

Folajikusesurabi Traditional House

Study as An Environmentally Friendly Housing

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Abstract— The exploitation of natural resources and the environment these days, which only prioritizes economic growth, has given degradation of other elements of development such as the environment. As a result, environmental conditions shift to a threat to the results of development itself. Then came the green movement that not only to protect natural resources, but also sought to streamline energy to use and minimize environmental damage. This reflects the attitude of people who are increasingly concerned about the environment. In general, it can be said that heading towards an environmental friendly building is measuring the impact on the outside environment, while helping to improve the environment inside.

Folajikusesurabi traditional house as one of the vernacular buildings, visually proved to be one of the environmentally friendly buildings, this can be seen with the use of building materials as a whole from the natural environment / natural potential in the area. In addition, the traditional house Folajikusesurabi does not use natural resources that are not renewable or fabrication material

The expected benefit of this research is to introduce the traditional North Maluku architecture as one of the solutions in the construction of environmental friendly houses. The approach method that used in this research including literature studies from various sources by emphasizing on environmental friendly dwellings, as well as direct observations to the research location by conducting interviews with resource persons at the research location.

Keywords—*Environmentally Friendly, Fola Sowohi Traditional House, Natural Resources*

I. INTRODUCTION

The issue of environmental friendly architecture caused by the problem of global warming and environmental damage that has occurred lately cannot be only reduced by efficient energy usage efforts, but there must have other efforts that support the usage of natural resources as a whole by preserving natural resources.

Based on data from the World Green Building Council, around the world, buildings account for 33% of CO₂ emissions, consume 17% of clean water, 25% of wood products, 30-40% of energy usage and 40-50% of the usage of raw materials for construction and operations. [1]

The concept of energy saving on buildings must begin with the selection of the location of the land where the building will

be taken place and the selection of the right material that is suitable for the local climate.

Architecture design with emphasis on problem solving of local climate, regardless of the type of climate including the tropical climate, will naturally use energy saving. Even so, in line with the development of science and energy. Energy saving in buildings that have adapted to the local climate can still be improved. Generally, people who interpret tropical architecture are only limited to how the building can protect the wearer from the rain and the sun (two climate factors that are best known as tropical climate features, but this is not enough). With the aim above an architectural work that uses roof as well as traditional forms of Indonesian architecture are considered to meet the requirements of tropical architecture. Although not necessarily true. [2]

Nowadays, regions in Indonesia actually have procedures for building houses and housing traditionally which is an application of environmental friendly development, especially for Gurabunga Village, Tidore Kepulauan City, related to the existence of the Folajikusesurabi traditional house as one of the traditional houses in North Maluku. In relation to the application of environmental friendly development, the existence of the traditional house needs to be considered and reviewed as one of the basic forms of an environmental friendly architecture, and an environmental friendly house.

Folajikusesurabi traditional house as one of the vernacular buildings, visually proved to be one of the environmental friendly buildings, this can be seen with the use of building materials as a whole from the natural environment / natural potential in the area. In addition, the traditional house Folajikusesurabi does not use non-renewable natural resources or fabrication materials.

II. LITERATURE REVIEW

Environmental Friendly Principles. There are several approaches to design buildings that are environmentally friendly, including recognizing the location of the house. This step questions how the quality of the environment is around and how possible the quality of life will be achieved. Awareness of the location conditions will be very important in an effort to obtain environmental friendly buildings, both in the framework of building renovations, buying new homes or

building houses from scratch. The second, is to consider the size of the building.

Primitive building forms are not only the result of the strength of the physical environment but are a consequence of various socio-cultural forces. Those who act in broad terms. In turn, climate conditions, construction technology, and available local materials act as modifying forces while socio-cultural forces are the main determinants. The hypothesis is based on the fact that the reason for the large number of types of houses is almost unexplained in the context of relatively few types of climate, limited amount of material, or other physical factors, but can be clearly explained by looking at the type of house in a particular society as an expression of an ideal environment that reflects world view of the general public and way of life. Focus on this hypothesis, it connects primitive and vernacular buildings with lifestyles, beliefs and desires. [3] For architects, designing environmental friendly buildings is actually a process. The goal is not to make a perfect building, but to create a better building.

Buildings can be categorized as environmental friendly buildings if they meet the following criteria, namely: [4]

- Using environmental friendly building materials.
- Equipped with facilities and infrastructure for the conservation of water resources in buildings.
- Equipped with facilities and infrastructure for conservation and diversification of energy.
- Using materials that are not ozone-depleting substances in buildings.
- Equipped with facilities and infrastructure for managing domestic waste water in buildings.
- Equipped with garbage sorting facility.
- Paying attention to the health aspects of building occupants, among others:
 - Performing a clean air circulation system;
 - Maximizing the use of sunlight.
- Equipped with facilities and infrastructure for sustainable site management.
- Equipped with facilities, facilities and infrastructure to anticipate natural disasters.
- Building materials usage that are resistant to climate or extreme weather high rainfall intensity, dryness and high temperature

Eco-architectural planning guided by nature as a pattern, with the following requirements: [5]

- Adjustment to local nature
- Save natural energy sources that cannot be renewed and save energy usage.
- Maintain environmental sources (air, soil, water).
- Maintain sources and improve natural circulation.
- Reducing dependency on systems of energy centers (electricity, water) and waste (wastewater, waste).
- Residents participate actively in designing, construction and maintenance of housing.
- Closeness of workplaces and settlements.

The possibility of occupants producing their own daily needs.

- Using simple technology

There are 13 principles of sustainable architecture include: [6]

- Small Is Beautiful

The trend lately has been toward huge mansion-style houses. While these might fit the egos of those who purchase them, they don't fit with a sustainable life style. Large houses generally use a tremendous amount of energy to heat and cool. This energy usually comes from the combustion of fossil fuels, depleting these resources and emitting greenhouse gases and pollutants into the air. Also, the larger the house, the more materials go into its construction; materials which may have their own environmental consequences. A home should be just the right size for its occupants and their activities.

- Heat With The Sun

Good passive solar design will provide just enough sunlight into the rooms to be absorbed by the surrounding thermal mass (usually masonry materials), so that the heat will be reflect back into the room when the sun goes down. The thermal mass is a kind of "heat battery" that stores the warmth, absorbing it to keep the room from getting too hot during the day. Equally important to thermal mass is insulation (such as straw bales or crushed volcanic rock) that will keep that heat inside. Thermal mass materials need to be insulated from the outside, or else they will just bleed that warmth right back out. A rock house might have tons of mass, but be uncomfortably cold because of this energy bleed. So a good solar design will utilize materials of the right type in the right places, blending thermal dynamics with utilitarian design.

- Keep Your Home Cool

Usage of stability of the earth's temperature to moderate the thermal fluctuations of the house. Digging into a south-facing hillside to build, or berm the north part of the house with soil, you can take advantage of this. The part of the house that is underground needs to be well insulated, or the earth will continually suck warmth out of the house.

- Let Nature Cool Your Food

In the past people relied on pantries and root cellars to help keep produce and other provisions fresh. Ice boxes made way for refrigerators, which are obviously much more convenient, but somehow the usage of cool pantries and root cellars also fell by the wayside. Cool pantries can store some product, but also other foodstuffs and kitchen supplies can be kept there. Cool, dry storage is the best way to preserve most food.

- Efficient Energy Consumption

There are many ways to conserve the usage of fossil fuel. Using the sun, wind, or water to produce electricity is one of them. Many appliances use

electricity by just being plugged in (known as phantom load)

- **Water Conservation**
Radical conservation approaches include diverting gray water from bathing, clothes washing and bathroom sinks to watering plants; catching rain water from roofs and paved areas for domestic use and switching to composting toilets. These can be very effective and save means of water conservation if done carefully to avoid bacterial infestation. Landscaping with drought tolerant, indigenous plants can save an enormous amount of water.
- **Local Material Usage**
There are several benefits to use local, indigenous materials. For one, they naturally fit into the "feeling" of the place. For another, they don't burn as much fossil fuel to transport them, and they are likely to be less processed by industry. An example of building materials found in our corner of Colorado would be rocks, sand, adobe and scoria (crushed volcanic rock).
- **Use Natural Materials Using Simple technology**
Use the material contained inside to reduce pollution caused by human activities and activities that can damage the environment
- **Save The Forest**
Wood is ostensibly a renewable resource, we have gone way beyond sustainable harvesting and have ruined enormous ecosystems. Wood usage as decoration. Cull dead trees for structural supports. Use masonry, straw bales, papercrete, cob, adobe, rocks, bags of volcanic rock, etc., instead of wood. Unfortunately it is difficult to get away from lumber in making a roof, so consider making a dome from materials that can be stacked. Domes are also more energy efficient and use less materials for the same space as a box. A conventional straw bale house only diminishes the amount of wood used by about 15%
- **Recycle Materials**
If the materials already exist, you might as well use them, because by doing so you are not promoting the creation of more of them. You might also be keeping them out of the landfill, or keeping them from being transported for further processing. Wood that is kept dry does not degrade much, nor does glass. All kinds of things can be used in a house. We're using old metal wagon wheels to support the window openings in our earth bag home.
- **Long Lasting Building**
It's a new trend in society that an old house might will be replaced by a new one. Unfortunately, this happened because of shoddy construction or poor choice of materials, or lack of maintenance. A good quality house can last for centuries.
- **Grow Your Food**

Why don't ask your house to help nourish you? With all of that south-facing glass, you might as well devote some of it to a greenhouse. Herbs and salad greens can be grown year round.

- **Share Facilities**
A basic sustainability is to share what you have with others. Doing this can diminish the need for unnecessary duplication of facilities. In this way a group of people can not only have fewer tools or appliances or functional areas, but at the same time they can have available a greater variety of these facilities. This benefits both the environment (through less industrial activity) and the individual (by providing more options for living.)

III. RESEARCH RESULT

A. *Local Wisdom in Traditional Architecture*

The history of the occurrence of architectural work in the past at first made use of the availability of nature as a place to shelter from the influence of climate by living in caves, rocks or trees. It is seen that occupancy is a direct part of the nature of their dwelling. [3]

Nowadays architecture is present, not a unity of nature, but as an insertion in nature. In this case, architecture can consider itself as part of nature or not at all. Architecture even behaves alien to nature and does not care about the environment.

In architectural and cultural relations, traditional houses in Indonesia are seen as a form of adaptation strategies for nature such as earthquakes through engineering construction structures (connection systems and pedestal) with exploration of local materials (stone, wood and bamboo. [3]

Local wisdom in the traditional house of Gurabunga village is very visible in terms of the shape of the house, the material usage, the shape of the plan, the division of the area and the use of simple technology.

The description related to the existence of traditional houses Folajikusurabi (5 clans + 1 sowohi), especially for 5 traditional houses (based on clans), has similar functions and plans, where the manufacture of traditional houses, especially related to size, is using human size and proportion (male or female), by using the soles of the feet, the hands and fathoms (the size of the fingertips to the shoulders / armpits). The shape of the traditional house is four square and consists of the main building which functions as a blessing house in the ruang puji (Praise Room), Sarabi (Serambi), Konora Room (R. Tamu), and Jiko Room (Bedroom) while the kitchen building serves as an activity of service to the family there is a dining room, kitchen room, warehouse and bedroom.

B. *General Overview of Kalurahan Gurabunga*

Kelurahan Gurabunga is located in South Tidore District, Tidore Islands Regency, the distance from the city center is around 6 km. The journey to Gurabunga village can be reached by car or motorbike. The surrounding nature is a plateau, surrounded by mountains which includes four kinds of mountains including, on the west of Kiematubu mountain, to

the south of Mount Kieici, to the north of the Mala-Mala mountain and Gumira mountain, from a distance it appears to the east of the Halmahera archipelago stretching with natural charm exquisite.



Fig. 1. Map of Tidore Island. (source : RTBL Kota Tidore Kep. 2016)

According to the monograph data obtained from the village office, the area of the village of Gurabunga is 4.46 Ha with a height of 680m above sea level with rainfall reaching 21 mm / year, so this area is a cool and very fertile area with various plants.

Two ways to establish the basis of ecological thinking / eco-architecture, namely: learning from past precedents or vernacular architecture, and second, applying new building technology. One external architecture that can be used as a precedent in environmentally friendly architecture, is the traditional architecture of the Fola Sowohi Traditional House.

D. Fola Sowohi's Custom House Review

The custom house in the Gurabunga region, Tidore is a traditional home built and used in the same way since generations of Soa Sowohi (Village Leader). By local people this house is called "Folajikusesurabi" which can be described as follows:

- Fola: Home
- Jiku: Angle
- Surabi: Porch / Patio



Fig. 3. Fola Sowohi Traditional House. (source : author. 2017)

So "Folajikusesurabi" means home living porch / terrace with four corners called Mabuku. The emphasis on Jiku or Mabuku (four corners) is not detached from the influence of Islam (there are four restrictions on inner and religious living).

The influence of religion is very important for the Gurabunga village community in making Folajikusesurabi houses. The most powerful influence is Islam which is reflected in the four corners or Mabuku as the boundary of the field. The four corners meeting with the four pillars are considered to have resembled the shape of a mosque. Another influence is the influence of Animism. For activities that are supernatural in nature, a special building is located adjacent to Folajikusesurabi's house.

Gurabunga village has five traditional houses (Folajikusesurabi) which are divided according to each clan as follows:

- Fola Sowohi, means the home of the Tidore customary leader
- Fola Tosofu, means the home of a leader who controls (Tasauf)
- Fola Toduhu, means a leader house that controls the sea
- Fola Mahifa, means the home of a leader who knows (Marifat)
- Fola Tosofu Makene, means the home of the leader who controls (Tasauf)

The distance between the five traditional houses of Folajikusesurabi is not too far away and can be reached on foot. The shape and size are the same. But there is a slight difference when viewed in terms of material. The purpose of the traditional house of folajikusesurabi is that it is a supernatural treatment activity and performs magical worship activities (supernatural forces).



Fig. 2. Map of Gurabunga Village. (source : Gurabunga Village Office. 2017)

C. Fola Sowohi's Custom House Review

The custom house in the Gurabunga region, Tidore is a traditional home built and used in the same way since generations of Soa Sowohi (Village Leader). By local people this house is called "Folajikusesurabi" which can be described as follows:

As is usually the case with people now building houses, people used to build houses in almost the same way, starting with the foundation, walls and then roofing. This also happens in the construction of traditional houses, only in its construction is still bound by the customs and traditions of the community that must be done in order to succeed in building the traditional house. Tradition means a habit that is carried out in the same way by several generations without or very few changes.

The habit becomes an unwritten rule when houses are built or begin to be built. Habits or traditions include, for example, determining a good day for the founding of the foundation, placing four pillars (Mabuku), installing roofs and taking building materials, determining the right direction where the house should be facing, the use of shapes, colors, motifs and decorations, what offerings must be sacrificed and what prayer or incantation must be read.

In principle the five traditional houses were used for treatment where Gurabunga was a place of treatment for the family of the Tidore Sultanate. The process of replacing Souwahi, who is also the head of treatment for the family of the sultanate, was carried out with an adat process. Where Souwahi candidates will sit following traditional rituals. Those chosen to be Souwahi are people who are possessed by spirits where the person will clearly explain the Souwahi lineage and can predict the fate of others who follow the ritual process.

The tradition itself has the legal power that is respected by everyone with mutual agreement. Likewise, the "traditional house" can be interpreted as a house built in the same way several generations. (Amos Rapoport (1969).

E. Ecological Approach to the Construction of Fola Sowohi Traditional Houses

Code of making custom house Fola Sowohi Custom House, as follows:

- Foundation (Dofamakaliuku)

Starting with digging the soil. After the excavation is complete, then proceed with the installation of the stone for the foundation then set up. The stone is arranged in accordance with the form of the predetermined plan. On its side (porch), a staircase / entrance is built. Other stairs / entrances are in the dining room. Stone times between 20 cm -80 cm.

In the past, the staircase was only in the form of bamboo, because it was not feasible for the designation, the stairs were replaced with concrete stairs. There are several traditional houses that have used cement mixes for foundation construction. The floor is only a heap of land with different floor heights. The room that is considered important is given a higher floor than the other room. As a base for placing the main pillar, flat stones were placed after the stone was completely arranged.

This baseboard is called Sogoli which forms the corner of the house. The bamboo that is placed at the bottom is called Goamadini, which functions as a checker for the walls of space and as a sloof. The tip of Goamadini is drawn to form

an excavation called Gapa. For each meeting / end of Goamadini at the top and bottom, Gapa is always made. The pole placed on top of Sogoli and inserted into Gapa is called Ngasu, which functions as a column. These four pillars are called Mabuku as a reflection of Islamic Architecture. The corners that have been given wooden poles are then tied with palm fiber. This palm fiber rope gives the impression of a natural, simple, beautiful, repetitive rhythm / shape and creates an authoritative impression.



Fig. 4. Goamadini functions as a binder for the walls of space and as a sloof. (source : author. 2017)

- Wall

The walls are made double (seeetto / biretetto) with the aim of preventing the influence of unfavorable environmental / natural conditions and enemies. The walls are made of bamboo of various sizes. The whole bamboo stands upright called Jaro, which lies above Goamadini that Gapa has made. A medium-sized Jaro with holes every 30 cm to 60 cm to enter by Jaha.

The distance between Jaro and each other is approximately 30 cm to 50 cm. Jaha is a bamboo hemisphere which consists of two hemispheres with a horizontal position from the bottom up with a distance between 30 cm to 60 cm. Jaha is inserted into Jaro's hole to pinch Teto. Teto / Bireteto is a bamboo that has been chopped to form a slab or sheet with a width of 20 cm

30 cm. Unified slabs or sheets are called Lirang. The location is parallel to Jaro, consisting of two layers of bamboo skin and each facing out and inserted between the two Jaha. Tuja / Support is a bamboo that is cut in half and placed across each wall that has been installed and then tied with palm fiber.

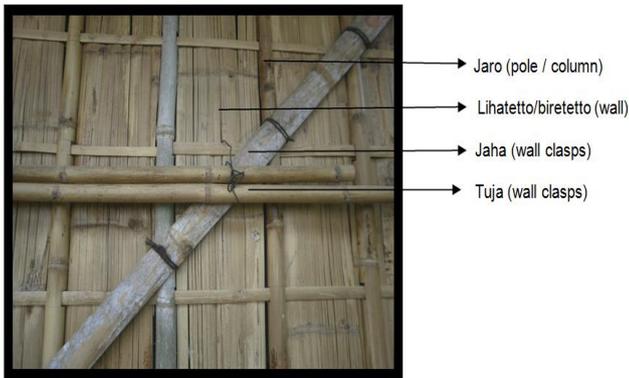


Fig. 5. Wall Construction. (source : author. 2017)

• Roof (Dubo)

Construction of the upper part of the house is called Gaokaluguti, has the characteristic that it does not have an easel pole, so that the upper part is open and spacious while the roof itself is made of katu (a kind of sago palm leaf). The ceiling arrangement consists of :

- Saru, made from bamboo sheets that function as ceilings.
- Ao, is a bamboo beam clamping saro sheets.
- Gaomada, is a bamboo that clasps and supports Gaomaden.
- Dolulu, as ring balk as well as retaining from Ao (Gaomada above)

What is typical of this traditional house is that the floor of the house is still using the land. This is meant that the land functions to treat skin diseases for those who want to seek treatment.



Fig. 6. Ceiling Construction. (source : author. 2017)

This can be illustrated that since a long time ago we have known the profession house where the division of the function of the room is adjusted to the function of the house, choosing and preparing bamboo material as the main ingredient of house construction so that it is not easily weathered is to leave the bamboo dry, then use accordingly with the function of each type.



Fig. 7. Custom House Material. (source : author. 2017)

F. Analysis of the Fola Sowohi traditional house as an embodiment of an environmentally friendly home

The construction of the Folajikusesurabi traditional house as an environmentally friendly house, at least assessed four requirements including;

- Healthy, in terms of health itself, planning the Folajikusesurabi Traditional House is a healthy house that has a good relationship with its environment related to water, air, soil, climate and solar heat (energy) and surrounding flora and fauna, so as to provide health optimal in both physical and psychological occupants.
- Strong enough and safe, from a technical perspective, Folajikusesurabi Traditional House uses the right building materials (natural materials), which can provide security for the occupants, and the use of these natural materials ideally does not cause such a large environmental impact, other than that can also be renewed and recycled if possible.
- Relatively affordable, in terms of economic capability and social affordability, natural building materials used in the construction of Folajikusesurabi Traditional Houses are easily accessible to local people.
- Pretty beautiful and comfortable, in the sense of having a good design, as a combination of the three conditions above, which can meet the needs, both taste and other dimensions of humans.

Based on the eco-friendly principles previously mentioned, it was combined into several points, and analyzed whether the traditional house of Fola Sowohi was environmentally friendly based on it, as follows.

TABLE I. THE CONCEPT OF APPLICATION OF THE FOLAJIKUSESURABI TRADITIONAL HOUSE AS AN ENVIRONMENTALLY FRIENDLY HOME

Concept	Explanation	Traditional Architecture Folajikusesurabi	scale
Small is beautiful	A large house, requires more energy to adjust the temperature in the room. In addition, the larger the size of the house, the more material is needed. Houses should be in accordance with the needs of the number of residents and their activities.	The concept of occupancy in the Folajikusesurabi traditional house is for the main building there should be no additional number of rooms. This can be seen from the equation of the floor plan and the function of the traditional house in the Gurabunga Village. Married family members are provided with land around the main house	+
Heat with the sun	Too hot or cold inside the house, not good for the health of the occupants. Using the right building material, not storing heat, or allowing the sun's heat to break through the building just like that, must be avoided	The use of bamboo material that is not manufacturing as a basic material for the manufacture of residential houses is the sun's heat absorbers besides that it also forms buildings that cross the direction of the wind, maximizing natural air	+
Let Nature Cool Your Food	Root cellars can store large quantities of produce from the time of harvest until the next summer. Cool pantries can store some produce, but also all manner of other foodstuffs and kitchen supplies can be kept there	Because Indonesia has a humid tropical climate, warehouses on the ground can store crops such as: rice, vegetables for a long time because there is good ventilation in the warehouse above the ceiling so that air and sun can keep food dry	+
Be Energy Efficient	There are many ways to use fossil fuels. The use of sun, wind, or water to produce electricity is one of them. Another thing that can be done is to use water and detergents which are more efficient for washing, replacing lighting with energy-saving lamps.	Generally, Folajikusesurabi traditional houses use rabbits (clay stoves). The use of natural lighting and natural ventilation, characterized by the position of the building that transverse the direction of the wind and the rotation of the sun.	+
Conserve water	Most people in the world use between 10-25 L of water in 1 day. In fact, it might take only 1/10.	The Gurabunga village which is located at the height of Mount Kie Matubu is a fertile area so it is not surprising to find various kinds of fruits and types of ornamental plants. Because it is located in a mountainous area that has a dense forest as a place for the growth of clove and nutmeg trees which are the result of community commodities, it can also be an area of water absorption. The Gurabunga Village community generally uses wells as a source of clean water	+
	There are several	The main material of the	+

Concept	Explanation	Traditional Architecture Folajikusesurabi	scale
Use Local Material	benefits to using local, indigenous materials. For one, they naturally fit into the "feeling" of the place. For another, they don't burn as much fossil fuel to transport them, and they are likely to be less processed by industry.	traditional house of folajikusesurabi is bamboo which is still widely found on the island of Tidore with a roof using sago palm leaves.	
Built To Last	Development in a long period of time so as not too often builds that can cause energy to be depleted	The age of Folajikusesurabi traditional houses is estimated to be hundreds of years. Since a long time ago, the condition of the traditional house of Folajikusesurabi still used wall materials from bamboo, ground floors and without electricity and was maintained until now	+
Share Facilities	A basic tenet of sustainability is to share what you have with others. Doing this can diminish the need for unnecessary duplication of facilities. In this way a group of people can not only have fewer tools or appliances or functional areas, but at the same time they can have available a greater variety of these facilities.	Another function of the traditional house of Folajikusesurabi is that apart from being a residence, it can also be used as a place of treatment for various diseases that are difficult to treat medically, and the treatment process is carried out by Sowohi Kie Matiti or what is called the traditional leader of the Tidore City community.	+

IV. CONCLUSION

The existence of traditional architecture is currently no less interesting with modern architecture today, so it is necessary to realize a building by displaying traditional architectural features but not only physical appearance or an impromptu culture but featuring an architectural figure characterized by local culture

The usage of bamboo, grain and rumbiah (katu) material as the main construction in the construction of this traditional house, allows local production or building materials around the site to be utilized according to needs while supporting the local economy of the local community, and the use of these materials also has a more carbon footprint low from imported (fabricated) material, besides that, the selection of natural building materials is adjusted to age and always carried out planting and maintenance so as to avoid the exploration of excessive natural resources (sustainable development).

Of the five traditional houses, Folajikusesurabi, where fola sowohi is one of them, has the same size. In making a house, the comparison of size according to the local community uses the size and proportion of humans, namely by using the soles

of the feet, the arms and hands (the size of the fingertips to the shoulders / armpits) of men and women. Conventional house construction can actually adopt one or all of the criteria for environmentally friendly homes. when planning and building a new house, or even when renovating an old house. Whatever the project, every step towards an environmentally friendly home is a step towards a more environmentally friendly future.

The tradition itself has the legal power that is respected by everyone with mutual agreement. Likewise, the "traditional house" can be interpreted as a house built in the same way several generations. [3]

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