meeting space for discussing important topics. During these gatherings, decisions are made regarding the types of

materials to be used, the quantity of logs required, and the sources of the wood. Community members possess knowledge about which types of logs are suitable for specific parts of the house, a skill passed down through generations as they worked with their grandparents in private forests. This education fosters an understanding of local tree species and their availability, crucial for planning future renovations.

c. Carpenter and Traditional Techniques

Carpenter and Traditional Techniques Carpenters in the community continue to employ traditional techniques for tree cutting, often guided by the lunar calendar to select the best times for harvesting. Interviews conducted as part of this research provide insight into the construction and renovation processes of the *omo hada*, alongside preparations for cultural feasts. It is noted that the use of the lunar calendar is integral to their practices, ensuring that the selected wood enhances the quality and longevity of the structures.

d. Local Materials

The use of local materials is paramount to the integrity and quality of the buildings. For instance, hardwoods are essential for the primary structural components, while softwoods are utilized for additional elements like walls, facades, floors, and furniture. This reliance on locally sourced materials not only supports the durability of the *omo hada* but also reinforces the connection between the community and their environment.



Figure 10. Model plan for future sustainable preservation system

The first long-term aim of the research is for ethnic groups in Indonesia to have a highly developed indigenous culture that is much more resistant to foreign influences and can uphold their ethnic identity over an amazingly long period of time. The second long-term aim is to find the connection between the whole Austronesian wooden architecture and be able to preserve the other similar wooden housing types of the Austronesian language-speaking countries for a long period of time. The resilience of traditional communities in rainforest settlements also means that they are able to preserve some of the traditional rainforest settlements, and Indonesia's young generation can visit the masterpieces of their ancestors. The local wisdom, tangible heritage, and some of the intangibles in Nias island contribute as one of the living heritages that help Indonesians and Austronesian-speaking language countries understand the roots and history of their ancestors. The rainforest settlement community also helps us learn from our ancestors how to live responsibly and protect our mother earth.

5. References

- Anderson, S. 1999. "Memory without Monuments: Vernacular Architecture." *Traditional Dwellings and Settlements Review* 11 (Fall): 13–22.
- Atmanti, F. P., & Uekita, Y. 2024. Preserving tradition: the role of community customs and sustainable practices in traditional house preservation on Nias Island, Indonesia. *Journal of Asian Architecture and Building Engineering*, 1–21.

https://doi.org/10.1080/13467581.2024.2431303

- 3) Atmanti, F. P., and Y. Uekita. 2023. "Adaptive Reuse of Vernacular Architecture for Conservation in Indonesia: Case Study of South Nias Village, Bawömataluo Conservation Project." Asian Culture and History 15 (1): 64. https://doi.org/10.5539/ach.v15n1p64.
- Atmanti, F., and D. Aiko. 2020. Indonesia Indigenous Knowledge Series 1: Structural Genius. Yogyakarta: Tananusa (MES56 Studio).
- Beatty, A. 1992. Society and Exchange in Nias. Oxford: Clarendon Press.
- Feldman, J. 1977. The Architecture of Nias, Indonesia with Special Reference to Bawomataluo Village. PhD diss, Columbia University.
- 7) Krieger, J., and D. L. Higgins. 2002. "Housing and Health: Time Again for Public Health Action." *American Journal of Public Health* 92 (5): 758–768. <u>https://doi.org/10.2105/AJPH.92.5.758</u>.
- Viaro, M. A., and A. Ziegler. 2006. *Traditional Architecture of Nias Island*. Nias: Yayasan Pusaka Nias.
- Widodo, J. 2010. "Urban Environment and Human Behaviour: Learning from History and Local Wisdom." ASEAN Conference on Environment-Behaviour Studies, Sarawak.

https://doi.org/10.1016/j.sbspro.2012.04.161.