

Physical Evolution of the Last Melanau Communal Dwelling in Kampung Sok, Matu, Sarawak, Malaysia

Salfarina Abdul Gapor ¹, Rahmat Moriat ², Haris Fadzilah Abdul Rahman ³, Muhammad Ariff Mat Saruan ⁴

^{1, 2), 3)} Borneo Regionalism and Conservation Research Centre, University Technology of Sarawak, Sibuan, Malaysia

⁴⁾ Architecture Programme, School of Built Environment, University Technology of Sarawak, Sibuan, Malaysia

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Corresponding author:
Salfarina Abdul Gapor
salfarina@uts.edu.my



Abstract – The Melanau is one of the main ethnic groups in Sarawak. Historically, they lived in a communal dwelling, known as the tall house, designed to protect against the harsh micro-climate condition, wild animals and, enemies. Today, there are no visible remains of the tall house. The only tall house available in Sarawak is a reconstructed replica available at the Sarawak Cultural Village in Santubong, Kuching. However, there is one Melanau communal longhouse located at Kampung Sok, Matu, which has been gazetted under the Sarawak Cultural Heritage Ordinance 1993. The objective of this paper is to analyse the changes that the longhouse has experienced throughout the years. This study employs a qualitative approach through in-depth interviews with the owners of the longhouse. Data are also derived from measured drawings. Findings show that the characteristics of the longhouse are a hybrid of the Iban longhouse combined with the Melanau tall house and later with some Malay influences. This can be clearly seen from the spatial and functional analyses of the spaces as well as the general form of the building. The general form of the building resembles more towards the Iban longhouse, whereas the functional spaces are more towards the Melanau tall house. The 1930s renovation also shows influence from the Malay vernacular architecture through the introduction of change of level and secondary access. The findings also show that vernacular architecture evolves through time due to different needs, influences, and building materials.

Keywords: Communal Dwellings, Matu, Melanau, Vernacular Architecture

I. INTRODUCTION

“Vernacular” is derived from the Latin word *vernaculus*, which means native or domestic and often represents traditional architecture (Oliver, 1997). Traditional architecture is often associated with bioclimatic design, which has been applied in the past due to the lack of modern facilities that can fulfill human thermal comfort, thus making the design rely more on passive approaches to maximise comfort. This is seen as a sustainable design strategy now. It reduces the dependency on non-renewable resources, for example, in achieving thermal comfort through natural ventilation and maximising the use of daylighting (Nguyen et al., 2019). Vernacular architecture is considered more sustainable by using local materials. According to Victoria et al. (2017), some bioclimatic designs are still being adopted in new

designs of vernacular housing, as well as replicated in modern buildings. Vernacular architecture is also believed to be well adapted to local climate and nature, thus embodying a comprehensive local wisdom (Nguyen et al., 2019). Local wisdom or indigenous knowledge used to be perceived as superstitious, nonsense, and irrational by policy-makers and academia. Likewise, these are also the sentiments shared among the built environment experts.

In the past, the value of vernacular architecture has been undermined. For example, according to Sim (2010), vernacular architecture has a negative and pejorative connotation, which is commonly described as simplistic, unrefined, and undeveloped. According to Hourigan (2015) vernacular in architecture used to be linked with terminologies like primitive, traditional, folk, “ordinary,” or “every day” that denoted as “non-pedigreed” and lack novelty architecture in contrast to monumental buildings. However, there has been a growing interest in documenting and promoting vernacular architecture for its inherent values and, in some cases, as tourism commodities. Bernard Rudofsky defines vernacular architecture as “architecture without architect” (Hourigan, 2015). Frank Lloyd Wright described vernacular architecture as a “folk building” that was designed to respond to society’s needs and its environmental context (Hong Kong Institutes of Architects, 2012). This is also supported by Salgie et al. (2017) as architecture that responds to the community’s culture, lifestyle, physical and climatic conditions to establish a harmonious relationship between climate, architecture, and people.

Mercer (1972) defined vernacular architecture concerning the traditional form, material, ornament, and society and its unique regional identities as ‘those which belong to a common type in a given area at a given time’ (Mercer 1972, 1). Glassie (1990) also shared a similar view on vernacular architecture having distinct “traditional” elements. Still, he went a step further by linking the tradition to the culture of participation, engagement, and egalitarian political ethics in building the vernacular dwellings. Glassie (1990) further reiterated that vernacular architecture provides a cultural platform to create orderings of experience, provisions of internal spaces to shelter, and help society organize social order. Vernacular architecture is not static but dynamic and evolves through times and may change as hybrid interactions between different internal and external influences by the collective actions of individuals by adapting and transforming itself to new functions and needs (Hourigan, 2015; Sim, 2010; Heath, 2009). The form of vernacular houses in different regions evolved by following their respective cultural settings. Today, they are the outcomes of long-term modification, adaptations, shared experiences, and innovations (Chen, 2007). In other words, vernacular is a process.

The case study of the Melanau longhouse at Kampung Sok, Matu, also shows the evolution of the longhouse, which was significant in 1872, 1888, and 1932 until it was totally abandoned in 2018. As a result of the change in lifestyle and preference towards modern design, the cultural link that vernacular architecture has provided will be lost, with the consequent weakening of the cultural system, causing ignorance and decline in personal empowerment and the sense of belonging and pride in identity.

The Melanau is one of the main ethnic groups in Sarawak, Malaysia, and the fifth largest ethnic group after the Iban, Chinese, Malay, and Bidayuh (Department of Statistic Malaysia, 2010). The majority of them lived in Central Sarawak, especially along with the coastal areas on the west starting from Paloh, Tekajong, Pulau Buit, Tanjung Manis, Jerijeh, Rajang, Belawai, Matu, Daro, Igan, Oya, Mukah, Dalat, Balingian, and Bintulu on the northeast of Sarawak (Refer to Fig. 1). In addition, some reside on river banks, especially along the Rajang River, such as Tanjung, Sibul, and Kanowit. The focus area of this paper is Matu, which is under the administrative district of Matu-Daro and Mukah division.

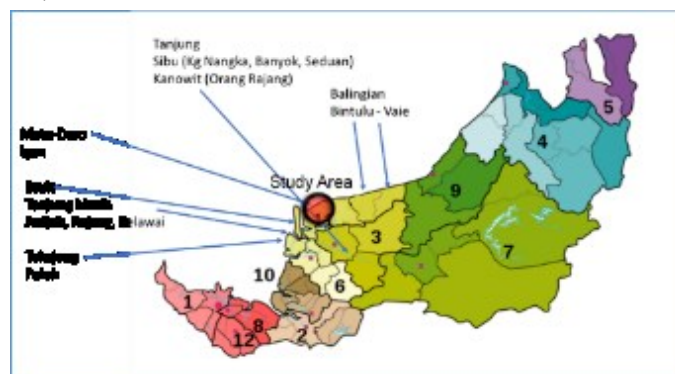


Fig. 1. Map of Sarawak showing Matu-Daro and distribution of the Melanau settlement
Source: Authors (2022)

Like many ethnic groups in Sarawak and Borneo, traditionally, the Melanau lived in a communal dwelling known as the Melanau tall house. In the past, the tall house accommodated families and extended families and was designed mainly for protection against harsh micro-climate disasters such as floods, wild animals, and enemies, especially headhunters and pirates. Among the ethnic groups in Sarawak, the Melanau vernacular architecture has changed dramatically throughout the years due to many factors. This is partly due to increased peace and security, making fewer needs for a “fortress” architectural dwelling design. In addition, dwelling preferences have also been influenced by other ethnic groups, especially the Malays, mainly through marital ties. They have switched their dwelling from a communal to an individual dwelling.

Hence, as it is now, there are no visible remains of the tall house, perhaps only indicated by a tall column in Kampung Medong Dalat and Kampung Tian, Matu. The only tall house available in Sarawak was a reconstructed replica available at Sarawak Cultural Village in Santubong, Kuching. However, there is one Melanau communal longhouse located at Kampung Sok, Matu, which has been gazetted under the Sarawak Cultural Heritage Ordinance 1993 (Sarawak LawNet System, 2007), but this is not the same as the typical tall house. The longhouse was abandoned entirely in 2018. The occupants opted for individual dwellings for many reasons, especially for privacy and facilitating renovation. There were many restrictions regarding social taboos and lack of opportunity for renovation due to site constraint to cater to the increasing number of household members. In Sarawak, it is not common to conserve a dwelling due to ownership issues, especially for a longhouse with multiple owners like the longhouse of Kampung Sok.

Moreover, all conservation efforts now focus on monumental buildings owned by the state government, such as the conservation of forts, museums, and galleries. This has been true in Sarawak and is a global issue in conservation. Efforts to conserve non-monumental buildings such as dwellings are highlighted in the Venice Charter and ICOMOS by setting up the International Committee of Vernacular Architecture in 1976 to support and study the conservation of vernacular architecture by implementing new methods and conservation strategies (Baca & Lopez, 2018).

Considering the challenges to conserving private dwellings, failure to restore and conserve the longhouse will lead to the high possibility that the last Melanau communal dwelling will be gone for good. There is a lack of academic writing on the Kampung Sok longhouse. Most of the writings are available in social media, weblogs, and newspaper cuttings, which focus on the socio-cultural and anthropological aspects of the longhouse. However, this paper focuses on documenting the architectural aspects of the building. In addition, due to the unique features of the longhouse, it is the objective of this paper to analyse the architectural spaces, structures, and elements of this longhouse concerning the socio-culture and examine the changes it has experienced throughout the years. The objective will be achieved by studying the Kampung Sok longhouse’s architectural styles, construction techniques, and/or forms.

In addition, findings from this paper will provide referral points for architects or other conservation teams to be more self-aware, critical of culture, and promote social activism in conservation. According to Glassie (1990), studying vernacular architecture helps capture the historical account and changes of a society. In this case, the study will be able to understand the changes from communalism to individualism and the consequences of the changes, thus providing references for future conservation.

II. METHODOLOGY

This study employs a qualitative approach focussing on epistemological interpretations through triangulation. Data collection is done through in-depth interviews and measured drawing. The study’s objectives are achieved through data collection and analyses, as shown in Table 1.

The first stage of the research includes in-depth interviews with the head of the longhouse and those who used to reside in the longhouse, making the total number of 10 respondents. The data retrieved during the in-depth interview include historical accounts of the buildings, building ownership, occupancy, building condition, architectural elements, building alterations, and usage. Data collected during in-depth interviews also include important factors involved in the process that directed the changes in the longhouse. A historical research method is chosen because it resonates with the study’s objective and quality of exploration. It is chosen because of several advantages. According to Pasha et

al. (2020), historical research methods verify and explain past human activity, subject, or event. The purpose of the historical research method is to find out the unknown, search and identify relationships of past happenings and their links with the present, and understand the human culture (Berg, 2001). Thus, the attributes of historical methods are suitable for examining the origin and dynamic of Kampung Sok longhouse in relation to its occupants' socio-culture, socio-economic, and changes in their aspirations. The historical method also helps explain space's concepts, creation, and transformation in architecture (Ehteshami, 2018).

Table 1. Objectives, Data collection, and Analyses

No	Objective:	Data Collection	Analyses
1	To analyse the architectural spaces, structures, and elements of this longhouse concerning the socio-culture	Measured Drawing	Visual analyses of form, spatial and functional change of use through time
2	To examine the changes, it has experienced throughout the years	In-depth Interview – Historical research method and factors	Thematic content analyses, identifying factors for the changes of the longhouse

Source: Authors (2022)

On the other hand, the case study method is chosen to explain the building's architectural characteristics and physical evolution. It enables the documentation of specific details and information about the buildings since there are limited references and empirical studies of the Melanau communal longhouse at Kampung Sok. The case study method has the ability for a subject, in this case, the building to be investigated in greater depth (Abdullah, 2013). Data of the physical building of the longhouse are derived from measured drawing, observation, and photo taking. These are done mainly to document the dwelling based on its distinct value and spaces.

In-depth interviews are analysed using thematic content analysis. This includes categorizing the data into themes, such as historical timeline and information on the construction of the buildings, indigenous construction and indigenous maintenance methods, dates of major renovations, and social taboos practiced in the dwellings. The data analysis method also used visual analysis. Visual analyses are done by analysing the evolution of existing plans and photographs of the building and spatial area in relation to the historical data in 1872, 1888, and 1932. Visual analyses examine various elements, such as floor plan analysis, structural analysis, and building elements analysis. In addition, detailed space analyses including zoning, hierarchy, and arrangement, are also done. In addition, data from in-depth interviews and measured drawing are also triangulated to investigate whether there are relationship between socio-economic and socio-cultural activities with the design of the dwellings. The triangulation of data from the historical method with a case study helps to strengthen the validity of both data through cross verification from diverse viewpoints.

III. RESULTS AND DISCUSSION

A. Background of the Study Area and the Melanau Longhouse

Matu district is a small coastal town under the administrative control of Matu-Daro District Council, under Mukah Division (Please refer to Fig. 2). There are 20 villages in the district of Matu, and Kampung Sok is one of them. Kampung Sok is a self-contained village with public amenities, such as a kindergarten, *surau*, and primary school, with a population of about 400 villagers (Please refer to Fig. 3). Most of the people in Matu depend on fishing as their main livelihood, especially popular for *toli* shad or Chinese herring (*Tenualosa toli*), known locally as *ikan terubok*. Apart from that, some depend on farming as their livelihood, mainly planting vegetables, swamp rice, rubber, sago, and collecting non-timber forest products. A distinct non-timber forest specialty product of the Matu-Daro area is the production of sekiu oil (*Madhuca motliయా*) and a local handicraft, a conical hat, known as the *s'raong Matu*.

The Melanau longhouse is located in Kampong Sok (Please refer to Fig. 3 and Fig. 4 as indicated by the hatched building). The longhouse faces Kampung Sok River. The longhouse was built using timber from the Belaga area (upstream Rejang River). Belaga is basically an Orang Ulu areas (mainly

consist of the Kenyah, Kayan, Punan, Kajang, Lahanan, Kejaman, Sihan and other sub-ethnic groups). This indicated a good relationship between the Orang Ulu and the Melanau at that time. It was believed that the Melanau was originally from the Kayan ethnic group, but they actually ran away from the attacks of the Ibans to the coastal areas and later called themselves Melanau. The Kayan actually called the Melanau, “*Kayan Lalau*” (the Kayan who run away). There are many similar words used between the Orang Ulu and the Melanau language to support this claim. The timber was brought from Belaga through the Baluih and Rejang River towards Batang Matu and Kampung Sok. However, the Kampung Sok longhouse did not follow the design of an Orang Ulu longhouse. The traditional Orang Ulu longhouse is characterised by changes in level, where the area belonging to the head of the longhouse is slightly elevated from the rest of the households. Furthermore, an Orang Ulu longhouse is ornamented with traditional patterns on the main columns and showcases a large mural painting on the wall entrance of the head of the longhouse’s household, also known as the “Tree of life.” This reflects the importance of social structural ranking in the Orang Ulu’s society, where a person is known through different rankings. Melanau has a similar social structure ranking system. However, the change of level depicting the status of the head of the longhouse and ornamental elements were not manifested in the Kampung Sok longhouse. The longhouse is rather minimalist, similar to an Iban longhouse.

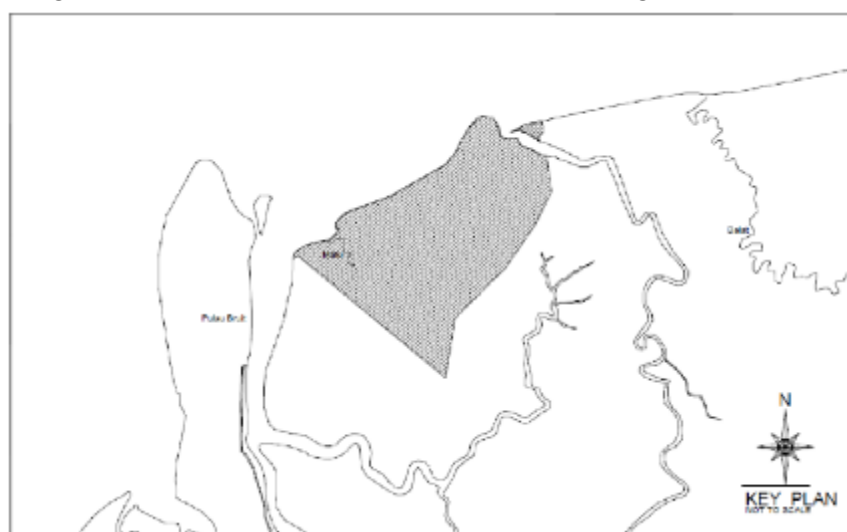


Fig. 2. Key Plan of the Study Area – Matu
Source: Authors (2022)

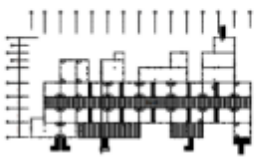
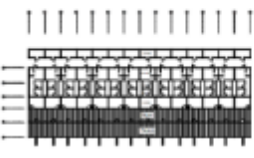
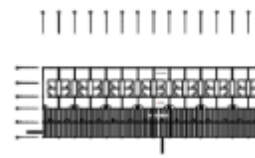
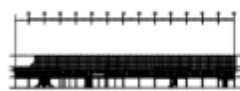
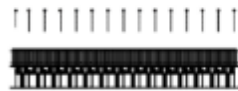



Fig. 3. Kampung Sok Longhouse
Source: Authors (2022)

The external design of the building has similar characteristics to the ethnic Iban longhouse, especially in the shape and form of the building. A traditional Iban longhouse is long and elongated with drying areas (*tanju*) on the front façade, followed by a communal space (*ruai*) and individual households (*bilik*). According to Waterson (2012), despite the fact that most vernacular settlements may seem

different in different ethnic groups, they all share the same physical characteristics (see Table 2). According to Victoria et al. (2017), an average longhouse can accommodate at least 200 people, while a bigger house can hold 500 to 600 people. New longhouses will be constructed parallel to the main house if the community continues to grow. The length of the longhouses is determined by the number of houses, varying from 4 to 50 houses. Besides, the width is at least 4 meters per unit, whereas the average length of the longhouses is 180 meters. These longhouses are usually elevated up to 6 meters on timber stilts. The Iban beliefs also affect their ways of constructing the spaces. For example, the entrances are situated on both ends with carved anthropomorphic faces to cast away the evil spirits. In contrast, the access to the Kampung Sok longhouse is originally from the front part of the house.

Table 2. The Differences Between Kampung Sok Longhouse Compared With the Iban and Orang Ulu Longhouses

	MELANAU LONG HOUSE	IBAN LONG HOUSE	ORANG ULU LONG HOUSE
FLOOR PLAN			
ELEVATION			

Source: Authors (2022)

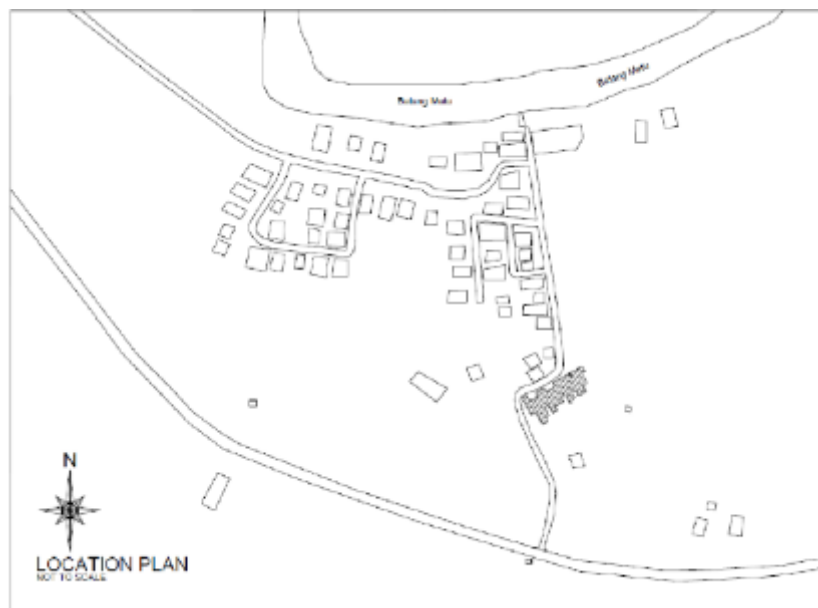


Fig. 4. Location Plan of Kampung Sok, Matu

Source: Authors (2022)

However, the internal layout of the Kampung Sok longhouse is different from the Iban longhouse. Internally, it follows the traditional Melanau tall house, where the communal area, known as the *dar*, is in the middle of the building between the households (*bilik tudui*). In contrast, the external feature of the Melanau tall house is different from the Kampung Sok longhouse, which is defined by the height of the house that can go up to 12 metres and accommodate up to 50 households (Bahauddin & Awg Musadat, 2018). The tall characteristic is explained by the fact that the house is on stilt and of two-storey height. In contrast, the Kampung Sok longhouse is only one-storey on stilt. The communal space of the tall house is on the first level, surrounded by several households, but in the case of the Kampung Sok

longhouse, the communal space is flanked by the *bilik tudui*. The entrance of the Melanau tall house is from an internal staircase located within the perimeter wall of the house. In contrast, the entrance of the Kampung Sok longhouse is through a notched log steps timber, which leads to a small narrow corridor (*lurong*) towards the main communal space – the *dar*. The longhouse has a rectangular floor plan, with a linear *bilik tudui* of about similar sizes and a gable end pitch roof (Refer to Fig. 3).

The Melanau longhouse was built in 1872, over 100 years old. Initially, it started with just four households (*bilik tudui*) but later was extended to 26 households in 1888. During that time, the occupants of the longhouse were still practicing animism or known locally as *likou* or *pagan*. Their livelihoods were mainly farming, especially planting swamp paddy and later planting rubber. They are also mainly involved in inland and coastal fishing. In their traditional belief, there are many social taboos, including the maintenance of the longhouse. One taboo stated that only those born in the longhouse were allowed to repair or renovate the longhouse. If the taboo is not followed, they believe that something bad will happen to those who break the rules. It can be either illness, an unwanted incident, or bad luck. One of the taboos that were also practiced was bringing along charcoal and placing them in their respective households (*bilik tudui*) whenever they returned to the longhouse to avoid bad luck. In the event of the death of the longhouse members, the body must not pass by many households but should be moved through the nearest narrow alley (*lurong*). Besides that, the occupants also have their indigenous tactics to prevent fire from spreading in the longhouse. This was practiced when the roof was still made from nypa palm. The indigenous knowledge to prevent the spread of fire was known as “*seketan*,” which is part of the nypa roof tied with rattan, and in the event of a fire, the *seketan* will be cut and released through the skylight to prevent the spreading of fire.


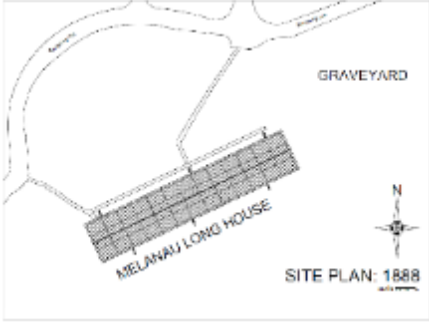

The longhouse has gone through major renovation since it was built in 1872. The changes affected the scale and dimension, space hierarchy and zoning of the building. Changes include building materials and additional utilities, such as the kitchen (*lebuk puyan*), toilet (*jamben*) and the verandah (*seramik*). The next section will discuss in detail the evolution of the longhouse in 1872, 1888 and 1962. The three significant periods were chosen because major changes occurred during those years.

B. Evolution of the Melanau Longhouse

The evolution of the Melanau longhouse is analysed through the site plan, floor plan, materials, zoning, scale and dimension, and space hierarchy. The evolution of the building can be clearly traced from the site plans (Refer to Table 3). In 1872, the village was only comprised of four households (*bilik tudui*) in a communal building. In other words, the head of the longhouse was the founder of Kampung Sok village, and these occupants were the first generation. 1888 marked the second generation, which was reflected in the expansion of the households from four to 26 *bilik tudui*. The extension was necessary to accommodate new family members and extended families. 1932 marked the fourth generation of occupants. Despite the growing households, the number of *bilik tudui* remained at 26, as the longhouse could no longer be extended due to site constraints. On the southwest of the longhouse is the village graveyard, whereby on the northeast is the road linking the village to Matu and other parts of Sarawak. Due to these constraints, it can be seen from the site that individual dwellings started to mushroom from north to the northwest of the longhouse facing Kampung Sok River and Batang Matu. In contrast, others, especially the newer dwellings, were built facing the roads in an interior lot fashion.

Floor plan evolution shows expansion to both the left and right sides of the building in 1888 and later in 1932. The expansion was built towards both the front and back of the building, mainly through each respective household as kitchen and utilities (refer to Fig. 5 on the right). In 1872, the plan consisted of only four households (*bilik tudui*) and the communal space (*dar*) (Refer to Fig. 5 on the left).

Table 3. Evolution of the Longhouse According to Site Plan 1872, 1888 and 1932

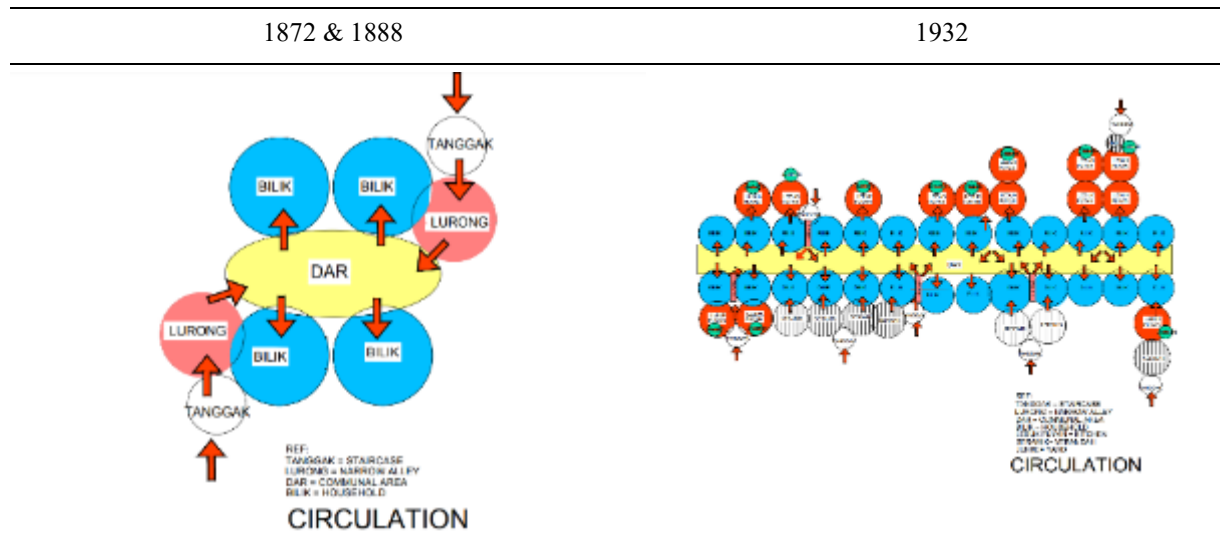
Year	Site Plan analyses
1872	
1888	
1932	

Source: Authors (2022)



Fig. 5. Interior View of Long House. The Dar showing Beam and Roof Opening (picture on the left). The Kitchen or Lebuk Puyan (picture on the right)

Source: Authors (2022)

Table 4. Space circulation in the original longhouse in 1872, 1888, and 1932

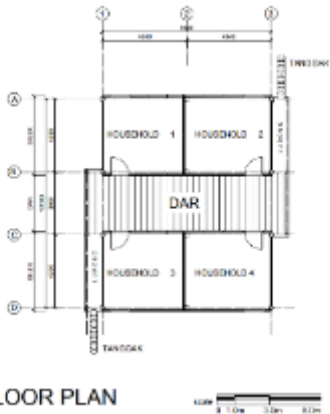
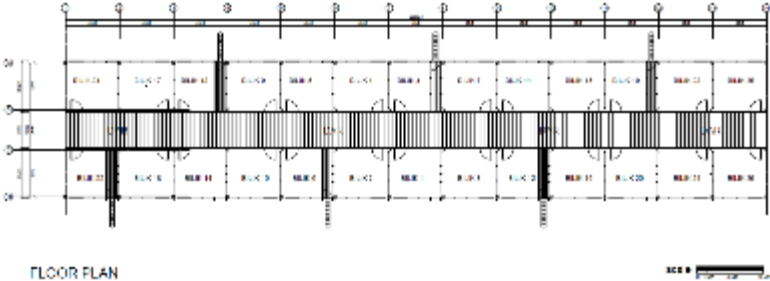
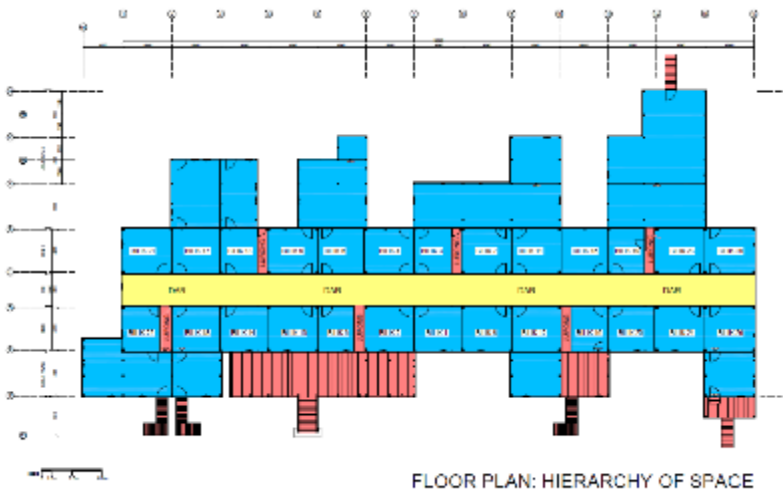
Source: Authors (2022)

Space circulation was through the notched log steps (*tanggak*) and straight to the two internal alleys (*lurong*), the communal space (*dar*), and finally to the respective households (*bilik tudui*) (refer to Table 4). In 1888, the floor plan was extended to include an additional 26 units, but the main spaces were still similar to the original floor plan. In 1932, the number of units was maintained at 26 units. The main spaces were still similar to the original floor plan but with additional spaces: the kitchen, known as “*lebuk puyan*” (Refer to Fig. 6), and the internal toilet, known as *jamben*. In 1932, the longhouse had also changed the notched log steps to a staircase built using mortise and tenon joint, following a typical Malay staircase. In addition, there was also the introduction of verandah (*seramik*) at both the front and back sides (*jungke*) of the building to welcome visitors and for utility purposes (refer to Table 5).

The building was built based on a horizontal and vertical grid system (Refer to Fig. 7). The building is on stilt, and its form is rectangular and cubical, compact but with a linear arrangement. Initially, the building had no level change between spaces until they introduced the kitchen in 1932. There is a slight drop in level at about 150 millimeters from the household to the kitchen. The scale and dimension show the differences in size between the main house and other spaces. In 1872 and 1888, the biggest area for the whole building was the total households, followed by the communal space, the *dar*, and the narrow alley. In 1932, the biggest area of the whole building remained the households, followed by the *dar*, kitchen, narrow alley, and toilet.

Table 6 shows the space zoning of the longhouse as it evolves. In 1872, the original longhouse was made up of three public, semi-private, and private spaces. The public spaces consisted of the narrow corridor (*lurong*). The semi-private space was the communal area (*dar*), while the private space was the household (*bilik tudui tudui*). The space zoning was similar for 1888. However, in 1932, there was the addition of spaces, which comprised the kitchen (*lebuk puyan*) and toilet (*jamben*) as private spaces. However, during certain occasions, such as festivities and gatherings, the *lebuk puyan* can be converted into a semi-private space for reciprocal activities, such as food preparation.

Table 5. Evolution of the Longhouse According to Floor Plan

Year	Floor Plan Analyses
1872	 <p>FLOOR PLAN</p>
1888	 <p>FLOOR PLAN</p>
1932	 <p>FLOOR PLAN: HIERARCHY OF SPACE</p>

Source: Authors (2022)

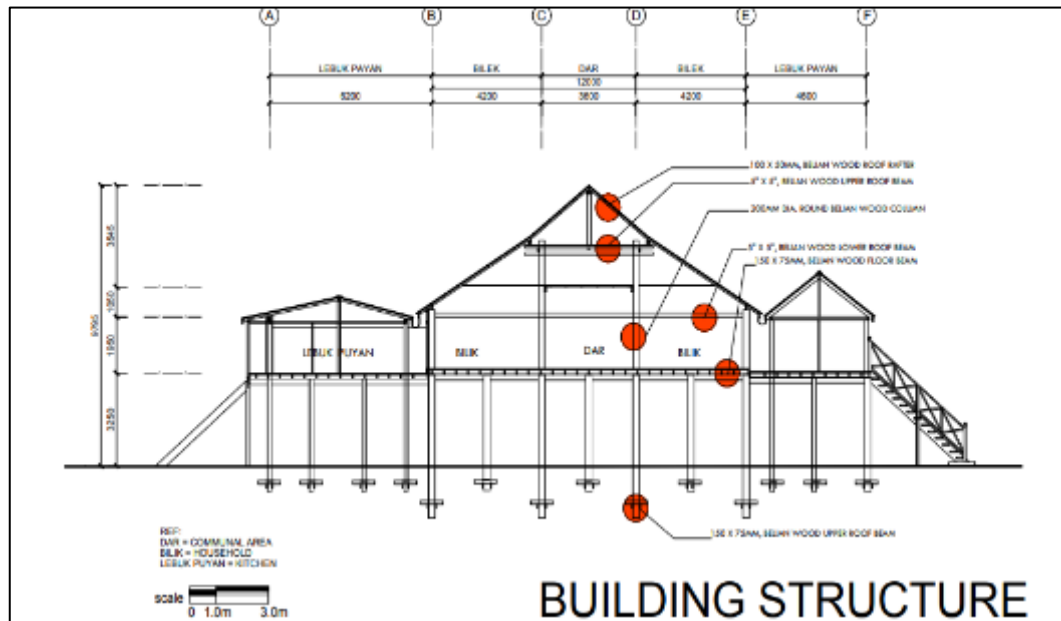
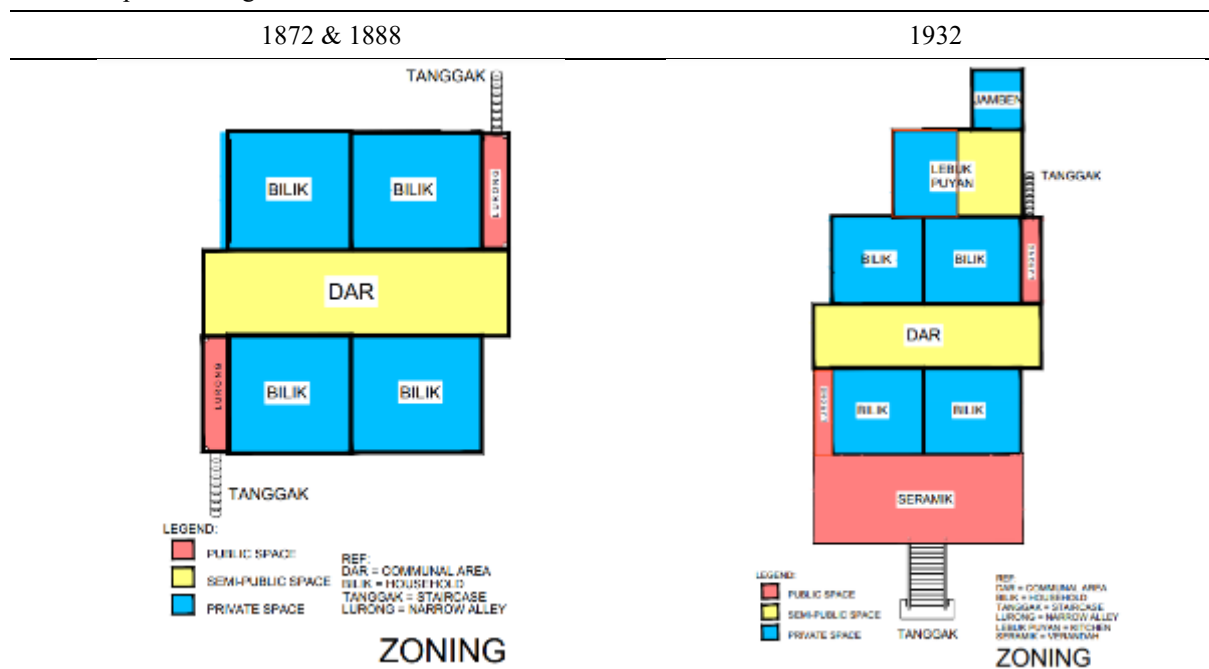


Fig. 6. Building Structure
Source: Authors (2022)

Table 6. Space Zoning



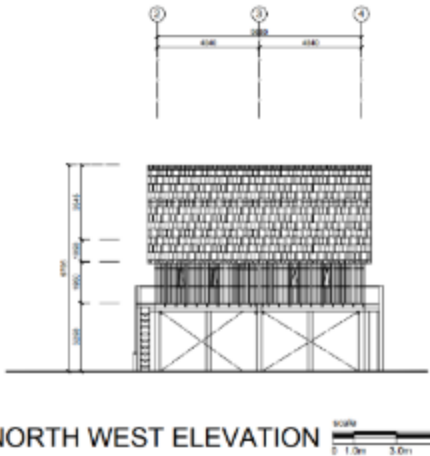
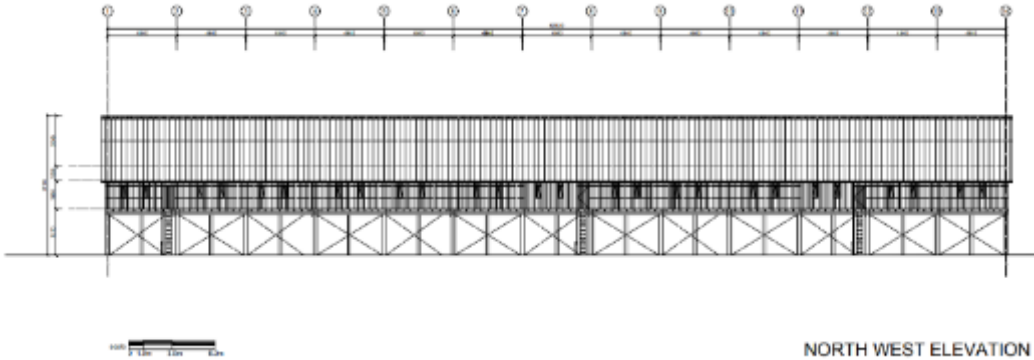
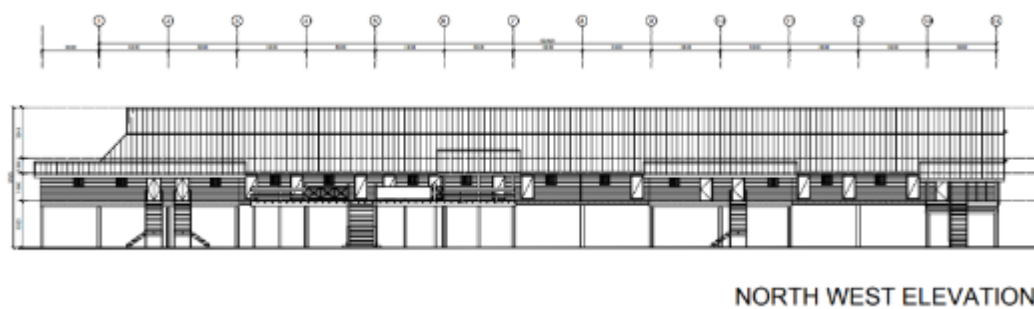
Source: Authors (2022)

Table 7 shows the evolution of the longhouse from the front or northwest elevation. In 1872, the original house was symmetrical and in terms of scale and dimension was smaller, based on basic design of four units. In 1888, the longhouse maintained the symmetrical elevation but had increased in scale and dimension due to additional units to the left and right of the original longhouse. The longhouse extended to 64.05 x 12.20 metres and at the height of 8.69 metres at the highest ridge above the *dar*. The household average size is 4.7 x 4.3 metres. The *dar* is 3.6 metres x 64.05 metres. The *lurong* has the smallest size at 0.9 x 4.2 metres. The size is restricted to be narrow for security reasons, easy to control and monitor access, and at the same time still sufficiently wide for movement.

In 1932, the longhouse was no longer symmetrical due to the additional spaces consisting of the kitchen, toilet, verandah, and drying areas (*jungke*). Further examination of the scale and dimension in terms of height shows that the height between the ground to the floor level is 3.25 metres. However, the

height between the ground and the additional kitchen is slightly lower at 3.1 metres, due to the level change between the household and the kitchen. The height from the floor to the roof beam in the household is 1.95 metres, which suits the ergonomic of the Melanau. The highest space is between the floor and the roof beam above the communal space, which is at 5.44 metres, which is double the volume of the other spaces relative to the roof beam. This reflects the importance of the *dar* as a communal space where the double volume height makes the area bigger and more grandeur compared to the other spaces in the building.

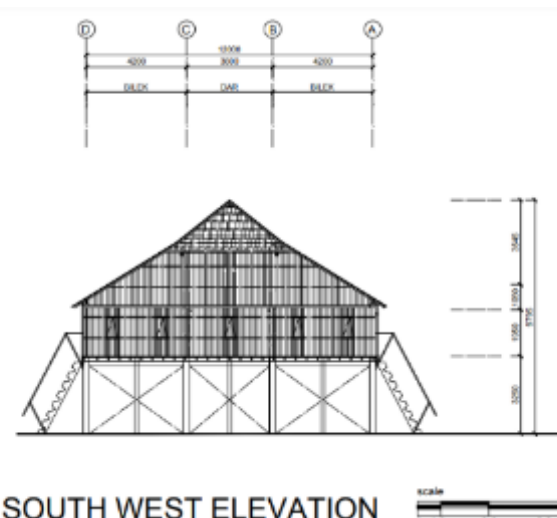
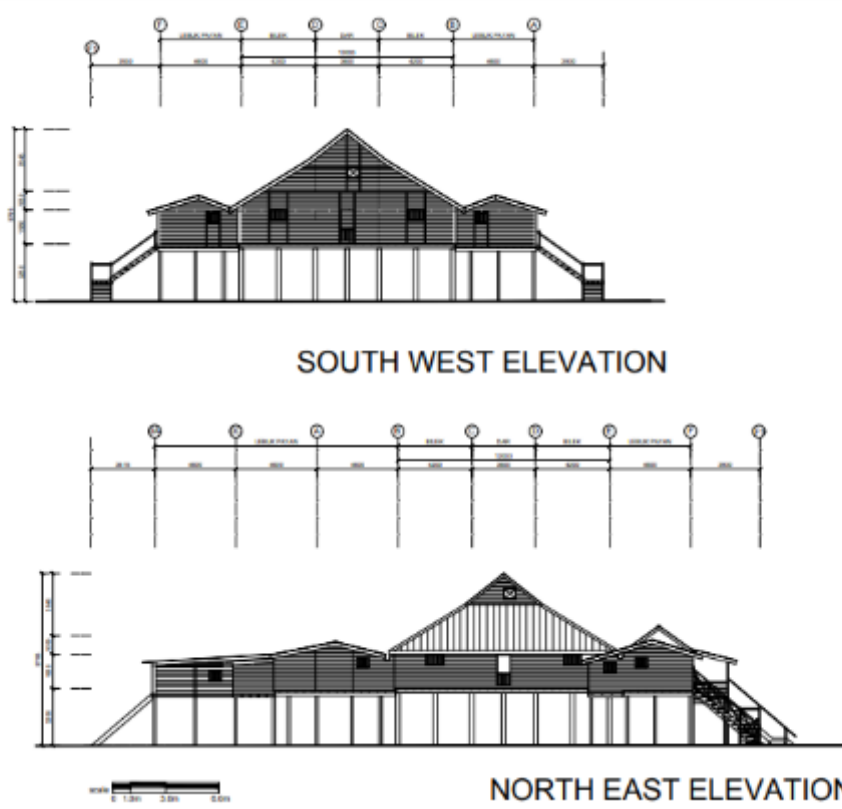
Table 7. Evolution of the Longhouse from the Front Elevation (North-west Elevation)

Year	Front Elevation
1872	 <p>NORTH WEST ELEVATION</p>
1888	 <p>NORTH WEST ELEVATION</p>
1932	 <p>NORTH WEST ELEVATION</p>

Source: Authors (2022)

Table 8 shows the evolution of the longhouse viewed from the building's side elevations. There were no major changes in the southwest and northeast elevations in 1872 and 1888. However, in 1932, significant changes can be seen in both left and right elevations. This was due to the addition of the kitchen, toilet, verandah, and changes of the new staircase from the notched log steps to a typical Malay-style staircase. The changes were quite significant on the right elevation due to extensive renovation on this side of the building.

Table 8. Evolution of the Longhouse from the Side Elevations

Year	Side Elevations
1888	 <p>SOUTH WEST ELEVATION</p>
1932	 <p>SOUTH WEST ELEVATION</p> <p>NORTH EAST ELEVATION</p>

Source: Authors (2022)

The hierarchy of space can be seen from the sectional drawing (Refer to Fig. 7). In 1872 and 1888, the space hierarchy of the longhouse was more or less similar. There were two main space hierarchies during this period. The *dar* and *bilik tudui* were the main hierarchy, followed by the *lurung*. In 1932, there were three main space hierarchies. The *dar* and *bilik tudui* remained the main hierarchy, followed by the *lurung* and other spaces, consisting of the *lebuk puyan* and *jamben* as the lowest hierarchy.

Figure 9 shows the details of the sub-structure and the jointing of the roof ridge, the kingpost, and the beams. The building's foundation is built using an indigenous system known locally by the Malay in Sibul as the "*selipar babi*" (Abdul Gapor et al., 2021), which is a timber double beam footing that sits on the ground as its main support (Refer to Fig. 8). The foundation system works by first driving treated

timber logs as columns into the ground. The majority of the areas in Borneo are of heavy peat soil. The timber double beam footings fixed to the columns at the ground level will stop the columns from sinking into the soil, by distributing loads of the building evenly at the ground level. The common size of the column is 250 mm in diameter. The continuous columns support the building from the ground level to the roof. The longhouse has a special column, known as the *Tiang Seri*, the first erected column (refer to Fig. 8). Three layers of black, red, and yellow spiritual cloth are placed for protection in the top part of the *Tiang Seri* connection to the beam (mortise and tenon connection). The lower part of the *Tiang Seri* is placed with a gold piece on the ground to give good fortune to the occupants of the longhouse.

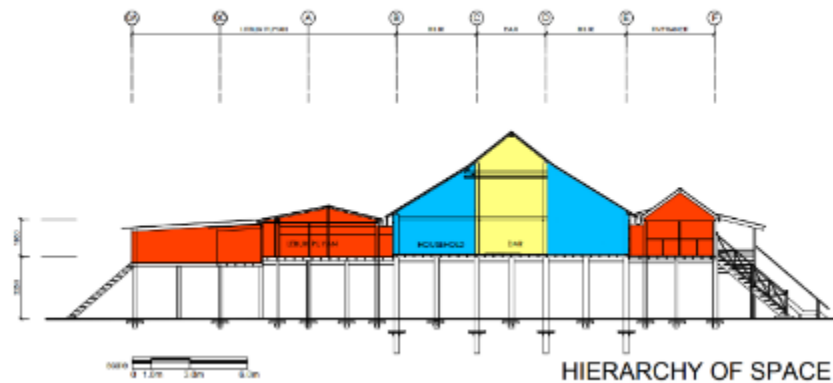


Fig. 7. Hierarchy of Space
Source: Authors (2022)



Fig. 8. *Tiang Seri*. Hidden Behind the Wall Partition (picture on the left). Double Beam Footing (Selipar Babi) (picture on the right)
Source: Authors (2022)

The open gable roof, which is 8.69 metres above the ground has a pitch of 42 degrees. The kingpost is supporting the main roof by distributing the load of the roof to the upper roof beam level and the main columns (refer to Fig. 9, detail C and D). Another distinct characteristic of the longhouse is the two-piece upper roof beam timber, 150 mm x 50 mm in dimension (refer to Fig. 9, detail B). The size of the rafters is 50 mm x 125 mm, and the size of the batten is 50 mm x 50 mm. The kingpost is connected to the ridge beam using a mortise and tenon jointing. The openings on the roof, which can be manually opened using a long bamboo pole, are located on top of the *dar*. The main function of the openings is to allow ventilation and daylighting into the *dar*. The size of the openings is 600 x 600 mm. The size of the kingpost is 50 mm x 125 mm. In 1932, due to the extension of the *lebuk puyan*, a new intermediate metal gutter was introduced between the new roof and the existing roof (refer to Fig. 9, detail A).

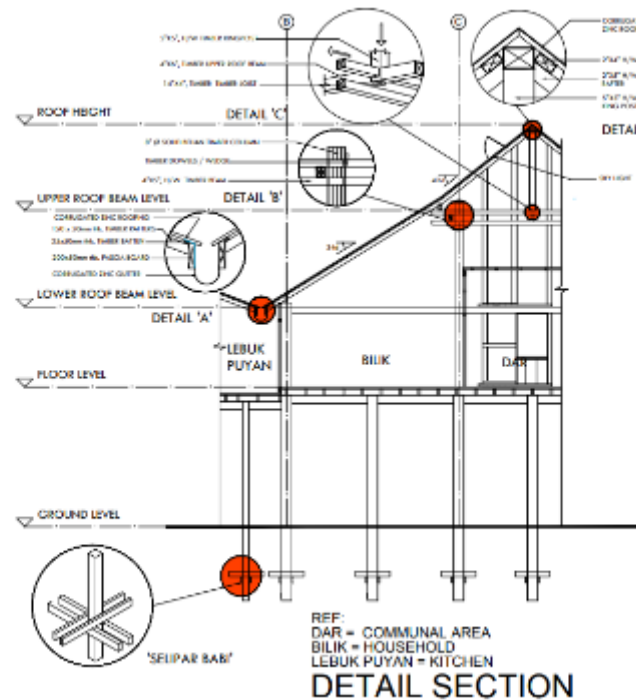


Fig. 9. Detail Section of the Building
Source: Authors (2022)



Fig. 10. Mortise and Tenon Jointing Between Column and Beam (picture on the left). Secondary Columns, Floor Beams, and Joists Below the Verandah (Seramik) (picture on the right).
Source: Authors (2022)

The building has also changed in terms of its materials. The timber structures, consisting of the kingpost, ridge beams, rafters, and battens, remain the same until now. The flooring used to be made from *nibong* palm trunk (*Oncosperma tigillarum*) and has been changed to timber flooring (refer to Fig. 10 on the right). The columns and the beams remained the same materials. The columns are made from *belian* hardwood (*Eusideroxylon zwageri*), while the beams are made from *selumar* (*Jackiopsis ornate*) timber, known locally as *kayu nyabau*. The timber roof structures were initially covered with thatch *nypa* palm (*Nypa fruitican*), known locally as *nipah*. However, the roof finishes have been changed to *belian* slates and later to the corrugated metal roof.

The walls were originally made from weaved *nypa* palms but later changed to vertical timber planks and horizontal timber planks (Refer to Fig. 11 on the left). Other building elements such as door, windows, and stairs also experience changes. The staircase has also changed from simple notched steps to a Malay-style mortise and tenon staircase with a landing and double flight (Refer to Fig. 11 on the right). The window has changed from the top hung to a casement window (Refer to Fig. 12 on the left).

The single-leaf door remains the same, with additional double leaves door at the verandah (Refer to Fig. 12 on the right).



Fig. 11. Exterior Wooden Structure. Horizontal Timber Wall Plank and High-Level Gable-End Window and Full Window With Balustrade (picture on the left). New Staircase With Landing and Double Flight (picture on the right).

Source: Authors (2022)



Fig. 12. Building Opening. Full-Size Window from Interior View and Small Casement Window (picture on the left). One Leaf Door towards the Household and a Two Leaves Door towards the Verandah (picture on the right).

Source: Authors (2022)

The main findings show that the longhouse has evolved substantially between 1888 and 1932. In 1888, the evolution was due to the growing number of households. In 1932, the evolution was more due to changing lifestyles and influences from other ethnic groups, especially the Malays. The design of the longhouse, especially the narrow *lurong* and centrality of the communal space, the *dar* reflects the socio-culture of the Melanau. It shows that security is still an issue for them, perhaps due to historical trauma from headhunting and pirates' attack. The centrality of the *dar*, despite being a public space, still denotes the introverted nature of the Melanau, that highly valued privacy and preference to be socializing with friends and close families that they trust. This contrasts with the open communal space of the Iban, known as *ruai* which tend to celebrate guests and showcases the occupants of the longhouse to outsiders. When the kitchen, *lebuk puyan* was introduced, the original space circulation and zoning were interrupted. The kitchen is private and occasionally a semi-private space, especially during communal gatherings. However, one has to pass through the private household; therefore, to solve this problem, some households started to introduce secondary access, following a typical Malay house.

Findings also show that the characteristics of the longhouse are a hybrid of a typical Iban longhouse combined with the Melanau tall house. This can be clearly seen from the spatial analyses of the floor plan and functional analyses of the spaces, and the general form of the building. The general form of the building resembles more towards the Iban longhouse, whereas the functional spaces are more towards the Melanau tall house. Later, there were influences from the Malay vernacular house, especially on the design of the staircase, the change of level towards the kitchen and toilet, which also affected the roof profile, and the creation of a new box gutter. This shows that vernacular architecture is not static and evolves through times due to different needs, availability of building materials, and influences from other ethnic groups. This study is important to Sarawak, especially Melanau, because the existing longhouse is in poor condition. Therefore, the detailed documentation can assist in conserving the building and ensure that future generations can refer to history. The longhouse can be a

source of tourist attraction and will indirectly provide income generations for the locals and promote tourism development in the region. Apart from that, traditional building technology can be showcased by conserving the building as a reference to building experts. In addition, intangible culture, such as indigenous knowledge, rituals, folklore, and social taboos, can also be linked and cross-referred to the construction technique and process of the building.

IV. CONCLUSION

Factors that contribute to the evolution of the Kampung Sok longhouse include changes in priority, especially concerning safety, availability of building materials, demographic changes, external influences, and cultural factors. The Melanau vernacular dwelling does not need to take into account safety issues anymore, and this is reflected in the design of the Kampung Sok longhouse. There is no longer a need to design a fortress dwelling to protect the occupants from their enemies. In 1872, safety issue was no longer a priority. Headhunting was already banned by Rajah Brooke when he took over the administration of Sarawak. Piracy problems were also handled by the Brooke administration, resulting in the expansion of the land control by them, as the Brunei Sultanate had transferred the control of the former Brunei area, including Matu, to Sarawak in return for peace and elimination of piracy attacks in the coastal of Sarawak, which was then part of Brunei. The evolution witnessed changes in building materials, especially after 1932. This is because of the non-availability of indigenous materials and the preference for more modern and durable materials that need less maintenance and replacement, such as timber replacing the nypa flooring and walls. The nypa roof was also replaced with corrugated metal roofing.

However, the space zoning remained similar to a typical traditional Melanau tall house, which indicated a strong upholding of their socio-culture and belief system. However, there is no indication that the longhouse is utilized for economic livelihood activities, unlike the Iban longhouse, where the *tanju* and *ruai* are common spaces. The Melanau have a small hut on their respective farms to store and process their farming equipment and harvest. For the fishermen, most of the catches were sold immediately. Thus, it can be concluded that there is no relationship between the spatial layouts of the longhouse with their socio-economic activities. In short, the condition of the longhouse is still fairly good. Old buildings are naturally susceptible to timber defects. The timber defects include termite and wood bore insects' attacks and wet rot due to leakage problems. However, the main structures are still strong. To preserve the historical legacy of the Melanau communal dwelling, it is recommended that a proper dilapidation study and conservation work be done to restore and conserve the building. The benefits of conserving vernacular architecture will prolong the life of the only Melanau longhouse. Future generations can refer to an important tangible historical structure, especially for those in the field of construction, specifically for timber analyses and building technology experts. The relationship between the Melanau and the building also provides excellent narratives to prove the Outstanding Universal Values (OUV) of the longhouse and the people as living heritage, which can further enhance the cultural diversity and rich heritage of Sarawak. The study shows that architecture is a collective affair between the communities and their dwellings. Space is created from human mind and human beings, which is later transformed by culture (Ehteshami, 2018). This study has managed to interpret the evolution of space in the longhouse, which is explained by the community's beliefs, culture, geography, history, and time.

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