

# Sustainability Of Building Elements in Bidayuh Traditional Longhouse Construction

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## Abstract

The traditional longhouse is facing challenges in maintaining the sustainable concept, form and antiquity of the building elements. Nowadays, the traditional longhouse is faced with demolition where it needs to give way to the construction of the single dwellings. Not only that, the existing traditional longhouse struggles to maintain its original concept and antiquity while it struggles with modernization. Thus, it is important to understand the sustainability of the building elements of the traditional longhouse in terms of space concept, layout, materials and method of construction. Later, the preservation of one of Sarawak's unique architecture will become possible. A study has been conducted to identify the sustainability of the building elements in Bidayuh longhouse and its relevance in the present and future construction of the longhouse. From the case study that focus on Bidayuh longhouse located at Serian area in Sarawak, Malaysia, the building elements of the Bidayuh longhouse which still stand the test of time will be obtained.

*Keywords:* Building Elements, Conservation, Sustainability, Traditional Longhouse

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## 1. 0 Introduction

Longhouse can be described as a village under one roof that consists of several apartments, a long covered gallery with a 'street' between the apartments and the gallery and an open veranda (Beynon, 2013). A longhouse is unique since a whole village community is living just under one massive roof in just one row while sharing some parts of the longhouse. Not much community in the world still has this unique lifestyle as compared to the Dayak community in Sarawak which still strongly practice this lifestyle although the longhouse is undergoing modernization. The longhouse may look like row of terrace houses but the significant aspect is the intimate relationship between the dwellers and the presence of the long gallery or known as *ruai* in Iban that serves the function of a multi-purpose hall. The longhouse dwellers may share some part of the longhouse but the privacy between the apartments is still being maintained (Patterson & Chiswick, 1981). Longhouse had been a signature building to the Sarawakians especially the Dayak community. Besides Dayaks, the Melanau community also practices the longhouse lifestyles but abandon it in this modern time. The Dayak community can be divided into three groups that are the Iban, Bidayuh and Orang Ulu (Chang, 2004). Those groups are further divided into subgroups depending on the dialects and locations. Among the Dayak groups, the Iban still strongly practices longhouse lifestyle while Bidayuh tends to leave the traditions where they more choose to live in single dwellings (Chang, 2004). The design of the longhouse depends on the structural organization of the community. Iban and Bidayuh whose are egalitarian community have smaller and less decorated longhouse while Orang Ulu and Melanau whose are stratified society tend to have bigger, wider and decorated longhouse (Winzeler, 2004; Ting, 2005; Morris, 1991).

## 1.1 Methodology

This paper will further discuss the traditional Bidayuh longhouse with its sustainable features where it has the potential to promote green construction with eco-friendly materials. The study focuses on traditional Bidayuh longhouse in Serian area since some villages in Serian still maintain traditional longhouse with only minimal modernization. The findings include how the longhouse materials can be considered as energy saving and classified as green materials. From the study it was also found that the longhouse design promotes the green concept thus complying with the four principles of sustainability; environmental, ecological, economic and societal (Glavic & Lukman, 2007).

## 2.0 Longhouse and Sustainability

Generally what we can understand about sustainability is the ability to maintain the ecosystem and the environment with the way we develop a place, wise use of energy and good planning of resources that positively impact the society and economy. Sustainability principles include four area that are environmental principles, ecological principles, economic principles and societal principles (Glavic & Lukman, 2007). In terms of environmental aspect, sustainability can be achieved by reducing the usage of hazardous materials and minimize waste production to the environment by reusing and recycling the waste materials (Glavic & Lukman, 2007). It is important for the industrial players to properly disposed their hazardous materials so that it would not harm the environment that indirectly harm the society. Under the ecological principles, it is about having a balanced relationship with the natural ecosystem where both will achieve mutual benefits from the action. It is about our smart utilization of the natural resources and energy such as oil and gas, electrical energy, coal and timber. In order to achieve economic sustainability, it is a must to reduce the cost, efficiently using the resources while increasing the quality but at the same time having less impact on the environment (Glavic & Lukman, 2007). It can be referred to any economy sector either products or services. Under societal principles, it is our, the society's responsibility to keep the environment in balance conditions, protect the environment and prevent future destruction to the environment. Thus, this paper will discuss how traditional longhouse construction can promote sustainability based on the four principles namely environmental, ecological, economic and societal.

The traditional longhouse is one good example of sustainable building and living concept. From its architectural concept, materials, and function show the strong relationship between longhouse and sustainability. Traditional longhouse promotes the use of environmental friendly materials and its concept leads to energy saving. This is due to the nature of the traditional longhouse which fits with the lifestyle of the past where electricity was unavailable. The unavailability of electricity caused the builder of the traditional longhouse to design it in such a way that it can provide cool room temperature and allow natural air to freely flow within it. The longhouse itself comply with all the four principles of the sustainability whereby it uses less harmful materials, energy saving, affordable materials but good in quality and the society tend to preserve nature as much as possible. The materials can be said of good quality due to the long life of the longhouse and the durability of the ironwood that are used to make the stilts and main posts of the longhouse (Chang, 2006). For example, Kpg Mujat longhouse that was built at the end of the 1950s still exists until today. The stilts, wall, and main posts still maintain although some other features have been replaced such as the zinc roof. However, the main challenges faced by the traditional longhouse is modernization where some modern materials introduced to the longhouse had reduced the sustainability value.



Figure 1: Left, the long gallery or *awah* still in traditional form. The floor made from split bamboo. Right, modernization occurs at the apartment section of the longhouse, especially in the kitchen and backyard area. Materials such bricks and concrete are used to replace timber and bamboo. Image Copyright, Victoria (2015).

### 2.1 Traditional Longhouse using a Sustainable Design

Longhouse is a massive structure that housed up to hundreds of people under one roof. Its concept is equal to one ordinary village (Sim & Khan, 2014). Although longhouse is very long in terms of length and may use a big space to build it, it still can save a big area of land used to build a sprawling village. Everything is centred in the longhouse from community hall to the residential area where it is available under one roof. Longhouse consists of apartment units for every family (*bilek, ramin*), covered long gallery (*ruai, awah*) and open veranda (*tanju*). If the longhouse has two to three floors, the upper floors are known as *sadau* in Iban or *rangah* in Bidayuh. All of the segments of the longhouse have the functions that are the same with what can be found in a village. The long

gallery has the same function with a multi-purpose hall. It can be turned into a meeting place, the place to conduct Christian Sunday Mass, for the wedding reception, a place for festival celebrations and place to meet dignitaries. The long gallery also can be used as a playground for the kids, to do daily activities such as pounding the rice husks, making craft and place for leisure activity such as chit chatting. Even one of the *ruai* component that is known as *tempuan* is equivalent to a street and known as street under the roof. The apartment is a complete home with living space, sleeping space and cooking area with hearth. A long time ago, longhouse had no proper bathroom where the longhouse dwellers need to take a bath from the nearby river. When piping system was introduced to the longhouse, it has an open bath area but the toilet is closed with wood planks. Sometimes two to three toilets are built just a few yards from the longhouse for the use of the whole longhouse. However, nowadays this kind of bath area and toilet are nowhere to be found. Every apartment in the longhouse already has its own closed bathroom and toilet even the one that is still in the traditional form. Uniquely, sometimes one of the longhouse apartments used the front part of it as a mini mart such as in Kpg Sebemban longhouse. Thus under just one roof there are many things from residence, multi-purpose hall to mini-mart. A Bidayuh traditional longhouse actually is not complete without the presence of *tanju*. This open area functions as drying places and to welcome visitors. Sadly, nowadays longhouse does not keep this open veranda and is now being replaced by road or car porch.



Figure 2: No more *tanju* present event in the still existing traditional longhouse and being replaced with a road. Image Copyright, Victoria (2015).

In terms of land use, longhouse construction is more land savvy than a sprawling village. A longhouse itself is a complete complex of a village. That is what is unique about longhouse. By this unique feature, longhouse promotes sustainable development and its construction is also eco-friendly as compared to high-rise buildings. Longhouse allows minimal deforestation where its surroundings still naturally blend with the original concept of the longhouse. Not only that, longhouse design also allows energy saving for example it is built on stilts that allow natural air to enter the longhouse which provide good natural ventilation. Bidayuh longhouse floors are made from split bamboo which allowing air to enter the longhouse from below. Not only that some Bidayuh longhouse has opening on the roof known as *kamban* that also allow air movements and natural lighting (Winzeler, 2004). Its high roof helps to reduce solar gained with the application of low thermal materials as roof coverings such as timber shingles and palm thatch. It is proved that by having openings on roof, wall and floor allow air movements speed from 154 to 173 mm/s as compared to have an opening only on the wall which the air speed is only 21 to 57 mm/s (Kristianto *et al.*, 2013). The air speed also depends on the height of the stilts whereby a house with higher stilts will receive high wind velocity (Kristianto *et al.*, 2013).



Figure 3: Bidayuh traditional longhouse of Kpg Merian Bedup, Serian. Left: Roof flap window or *kamban* can be seen where it functions both for natural lighting and ventilation. Timber shingles and sago thatch are used as roof coverings. The longhouse was completely demolished in the year 2011. Image Copyright, Victoria (2015).

## 2.2 Traditional Longhouse Sustainable Materials

Traditional longhouse materials consist of indigenous materials such as ironwood, light-weight timber, bamboo, sago leaves, and rattan. Due to the unavailability of modern materials such concrete and bricks in the past, timber and other indigenous materials that exists in the Sarawak forest are being used as the main material for the longhouse. The uniqueness of those materials include being eco-friendly and sustainable as compared to more modern materials. Not only do those materials have low thermal mass and are permeable, they also control the amount of heat that enters the longhouse and allow natural ventilation (Ting, 2005). Thus, traditional longhouse does not necessarily need fan or air conditioner to cool down its room environment. Bidayuh traditional longhouse was built from ironwood, bamboo, lightweight timber and sago leaves. What makes Bidayuh longhouse different from the other ethnic is the obvious usage of bamboo as it main materials. For example, split bamboo is used for flooring materials and sometimes for the wall. These permeable materials allow natural ventilation into the longhouse. The longhouse has fewer windows, but the materials permeability ensures that the longhouse is cool.

Bidayuh longhouse has a high pitched roof with timber shingles and sago or palm thatch as its roof coverings. This low thermal mass material does not permit much heat to enter into the longhouse thus providing good shelter from the tropical heat outside. The only problem with sago thatch as roof covering is the need to regularly change the materials due to its lack of durability as compared to timber shingles. Due to that reason, the traditional longhouse that still survives until this day changes the palm thatch and timber shingles to zinc roofing.



Figure 4: Timber shingles and sago/palm thatched for roofing. Image Copyright, Victoria (2015).

## 3.0 Discussion and Conclusion

The traditional longhouse is an iconic traditional building for the Dayak community in Sarawak. However, despite its importance, the traditional longhouse is faced with the threat of either modernization or lifestyle changes. The Iban community still maintains their longhouse lifestyle, but their longhouse is undergoing modernization. Modern materials are used to replace traditional indigenous materials. The concept of the traditional longhouse is still maintained but some elements that do not seem important in this modern time such as *tanju are* being replaced with a car porch or road. Besides that, the longhouse does not look like the traditional one anymore. The design has totally changed but still maintained the traditional spatial concept. Some traditional longhouses are being demolished and rebuilt but in a more modern form. That also happened to the Bidayuh community where they choose to live in an individual house rather than in a longhouse community. The modernization of the longhouse diminishes the sustainability features of the traditional longhouse. The changes in using more modern materials make the longhouse less eco-friendly, energy saving and sustainable. Some modern longhouse did install air conditioner to cool down the inner environment that is not energy saving and with the probability of gas emissions that lead to global warming. Not only that nowadays longhouse are built directly on the ground without having high stilts. The high stilts that allow raised floor to be constructed allow natural ventilation from beneath the floor to the longhouse. The materials of the floor that is air permeable also allow this kind of natural ventilation. However, sadly nowadays longhouses are built using concrete floor which replaces the timber and split bamboo floor. The concrete floor is not air permeable and never allow air to flow into the longhouse interior. When natural ventilation becomes ineffective, then mechanical ventilation is needed which is not energy saving.

Longhouse modernization diminishes the uniqueness of the original traditional longhouse, its sustainability and 'friendly' relationship with nature. Traditional longhouse is always portrayed as a traditional house that intimately blends with the jungle and nature of the traditional Dayak living, but the reality nowadays is quite different where modernization is introduced to the longhouse lifestyle. Some longhouses are even built in luxurious form with modern surroundings and not surrounded by the so-called 'jungle' surroundings. For instance, a longhouse in



Krian, Saratok known as Rumah Katol is surrounded by oil palm plantations. This oil palm plantation has become the new symbol of the economy for the Dayak. Thus, preservation and conservation of the still surviving traditional longhouse needs attention especially from the government before it slowly disappears from the modern generation. In this study, it was found that only a few Bidayuh traditional longhouses that still exist especially within the Serian area. However, this traditional longhouse had undergone some minimal modernization, especially within the individual family apartments. Some existing traditional longhouse partially abandons and in a deteriorating state where anytime the existing dwellers will abandon and have it demolish such as the longhouse at Kpg Rasau and Kpg Paon Rimu, Serian.

As a conclusion, attention needs to be given to preserve and conserve the existing traditional longhouse so that it would not disappear as time passes by. The government bodies, private bodies, and any organization that are related to cultural and heritage preservation should support the conservation of traditional longhouse. Its sustainable features should not disappear. Who knows that one day the uniqueness of the traditional longhouse is being implemented in future sustainable development especially for low-cost sustainable housing. Maybe the durable bamboo that is used in the longhouse construction can be studied further to be used as alternatives to sustainable construction materials where it can be used to replace steel (Atanda, 2015). Who knows further findings on bamboo materials will prove it.



Figure 5: Modern longhouse of the Iban community, Rh Katol, Krian, Saratok. The longhouse using more modern materials. Image Copyright, Victoria (2015).

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