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RE-ADAPTATION OF MALAY VERNACULAR ARCHITECTURE THERMAL COMFORT ELEMENTS: TOWARDS SUSTAINABLE DESIGN IN MALAYSIA. (A LITERATURE REVIEW)

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Abstract

Malay vernacular architecture has been designed with perfect solution to meet thermal comfort of the occupants. The orientation of the house, plenty of windows and openings, roof design and multilevel of floors are part the elements that help them to gain the thermal comfort for occupant's lives. Nowadays, indoor environment influenced the occupant's physical and mental health. The practical solutions of the vernacular characteristic in design have caused present designers to re-evaluate their design approach into finding the design solutions to achieve sustainable design. Therefore, in building a good design, ideas are re-adapted from Malay vernacular architecture thermal comfort element into modern building. Re-adaption is one of the design solutions considered but to what extent may the vernacular architecture be adapted to contemporary buildings in order to create a better interior environment for the occupants? The research will use case study and ethnographic observations study whereby the researcher becomes a participant during the process. However, this paper is aimed to review the literature in identifying the relationship between the designs of the Malay vernacular building components to the local climate's context. The research is intended to change future designers approach towards designing contemporary buildings so that they are more sustainable.

Keywords: Re-adaptation, Malay Vernacular Architecture, Thermal Comfort, Sustainable Design.

1. Introduction

The main purpose of this paper is to review the literature in identifying the relationship between the designs of the Malay vernacular building components to the local climate's context. This process of identifying the relationship is important to understand how the vernacular architecture was built by the Malay carpenter in deep understanding of Malaysian equatorial climate.

Vernacular come from the Latin word which is 'verna', a slave and the connotations still exist in Italy, even though 'vernaculus' meant 'native'. Oliver (2006) in his book *Built to Meet Needs* has defined vernacular as:

'Vernacular architecture comprises the dwellings and all other buildings of the people. Related to their environmental contexts and available resources, they are customarily owner or community-built, utilizing traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating the values, economies and ways of living of the cultures that produce them'.

According to Hutchinson (2002), 'A region can often be clearly recognized by the character of its housing. ... House design reflects critical factors such as climate, materials, economics and cultural background'. Malay vernacular architecture can be define as the house that design to meet the thermal comfort of the occupant, considering the climatic factors, using local materials and reflect the social background of the occupant in the specific region.

Krisprantono (2005) had claim that vernacular building pursues the relationship between the theoretical and practical knowledge that covers the physical and non-physical characteristics of a particular location or place. The physical character refers to knowledge that is connected with the human versus nature, in term of

appropriate responses to environmental factors such as the variation of climate, topography and the limitation of the materials. The non-physical character refers to culture and technology, social relationship and history of the people. Furthermore, he emphasize that vernacular building expresses the specific nature of the specific cultures and can employ numerous forms that symbolize the relationship between humans, society and the natural and built environments they live in.

2. Malay Vernacular Architecture

2.1 Definition of Malay Vernacular Architecture

Zulkifli and Abdullah Sani (2006) emphasize that traditional Malay house can be classified as a vernacular architecture, is the architecture of the local people, 'architecture without architect', of the Malay Peninsula before the colonialism period. According to Yuan (1987), the Malay house is basically a timber house with a post and lintel structure raised on stilts, with wooden, bamboo, or thatched walls and a thatched roof, the house is designed to suit the tropical climate.

Most of the traditional Malay houses are constructed by local carpenters or by the owners themselves. The design and materials used for traditional Malay house highly influences by socioeconomic, cultural and environmental needs. Most of the material used is readily available local material such as timber, bamboo and palm (Lilawati et al., 2005).

However, Wan Burhanuddin (1984) had a different meaning of the Malay house. He was stress that the word 'Malay' itself does not have any one meaning. In Malaysia, Malay as defined in the constitution is 'a person, who professes the Muslim religion, speaks the Malay language, conforms to Malay customs'. He said that to describe a house as Malay because it is designed, built, owned or inhabited by Malays, is inaccurate because one may find non-Malays designing, building, owning and even inhabiting Malay houses.

However, in Malaysia today, Malay house was few built by the local carpenters and it still inhabited by Malay people in *kampung* until now. Even though there are few house that inhabited by other races but it still be called as Malay house than Chinese house or Indian house. Traditional Malay house can be defined as a house that were built by local carpenters, using local materials, own and inhabiting by Malay people, built with deep understanding of local climate, reflect the Malay cultural and religion also practice the Malay manners and heritage.

2.2 Malay House Building Components

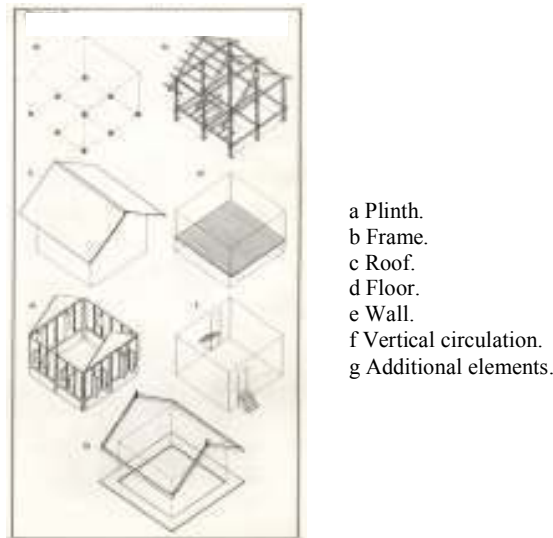


Figure 1: The physical elements of the Malay house
Source: Wan Burhanuddin (1984)

Malay traditional house components include the plinth, frame, pitch roof, the multilevel floor and wall with a lot of openings. The interrelationship of these components is primarily due to the constructional requirements. Wan Burhanuddin (1984) was described that the Malay house was built on the plinth. The plinth is never connected to the roof directly. The roof requires a set of frames consisting of purlins, rafters, wall-plates and columns to support it. Therefore the only way that the roof may connect to the plinth is by having a supporting frame.

Similarly, this frame must exist between the roof and the wall. The frame element consists of the openings which are the windows, door, fan light, shutters and walling sheet.

3. Malaysian Climate Context

Situated in the equatorial region, the climate characteristics are uniform temperature, high humidity and copious rainfall. Winds are generally light. Proximity to the sea and an equatorial location generate a warm and humid climate, which is constantly throughout the year (A.S. Hassan, 2001).

According to Yuan (1987), the Malaysian climate can be classified as warm-humid equatorial, characterized by high temperatures and humidity. Air temperature averages within 22 and 32 degree Celsius with small annual and diurnal ranges.

Today, the Malaysian Meteorological Department (MMD) under the Ministry of Science, Technology and Innovation (MOSTI) had claimed that the average air temperature in most cities in Malaysia has been increase. In two decades, the average air temperature has increase to 2 degree Celsius from the minimum of 22 degrees to 24 degrees and the maximum of the air temperature had reached 34 degree Celsius. This result showed that Malaysian climate has been change starting 1990 until 2010.

In summary, according to report, research and observation on climate shows that the dampness will increase right through the year followed by weighty clouds which covering the water vapor content in the air. These phenomena will help to filter the direct solar radiation to the earth. The effect of the high dampness in local climates as well accelerates the decomposing action, rusting and the growth of algae and mould. These phenomena will give bad effect to the design and structure of the local house. The winds in local are usually are in low velocity speed. These will give more comfort to the people surrounding. Nevertheless the sturdy winds can occur with followed by the rains. According to Yuan (1987), rainfall is high throughout the year averaging 250 to 300 cm annually. Rains turn out to be more extreme in the monsoons season. Wind will spreads more higher with increasing heights of surface and become lower to the ground area where it has many obstacles of that area. The frictional effects will happen while air flowing across on any surface on the earth. The local house necessary needs the glare controls elements in houses because of high percentage reflections of solar radiation happen from the sea, sky and the beach. Infrequently, it also will face serious hazards during monsoon season because of strong winds happen

4. Thermal Comfort Requirements

As described in The Environment Encyclopedia & Directory (2005) thermal comfort is defined as the state of mind in humans that expresses satisfaction with the surrounding environment which affected by heat conduction, convection, radiation, and evaporative heat loss. Thermal comfort is maintained when the heat generated by human metabolism is allowed to dissipate, thus maintaining thermal equilibrium with the surroundings.

The traditional Malay house is professionally designed and has evolved over a period of time using readily available local materials, which suited to the local climate and environment conditions. As stated by Sufian and Mohd. Sabri (2009), "*The Malay, being the inhabitants of the archipelago are understandably respectful not only of their natural environment but also towards the metaphysical elements related to their surroundings; hence the use of natural material is considered as being in harmony with nature*". Furthermore, the design, the construction process in terms of energy efficiency, the indoor environmental qualities, sustainable site planning, the materials and resources used have always been essential aspect related to traditional Malay architectural practice. The Malay house is a perfect vernacular architecture in the past that is environmentally sustainable (Sufian and Mohd Sabri, 2009).

Tajul Edrus, Husnul Nizam and Kamarul Syahril (2005) emphasize that the successful design of the traditional Malay house in relation to the environmental aspects has made one wonders that Malay people in the past seemed to understand bioclimatic design more compared to the recent building development.

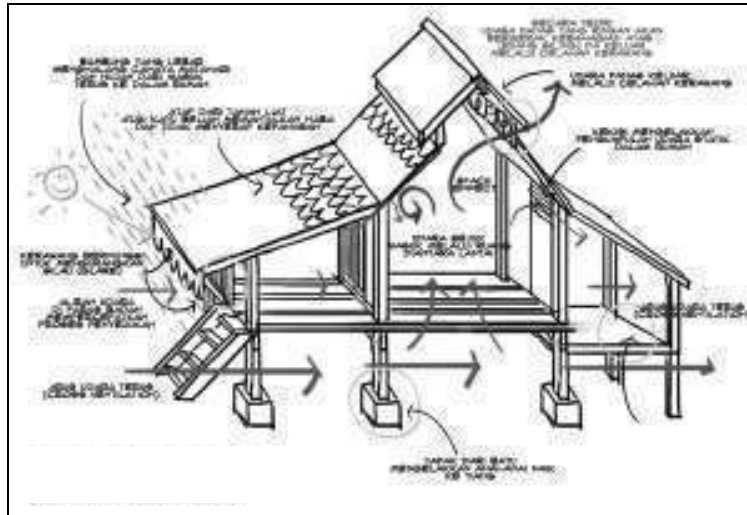


Figure 2: The Climatic Control Design Requirement

According to Nasir (1985), the overall Malay house construction would provide to allow ventilation for cooling and reducing humidity and use building materials with low thermal capacity so that little heat is transmitted into the house. Furthermore the Malay house was design to control from glare and direct solar radiation as well as to protection against rain. The natural vegetation in the surrounding added to provide a cooler environment.

The thatch roof was designed with lightweight materials which is from *rumbia* leaves and act as good thermal insulator that can reduce heat during the day and cooling down at night. The gable ends were designed with carved wood that act as screen to allow natural lighting and natural ventilation into the house.

Kamarul et al. (2006) claimed that the Malay house was built the floor raised on the posts above the ground as an ideal solution to avoid the dampness and flush flood while heavy rain. It is also to allow the house to be ventilated through cracks in the raised floor. Open spaces, high ceiling or roof are needed to provide good ventilation and airy the space (Sufian & Mohd. Sabrizaa, 2009). The open spaces in the Malay house can be designed because of the master builder create the multilevel floor that can be used as the separated between two space. The natural ventilation also flows through the design of multilevel floor.

The many windows in the wall provides good ventilation and views as well as creating a comfortable and cool atmosphere. The building material itself provides comfort and cooling the interior part of the house (Tajul Edrus et al., 2005). Plenty of windows and openings allow the natural ventilation flows into the interior spaces to cooling down the temperature and meets the thermal comfort of the occupants. Used of local materials such as *rumbia* thatch roof, bamboo wall or *mengkuang* weaving, and *cengal* wood can decrease the temperature of the Malay house interior space.

Yuan (1987) insist that the traditional Malay house seems to merge naturally with the environment. Vernacular Malay house were designed to suit the hot and humid tropical climate and it's connect to the natural surrounding that give the perfect solution to meet the thermal comfort of the dwellers.

5. Conclusion

The vernacular Malay house built is much influenced by the local climate. It can be seen on the vernacular house either on the materials selection or the design of the house shape. The design of the house intended to give the best thermal comfort to the occupants inside. All the components and materials uses are reacted to the comfortable of the occupants. The materials were taken from the surrounding forest and it is readily available and no pricing charged. Its selections were influenced by its strength, durability, aesthetic and its spirit as well

While the shape of the house was designed in order to act in response towards the local climate. Malaysian climate is facing to warm-humid throughout the year. This can be classified as high temperature and humidity. In order to react to this climate, indigenous people designed the house accordingly. These can be seen per example house was raised on the post is to prevent the wooden materials from the termites and at the same time to allow the winds through without any obstructions. The wind velocity under the house will give the natural ventilation to the house trough the floor by using natural materials such as bamboo strips. Other example can be seen on the shape of roof of the house where it is respond to the heavy rainfall. The pitched roof is allowed the rains water fall down to the ground. Whilst internal of the house, the pitched roof also functions to collect hot air on the top of the house and expelled it to the outside and the fresh air will take place into the

house through the opening. These intelligent designs of the vernacular house are very concern of thermal comfort of occupants inside. These all useful elements should be re adapt into the modern building by using the intelligent materials which can compete with the properties of available traditional materials using in vernacular house.

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