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## SUSTAINABILITY CONCEPT: **CULTURAL BASED METHOD IN BUILDING GURUSINA SAO** IN FLORES-NUSA TENGGARA TIMUR

Khotijah Lahji<sup>1</sup>, Agustin Rebecca Lakawa<sup>2</sup> Architecture Department, Faculty of Civil Engineering and Planning, Universitas Trisakti <sup>1</sup>email: khotijah@trisakti.ac.id <sup>2</sup>email: agustin@trisakti.ac.id

#### Abstract

Traditional house (Sao) in Gurusina Flores is a building designed based on local wisdom by considering the concept of cultural sustainability, the balance of ecosystem (human and nature), and the concept of green building. One of the aspects that becomes the basic concept of environmentally friendly architecture and affects sustainability of a building is the concept of building a traditional house. This study aims to find the concept of sustainability applied by the Gurusina community as they build their houses through traditional cultural aspects that are believed to be inherited through the concept of inner space hierarchy, the space form, and the construction system. The research method is conducted through field measurement. observation. and interview. The results of this study reveal that traditional community of Gurusina implemented the concept sustainability in the form of cultural sustainability which has been applied in the phases of building Sao from planning, development and design, as well as construction. Nevertheless, sustainability aspects of the balance in ecosystem, the health and comfort and the waste reduction should also be taken into account in order to achieve the concept of total sustainability.

Keywords: Sustainability. Vernacular, Traditional house, Gurusina Sao

#### INTRODUCTION

#### 1. Background

The concept of sustainability traditional community is often expressed in the form of civilized treatment to the surrounding environment. One of the most obvious treatments is how the people build their houses as comfortable and safe ones. Traditional houses are those which represent a particular group of people that were built in accordance with the traditions and rules that were applied and passed on from one generation to the next (Yudohusodo, 2007). Thus, traditional house is a representative of the way of life, the economic, social, and environmental conditions of the neighborhood (Chee, 2009) along with the growth of culture in the society. Traditional houses were built with the attention to the usefulness and function of social and cultural meanings behind the design or style of buildings developed that were in certain communities (Yudohusodo, 2007).

Nevertheless. the development of traditional house is still highly sectoral and less dependent on systemic and ecosystemic approaches (CIB Kemenpera, 2013), prioritizing on shortterm outcomes to meet the quantity of inadequately sheltered housing needs (CIB in Kemenpera, 2013), ignoring the prospects of long-term sustainability as holistically and comprehensively possible that has caused environmental disharmony (CIB in Kemenpera, 2013), so that it can affect the natural damage or extinction of local wisdom that has been retained (CIB in Kemenpera, 2013). In order to minimize the possible damage, the elders of traditional community continue to uphold the principle of ecosystem by balancing between human being and nature. They are fully aware that the construction of traditional houses has partially fulfilled the principles of sustainability through although traditional cultures. sustainable aspects of traditional settlements are still lagged behind from the present concept (Lahji et al, 2016).

The discussion on this paper highlights how Gurusina community in Flores, East Nusa Tenggara accommodates the concept of sustainability in building their traditional houses. The Gurusina people employ existing materials around their neighborhoods, define building structures, and select specific processes in determining the shape of spaces within their traditional houses (Lahji et al, 2016). This community is concerned with the rules of tropical situation when implementing the process of building a traditional house by applying local representative cultures as а preserving Gurusina traditional culture.

#### 2. Gurusina Traditional House

Traditional house (Sao) in Gurusina Flores is a house that is designed based on local wisdom by paying attention to the concept of tropical architecture. The construction of traditional house is a stage or stilt house built to respond to micro environments and to be used as a safe and comfortable protection. The hierarchy of space in all traditional

houses is composed horizontally from the outside to the inside, which consists of several spaces i.e., Loka (yard), Wewa (transitional space from outside to the inside), Teda Wewa (terrace), Teda One (living room), and One (main room or private space). The other spaces are Wewa Sao, Lago Sao, and Kolong. All of these spaces are used to accommodate all the owners activities of the traditional houses.

Tropical rules are particularly perceived, among others, by using a wide/high angle to construct a roof shape in order to reduce heat-gain inside the space. Vertically, the component of Sao as part of space structure is divided into three parts, i.e.; roof (zeta ulu), wall (zeta wekki), stilt floor (zale wekki), foundation and wood column (zale wa'i) as can be seen in Figure 1. The vertical and horizontal structural systems of Teda one and Teda wewa are separated from One (Figure 1). One is first constructed elsewhere, resembling a cube shape. After the construction is completed, One is then assembled on top of the stage construction i.e., column (leke) and beam (ledha) which stands on the foundation of stone pedestal (ture).

The elements of Sao consist of: (1) floor which is made of bamboo (najah) and composed of flat-board that has a cavity with a thickness of 1 cm, and assembled

#### LITERATURE REVIEW

### 1. Sustainability Concept

Sustainable development is a physical

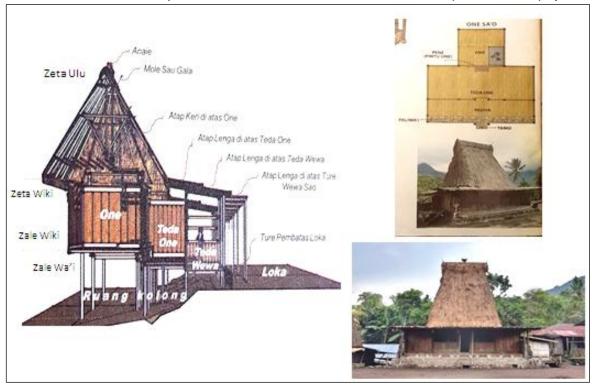


Figure 1. Space elements and the construction of Gurusina Sao (Source: Authors; Susetyarto, 2013)

on the framework of coconut wood, (2) a wall of wood-board measuring 3x30cm arranged vertically between wooden frames, piles, and beams are hardwood (fai wood and oja wood) with an average size of 18x18cm; (3) roof consists of wooden frame (ladolewa) with the dimension of 8x14cm and kasau (puja soku) with 5x7cm size covered with alang-alang grass (keri) in a thickness of 25-30cm. The shape of Sao roof is a small limasan topped with a height of 5.3m, roof cover is made of alang-alang leaf-folds arrangement to provide smoke outflow because in One there is a furnace which is always ignited.

form that integrates cultural, technological, and ecological aspects to achieve the balance of quality built environment. During the life-cycle, buildings require energy, water, and materials that will produce both solid, liquid, and gas waste. This has a negative impact on the environment, so the concept of sustainability will be able to reduce energy, water, materials, and waste in order to maintain the balance on the environment (Yodelson, 2009).

Sustainable design creates a space for humans, healthy and worthy environment both socially and economically, as well as culturally (Edwards, 2010). Therefore, sustainable concepts can be created through green aesthetic concepts that take

consideration the ecological and responsive values to natural systems (Edwards, 2010). The concept of green aesthetics (Figure 2) consists of five

into account the health, safety, and comfort aspects of its inhabitants (Greenship, 2013).



Figure 2. Sustainability Concept of Gurusina Sao (Source: Edwards 2010: 17-23)

aspects that can achieve sustainable development (Edwards, 2010: 17-23) and can be summarized into three main aspects: (1) Considerations of social and cultural ecology, (2) Natural oriented design, (3) Community based planning/Participatory planning. These three main aspects can be used as guidande to help the research team in finding aspects of cultural sustainability at Gurusina Sao as can be seen in Figure 2.

Currently, the impact of global warming and climate change as a result of massive exploitation in nature, is not followed by long-term rationale with the maximum sustainable concept ecologicy to improve nature, so that the negative impacts on nature can be avoided (Kemenpera, 2015). This longterm rationale pattern should socialized to all parties or stakeholders jointly take responsibility preserving ecological development both physical and non-physical/socio-cultural.

The building process with the concept of sustainable development aims to build environmentally friendly buildings that can minimize negative impacts by taking

#### 2. Sustainable Construction

The Regulation of the Minister of Public Works and People's Housing no: 05/PRT/M/ 2015 on the Implementation of Sustainable Construction emphasizes that sustainable construction is an approach starting from the awareness of the construction sector to the importance of sustainable building (Kemenpera, 2015). This has been described by CIB or Counseil International du Batiment or International Council for Building (Kemenpera, 2015) which can be seen in the framework below (Figure 3). Based on the framework, the definition of sustainable construction is all activities undertaken at each stage of the life-cycle of the building. These phases start from planning to deconstruction which always consider the use of resources in terms of land, materials, water, energy, and ecosystem. The scope of framework on the implementation of sustainable construction covers all stages of the lifecycle of the building, including the construction phase.

A series of sustainable construction of green building concept is used as an effort to connect the sustainable concept.

The concept takes place in empirical experience, through the assessment of aspects of green building aimed at fulfilling a green building concept from planning and implementation, to operation and maintenance (Greenship, 2013).

The assessment system is grouped

to construction stage. These stages examine aspects of cultural sustainability such as participatory planning and construction, natural protection, cultural/local wisdom, land selection, the balance in ecosystem (health, comfort, and security), and waste reduction (Figure 3).

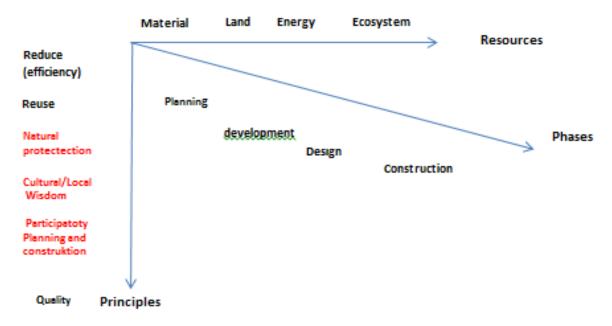


Figure 3, Implementation of Sustainable Concept of Gurusina Sao (Source: CIB in Kemenpera, 2015: 26)

based on 6 categories, i.e. (Greenship, 2013: 6-7): (a) Land use, (b) Efficiency and Energy Conservation, (c) Water conservation, (d) Source, Cycle, and Material Efficiency, (e) Indoor Health and Comfort, and (f) Environmental Management Building. The latter two aspects are part of the ecosystem. The green building aspect of the discussion in this paper is limited to the aspects of appropriate land use and ecosystems. Based on the concept of sustainability framework and sustainable material aspect (Edwards et al, 2012, Greenship, 2013; CIB in Kemenpera, 2015), it can be concluded that the implementation of sustainable concept of Gurusina Sao are the phases of constructions starting from planning stage, development and design

# 3. Traditional and/or Vernacular Concept

The term 'vernacular' is a linguistic one, it is quite different from the term 'traditional'. Vernacular architecture can be said to be 'the architectural language of the people' with its ethnic, regional, local 'dialects' (Oliver, and 2006). Whereas, the term 'tradition' refers to the result of local culture in the form of 'procedure and object materials' (Noble, 2014) that have become accepted as norm that contained knowledge and understanding to construct the building (know-how). This knowledge concerned with the transmission of skills and educative process and are passed on from one group to the next (Oliver, 2003; Noble, 2014). The knowledge that was passed on to another generation was mostly in the form of oral langauge such as; stories, poems, songs without any records of written forms, design, drawing as the basic of the architectural design (Oliver, 2003; Turan, 1990). This is applied in building the traditional house of Gurusina village in which the knowledge was based on stories that was transmitted orally in the form of knowledge, instruction, and procedures of how to build the house (Noble, 2014). The villagers maintain the knowledge and understanding on how to construct and build the traditional house by using materials from the local environment based on the exact grips and rules that cannot be transformed (Turan, 1990). Furthermore, vernacular architecture embraces the entire filed of tribal, folk, peasant, popular, and informal sectors of the urban building; it includes the collective wisdom and experience of the society concerned, and the norms that have become accepted by the group as appropriate to their being environment (Oliver, 2006; Turan, 1990).

As а cultural product, vernacular is architecture influenced bγ environmental factors, such as: geographical, geological, climate, and temperature; technological factors, such resource management, building technical skills; cultural factors, such as: philosophy, perception, religion and belief, social, economy, and family structure (Altman, 1980). All forms of vernacular architecture are built to meet specific needs, to accommodate values, economies, and ways of life of the cultures that produce them in order to be sustainable (Altman, 1980). Rapoport (1969)claims that vernacular architecture is formed based on six modifying factors, i.e.,: materials,

construction method, technology, climate, land selection, and sociocultural. These factors represent the concept of sustainability which at the same time can also be considered as sustainable architecture.

#### **METHODOLOGY**

This study is qualitative in nature by using field survey of the relevant aspects coupled with interviews to the occupants of Gurusina Sao and other significant figures or the member of lima pade about the cultural concept of sustainability in building the traditional house. The data survey was based on field observation of the architectural characteristics of Gurusina Sao. The methodology of this study consists of several stages:

- The selection of Gurusina traditional house was merely based on the consistency in preserving and implementing local wisdom in terms of building Gurusina Sao which relies heavily on cultural sustainability (Edwards, 2010).
- The data used to determine the indicators based on the phases in building Gurusina Sao (CIB in Kemenpera, 2015).
- The data from the interview is used to measure the local wisdom in terms of culture in the development of Gurusina Sao (Rapoport, 1969; Oliver, 2006).
- 4) The phases in building Gurusina Sao were measured by using three principles of sustainability, i.e. natural protection, land selection, and balance of ecosystem (CIB in Kemenpera, 2015).

#### **RESULT AND DISCUSSION**

# 1. The Development Process of Gurusina Sao as Part of Cultural Sustainability

Several factors supporting sustainability in vernacular architecture have been revealed by some experts (Rapoport 1969; Altman, 1980; Turan, 1990; Oliver, 2003, 2006; Noble, 2014) among others are materials, construction, technology, climate, land selection, and sociocultural. The construction phases of Gurusina Sao support the sustainable culture of Gurusina community which has been implemented and maintained as part of the process of cultural sustainability. The leaders in Gurusina have implemented the traditional phases in building Sao for generations. Sao development involves the whole community of indigenous village, either in ritual ceremonies or in implementing the construction. The construction of Gurusina Sao consists of three phases, namely planning, development and and construction design, (CIB Kemenpera, 2015). These three phases will be discussed in detail in the following sections.

#### 1.1. The Planning Phase

Implementation of sustainable concept (Figure 3) at the planning phase begins with the discussion conducted by several parties such as traditional prominent leaders. villagers, construction experts (Lima pade), and families. At this stage, traditional community has examined appropriate land use (Greenship, 2013), among others by: (1) selecting proper land; (2) determining easy access for vehicles and pedestrians; (3) manipulating macro climate i.e., temperature, wind, rainfall, and (4) recovering environment as an effort to protect nature.

The Lima pade that coordinate the constuction of Sao have implemented appropriate land use aspects in the process. It starts with the search for a strategic location in a high-elevated area with a house construction on stilts so that the traditional village is safe from fellow opponents and animals that may attack. In addition, the location of this village is taken into consideration i.e., the ease of access, both from outside and from within the village which is equipped with Loka as a center of orientation and as a center of traditional activity of Sao community. Loka also serves as the





Figure 4. Siteplan of Kampung Gurusina (Source: Authors)

space for drying the agricultural products and as a means of interconnecting circulation with the other opposite sides. The concept of interconnecting is an implementation of the concept of green building (Greenship, 2013) which can be seen in Figure 4 as the site plan of Gurusina Traditional Village.

The next stage is the ritual ceremony of local cultural customs in the form of *Tau Sao* which is the process of implementation strategy in building *Sao*. This includes the determination of three-dimensional space size and the selection of materials. This stage is the initial stage of *Sao* design process by considering the custom rules in building the traditional house, one of which is the source of clean water installation.

Traditional people drain water to each of Sao in the village by employing gravity and soil contours, so the water supply is assembled without energy. Nevertheless, household wastewater and rainwater have not been well-managed so that there are some areas that are flooded with wastewater or rainwater.

## 1.2. The Development and Design Phase

The second phase is the stage of development and design. This phase

follows up the results of the discussions at the first phase marked by the second ceremony of Basa Taka (blood vessel) on the equipment to be used for cutting wood as the construction material. Furthermore, the third ritual ceremony is Lamu sobho or Wela kaju utu one woe as the cutting stages of wood. After the wood is being cut, the dimensions of the wood are determined by size according to the rules that have been applied for generations. The next ritual is the fourth ceremony which is Wela ngani Sao as the cutting or splitting stage of wood as the main material in constructing One. Wood preservation effort with simple technology is done by cleaning, drying, and straightening wood. This activity requires 2-4 weeks to perform followed by the fifth ritual ceremony that is Dedha Ghane.

The traditional leaders arrange the spaces in Sao based on the prevailing rules which consist of One as a sacred space interpreted by the form of a high roof. The roof with a high slope angle is the response of the wet tropical climate with high rainfall so that the rain will flow easily. Teda one roof becomes one with One roof as a result of the decrease of bamboo in Gurusina area. The roof of Teda wewa is bamboo (lenga) with a gentle slope and with a one layer arrangement. This is a sign that this

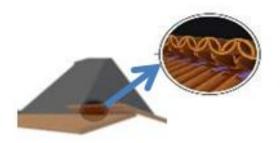






Figure 5. Hollow bamboo as the additional layer to reduce heat transmission in *Teda wewa* (Source: Authors)

space is a public space whose value of sacredness is under *One* and *Teda one*. The angle roof of *Teda wewa* space is 10%, consequently the temperature in *Teda wewa* space becomes hot and uncomfortable (Lahji 2016). Thermal comfort in *Teda wewa* space can be restored by using a hollow two-tiered bamboo roof construction as can be seen in Figure 5.

#### 1.3. The Construction Phase

The construction phase of *Sao* begins with the building of *One*. *One* is in the cube-shaped with the dimension of approximately 3.6-4 meters as the most sacred space (Figure 6). *One* is usually built and assembled elsewhere earlier than the other components, it is not constructed at the location where *Sao* will be constructed. This activity is

event of a natural disaster (wind and earthquake).

The seventh ritual ceremony is marked by the completion of One construction, namely Sao nuka nua/Kali Sao. This activity is done by traditional community in the form of chicken blood splash on One (Wusu) pile. Then, the construction of One wall that has been completed is assembled together by the community of traditional village on the stage construction of Leke and Ledha which stands on the foundation of stone (Ture) on the location of Sao. This whole activity is called Tere pudha. The process of assembling the One elements in detail can be seen in Figure 7, whereas, the assembling of One with other Sao components i.e. the Teda One, Teda Wewa, and Wewa spaces can be seen in Figure 8.

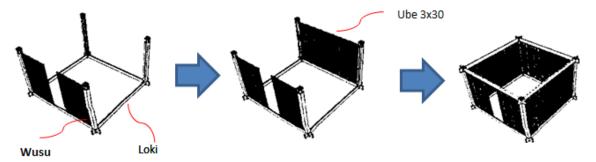


Figure 6. The Process of Assembling One (Source: Susetyarto, 2013)

marked by the sixth ritual ceremony that is Kobo Sao/Sapi remi that is threading the One wall in the form of wooden planks tucked into wooden blocks (loki), without nails. The connection system of One shows that the system and the support of the basic elements are joints and rollers. This indicates that the Lima pade have applied structural systems that are responsive to natural conditions (environmentally friendly). This connection system will keep the building firmly on the Sao structure even in the

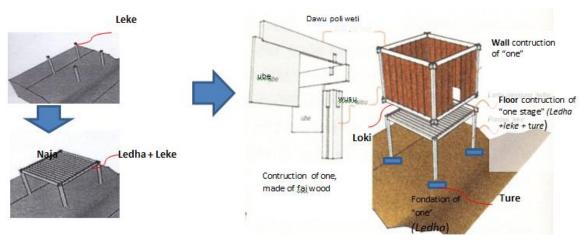


Figure 7. The process of laying One on the stage construction (Source: Susetyarto, 2013)

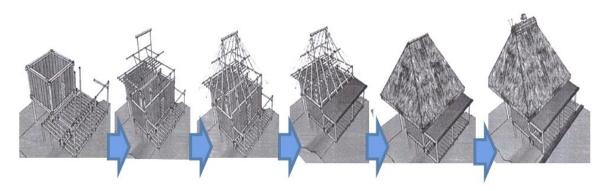


Figure 8. The Assembling Process of Sao Components (Source: Susetyarto, 2013)

## CONCLUSION RECOMMENDATION

AND

The Gurusina people pay special attention to the tropical principles when implementing the process of building a house. This community strongly upholds the ancestral knowldge by considering the harmony with nature and continues to perform some traditional ceremonies. Thev also consider the selection of land settlement based on local traditional criteria as well as the balance of ecosystem between human and nature. They are fully aware that the construction of traditional house has partially fulfilled the principles of sustainability through traditional cultures, although the sustainable aspects of traditional settlement are quite left behind when viewed from the present concept (CIB in Kemenpera, 2015).

The concept of sustainability in Gurusina Sao has undertaken several phases of development. The procedures of Sao development are still implemented by Gurusina traditional people. Lima pade Sao development leaders important role in conducting the ancestral ritual process representing the cultural preservation efforts. Traditional people consider the maximum use of natural aspects, and take into account the balance of ecosystem traditional village and health, security and comfortable environments. This has been done when traditional community begins the development stage of Sao i.e., from the planning phase, development and design phase and ended with the construction phase of Gurusina Sao.

Nevertheless. the development traditional village comprised of several Sao, has not been able to treat liquid waste and to improve the forest ecosystem as a source of local material, thus requiring additional knowledge for the local community. The knowledge in question is related to the concept of sustainability, namely the treatment of liquid waste and reforestation. Knowledge in the form of simple technology can be done by creating a pool of liquid waste storage in a pond so that it can be used as a duck breeding or freshwater fish. Similarly, rainwater treatment with biopori and absorption wells is an alternative to avoid water puddles at Loka.

In addition, to enhance thermal comfort in Teda wewa space, roof construction technology can also be introduced by adding the roof thickness into two layers of hollowed bamboo without segments. By doing so, that bamboo can be used as part of the environmentally friendly roof construction (Figure 5). It is therefore, necessary to have a traditional cultural heritage management system of Gurusina that can record and document all cultural traces and regulate all these processes in writing. It is hoped the document can be introduced and socialized to the general public so that Sao development process can sustainable which will not be replaced by other cultures which come to Gurusina traditional area.

#### **ACKNOWLEDGEMENT**

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