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Research paper

Analysis of Traditional Malay House as a Design Approach for Vertical Dwellings towards Green Design

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Abstract

The dwelling space for the Malays is a reflection of the personality of its inhabitants based on the Islamic religion in the fulfilment of its Syariah. In order to meet these needs comfort, safety, health, peace and aesthetic factors have a close relationship to the well-being of the inner space thus making a home of blessing. Today's residence cannot respond well to the needs of the occupants and is too much influenced from the west. It is contrary to the needs of the local design especially the Malays. Compared to the design of Malay house architecture, this concept and architectural approach have met various aspects in achieving the objectives of its residents. There are many lessons and values gained from it. Designs and ideas based on a nature-based environment are able to maintain the need for the future. The writing of this study discusses the issues and problems of modern-day residential homes focusing on interior space planning towards a green and sustainable design by make an analysis of Malay house architectural designs. The design of Malay house architecture has been proven to address the problems and diversity of its residents' needs in achieving the well-being of life.

Keywords: *Sustainability, Architecture of Malay Traditional House, Wellbeing, Spatial design, Affordable housing.*

1. Introduction

Residential home is an entity in human life as a place of refuge from danger, weather and environment [1]. Owning a home is the dream of every human being. The home is not just a shelter, but it is also the foundation of the construction and the formation of a life. The success of a life is influenced by the quality of the interior space of a residential home. While this quality covers the relationship between architecture, interior space and the environment. Homes as living in a daily life should be designed with a balance of physical, human and environmental as the inhabitants for the well-being of life in line with the flow of life [1], [2], [3], [4], [5].

1.1. Page Layout

The role of dwellings in Islam is very important. The residence is the centre of Muslim individual development, family development and Ummah development. According to [6] he has to carry dichotomy and ideology. Therefore, the design of Muslim residences must meet those requirements from both spiritual and psychological aspects and physical aspects [7]. Western Researcher, [8] states the character of the occupants in the form of residence through its design, space and neighbourhood layout. The quality design of a Muslim home means the layout or space organization and the living room position should meet the function and needs of the home [9]. According to [10], Muslim residential design means the quality of the space layout that meets the needs of the occupants i.e. in relation to the function and placement of space. The will of the inhabitants is based on the Islamic value system and is translated through the physical environment and fulfils the spiritual needs of its inhabitants. Thus, the provision of a good physical space frame will affect the mind and psychology of the occupants.

1.2. Green Interior

The concept of green design in the sector of construction is defined as; "the creation and responsible management of a healthy built environment, based on the efficient use of resources and on ecological principles". Green design in the construction industry works for the present and future improvement in the life quality [11]. Hence, interior design disciplines can give a great contribution to the concept of green interior environment as an area directly related with the human being for healthier interiors and satisfied occupants for the future of the discipline [12]. Environmental sustainability is becoming a major concern within the interior design field due to the extensive resources needed for interior use [13]. Overall, environmentally sustainable or green interior design minimizes negative effects and maximizes positive effects on environmental systems over the life cycle of a building by blending solutions of the past with new technology of today [14]. Pilatowicz (1995) [15] defined sustainable interiors as interiors designed in such a manner that they sensibly address the impact of all their functions, parts and elements on the global environment.

The benefits of dealing with sustainability are distributed in terms of environmental, economic, health and safety, and community

benefits (U.S. Green Building Council, 2003). The environmental benefits derive from the reduce influence of the building's construction and operations on air, water, landfill's and on-renewable energy resources. The economic benefits come from reduced operating costs and improved occupant's performance. The health and safety benefits come from the improved comfort and health of the occupants. The community benefits come from minimized strain on local infrastructure and an improved quality of life. The American Society of Interior Designers (ASID) believes that sustainability should be an important part of every designer's approach toward green interior environment, from energy efficiently to reducing environmental impact. Six tips to take a green approach:

a) Maximize the efficient use of space. Efficiently-used interior spaces can keep the size of a building and, therefore, the use of construction materials and other resources to a minimum
b) Use energy-wise construction and design materials. Interior designers can work with windows and doors that maximize energy efficiency, wood flooring that comes from rapidly renewable sources like bamboo, water-saving toilets and other environmentally responsible materials.
c) Use material produced in a socially responsible manner.
d) Reduce waste by using reclaimed or recycled materials.
e) Plan for energy-efficient lighting. Clever interior can incorporate windows and skylights to maximize the use of daylight and minimize artificial light. When artificial lighting is needed, LEDs and compact fluorescent light bulbs save energy and last longer.
f) Use as many non-toxic and non-polluting products as possible

1.3. The Traditional Malay House

The traditional Malay House typifies and embodies essential characteristics and demands of sustainable design [16]. The Malay traditional house was some example of vernacular architecture in the past that is environmentally sustainable [17]. The construction of a Malay house is based on the ability of the owner according to the needs of the occupants and current status of their economy. They are directly involved in construction ranging from planning, architectural design and space planning, site selection, selection of building materials, costs and until completion of home construction. Making it a highly effective architecture in terms of design and cost efficient [18]. The outcome of architectural intention or aesthetic expression is inherently full of sustainable wisdom when analysed deeply.

2. Issues and Problem Statement

The rising cost of living includes increasing the cost of owning a home as the basis of family construction and life has become a burden and pressure on home buyers [19]. To date, there are few housing schemes for low and middle class with satisfactory space environment and meet the needs of the interior space users with the optimum style, elements and principles of interior design towards a comfortable home. With respect to high house prices supposedly the buyer is entitled to the quality of the house and the state of the interior space that is commensurate with the price paid. Dwellings are designed to meet various goals and activities. The design of residential and interior space should have the elements to translate and reflect it. Modern housing designs, especially in Malaysia, have been influenced by inappropriate western designs for local culture and activities [2]. As a result, the design has affected the occupants. Dwellings design is a manifestation of its inhabitants. In contrast to the rest of the race, the Malays live a life based on a culture that defines Islam as the principle of life. The vertical housing design is seen failed to reflect on the needs of space occupants to meet daily activities. The disadvantages of space layout design do not fit the space function layout - Space size that does not scale as a result of design based on cost of convenience. Lack on design to meets the socio-cultural needs of dwellers, customs and religious needs. The design failed to suit the natural environment and comfort of the space. Some housing designs are devoid of basic design principles and are aesthetically offensive.

3. Methodology

The aim of the study is to analyse the design of Malay traditional houses with unique values and aspiration. The research studies of the design are based on a number of factors and characters that make Malay house architectural designs have their own identities. Environmental-friendly climate-based designs, low thermal capacity material used , open space planning concepts and adapted energy conscious designs in the design make it an economical, efficient and effective design of the occupant needs towards green design. The next objective suggests that these values apply to verticals modern contemporary design houses. In order to achieve the objective, the methodology of the research is related to the collection of data through observation, literature, interviews and the taking of relevant photographs. Literature review are obtained through theses, journals, articles, books and others has been documented from reliable resources to meet the objectives of the study. Methods of stratified; random interviews and respondents' responses were number of issues related to vertical housing, low and medium cost housing, among Malays at Kinta Valley, Ipoh, Perak. The focus of the study is on the quality of housing, neighbourhood, residents' behaviour, home design to understand, address and resolve the problem effectively. This paper will only discuss on the main design characteristic of Malay traditional house design and highlight especially on the spatial organization. Adaptation of the criteria mentioned, will be discussed in relation with vertical dwelling designs in order to create better solution toward green and sustainable design.

4. Aspiration from the Past

The traditional Malay house is one of the richest components of the Malaysia's cultural heritage [16]. A study of the history, role and experience of the traditional Malay house can be a great value to a people, construction industry and policymakers. The study can reveal the value of the traditional house form, the relevance of traditional housing component, as well as the problem faced. It is important to understand the technique and system available and the best practice with principles of design approach for optimal design. Malay traditional house architecture is a production of the best architecture that truly has the spirit of the time and the spirit of the place [20]. Malay traditional house architecture is not just to be seen, but should learn from the analysis is not just a comparison. If we only compare to each other, we will only see on the surface, and will not find honesty in fact and will not learn new things. The history and architecture of the Malays should be continued in a healthy way. To depend directly on natural resources for the use of materials of construction and a high degree of knowledge on the ecological balance, the Malay traditional house has been designed with great care to meet the various requirements to overcome the problems of the local climate [21].

4.1. Design Principles and Criteria

According to [17], there are four major criteria which are 'aesthetical elements or ornamentation', 'spatial organisation', 'materials' and 'construction technology'; identified as elements of genius loci in Malay architecture. While [20], define the rules or principles of architectural design in general to be considered shall include the following items:

- Humanity - way of life , social systems, cultural practices, religious practices anthropometric

- Spirit of time - safety factors; current economic factors; political factors; building materials; technology; philosophy; urbanization; statutory requirement
- Spirit of place - climatic factors; environmental factors; historical; Heritage; topography; energy efficiency

The Malay house design is based on some of the key principles. The climatic and environmental design of traditional Malay house is a major component of the construction of traditional Malay houses for the purpose of providing a suitable environment. Selection of site and building orientation over the sunrise have made the traditional Malay house a passive and energy-saving design [21]. The traditional Malay house is a modular build system with a special joint system that can be installed and re-opened for the purpose of adding and subtracting home modules [20]. It is basically a post-and-lintel structure and ready-made sistem installation . The construction of a timber house raised on stilts to avoid the elemental beast and flood conditions [22]. Which is the construction impact is lower than modern construction methods. Having large roof eaves and low walls to control direct solar radiation and protect against rain. High roof design elements with maximum window aperture and breathing wall elements are intended to allow a comprehensive ventilation into space for cooler space [23]. Basically, most of the Malay traditional house must consist of plan is uniquely design to suit local need. The spatially fragmented and open plan form of the traditional Malay house is environmentally conducive to external wind flow and the principles of natural ventilation as well as the need to maximise the cooling effect [18]. Hence, commonly multifunction and define functional spaces such as anjung, serambi, rumah ibu and dapur are not just socially defined, thus they also play a role in ensuring that more critical functions with highest needs of comfort are accommodated with minimal heat gain and expenditure within the central part of the house [23]. Depending on the status of homeowners, the quality of timber used in construction will vary [21]. Sustainable standard requirements such as reducing carbon contained have been captured in practice and details [16]. Such designs are not just artistic expressions in design, culture and architecture but have met the sustainable design and reduce dependence on electricity for more cost-effective.

4.2. Space Classification

Space and form in Malay tradition were design on a strong , utalirian basis. Normally space was divided between the public, the private and semi public. The notion of privacy of the family was reflected in form and arrangement. The previous researcher on the traditional Malay house explained that the spatial classification was according to the characteristics or nature of space in Malay houses. According to [24] traditional Malay houses are clasify into three types, namely formal rooms for receiving guest visits and used for official purposes such as Porch *(Anjung),* Verandah *(Serambi)* and Kitchen *(Dapur*). Secondly is active space, it is used to carry out family day tasks such as kitchen space and washing area or *pelantar* and thirdly is passive space, involving core house *(rumah ibu)* and bedroom for family member main activity. According to [23] traditional Malay house can be divided into the front and back portion which are centered around the core house (*Rumah Ibu)* and the kitchen (Dapur) . Furthermore, the arrangement of space within Malay houses is based on the priority of space functions and space adjacency. This space is divided into three areas namely Verandah *(Serambi),* Core House (*Rumah Ibu)* and Hitchen House*(Rumah Dapur)*. Therefore the optimal and efficient use of space with the needs and space function will be achieved. Table 1 below shows space clasification by other authors in the study of traditional Malay houses:

Table 1: Classification of Traditional Malay House

Space Classification	Spatial Organization	Space Classification by
Based on Genders Types	Male Areas; Female Areas; Common Areas	Phillip Gibbs
Based on Genders Type and position of space	Male areas (in front of the house); Female areas (Main House/centre of house); Space for common areas	Abdul Halim Nasir
Based on genders type and privacy space	Dual compartmentalization concept; Front Area Zone; Back area zone; Central Zone; Public-private Zone	Mokhtar Haji Ismail
Based on Construction technique	Standard/ basic areas; added space	Abdul Rahim Abdullah
Based on frame/structure	Main structure; Secondary structure	Phillip Gibbs
Based on functions	Public areas; Special area	Zulkifli Hanafi
Based on religion; social- culture; custom	Veranda & Kitchen areas; centre areas-main house/ room	Mokhtar Haji Ismail

Source: [29]

4.3. Space Organization

The traditional Malay house is divided into several main spaces namely the Anjung or porch Space; Veranda or *Serambi*; (Serambi naik, Serambi Gantung); Core House or *rumah ibu* ; Bedroom; Loft/loteng; Kitchen; Platform or *Pelantar*. According to [18], the layout of the Malay traditional house is according to the needs and daily activities of its occupants. According to [21], the traditional Malay house is not just meeting the various needs such as function, comfort, safety but fulfilling spiritual aspiration because good life starts from his home. For the Malay community of home designs, it is necessary to fulfil the socio-cultural requirements based on the Islamic religious law. According to [25], architecture or dwelling is a manifestation of culture. Where it embraces spiritual values, physical, emotional, taste, philosophy and religion. The Malay community combines humanity, nature and spiritual religious beliefs in the architecture of dwellings very well. Table 2 below show the spatial planning of traditional Malay house :

Table 2: Traditional Malay space planning

Space Classification	Spatial Organization Space Classification by
Anjung/Porch	Focal point of entrance façade of the house. Space to welcome and entertain unknown guests. There are seats like chairs to relax, chat and enjoy the environment.
Serambi/Verandah	Long, lower space and adjacent to main room/ *rumah ibu* . Suitable for welcoming and entertaining guests, children's sleep areas as well as guests and recite al-Quran. Space for holding a feast for men like function's, engagement, death and other functions. There are plenty of door openings that are relatively low compared to other windows good for plenty of ventilation and good views to the environment. Low ceiling height of space and partitions use are to meet the privacy requirements.
Rumah Ibu/Core House	It is the main space that has the highest floor height compared to other space. It is the largest functioning room to welcome and entertain guests with the status of family members and close relatives, wedding feasts, meeting rooms and guest rooms, family members and parents making it a multi-function space. Minimal furniture use, partitions and interior walls are good to allow proper ventilation and natural lighting into space. Make it a flexible and open space to carry out.
Bilik Tidur/Bed Room	There is usually a room for parents' use as well as a dressing room for virgins for privacy. There is also a loft space for some Malay houses that serve as space for virgin and store items.
Selang/Joint Area	Walkway area to join between rumah ibu and the

	kitchen of the Malay house. The floor of this area are lower than rumah ibu and the kitchen. Located here stair and side entrance for women guest. Space is used for welcoming, chatting and entertaining activities for women. Apart from that, it is also used as a place to weave mats, sewing, for economic growth
Dapur/Kitchen	The kitchen is a space for mothers, often located at the back of the house. Used for food preparation, cooking and family meal processing. Also used for food preparation process for women if the ceremony is held.
Pelantar/Platform	Space is adjacent to the kitchen to wash groceries and equipment in the process of food preparation. Under certain circumstances, it is also used to bath the infants and mothers who are in abstinence.

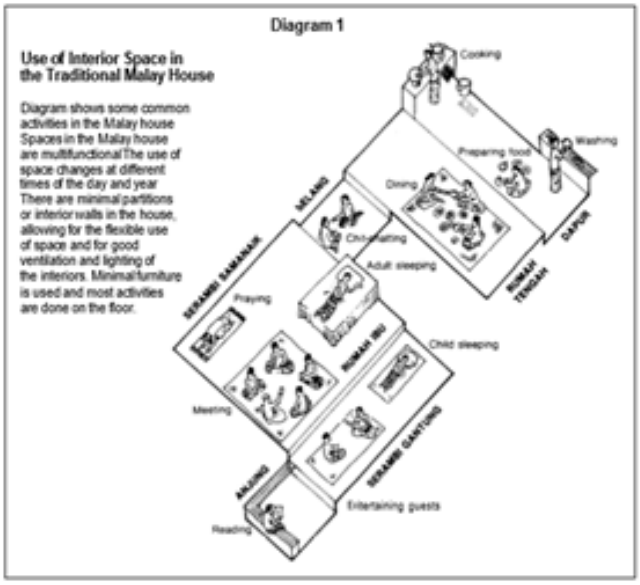

Fig. 2: Use of Interior Space in Traditional Malay House
Source: [23]

4.4. Lesson and Value from Malay Traditional House Design

Climatic Design of the Traditional Malay House - The characteristics of Malay architecture are synonymous with nature. Deep understanding and respect for nature are reflected in its environmentally-friendly design. This makes it a passive and environmentally friendly design [23]. A lot of openings and infiltration ventilation promoting wind moves freely from outer to residential homes. While the cold air moves in, it replaces the hot air position through the wide openings of windows, the full height of the floor to the height of the windows, the windways at the height of the human body level to permit cross ventilation. Spacious area with minimal partition walls allows air to move freely within the room [26]. The built-in Malay house architecture also serves as a way to prevent the house being flooded with the flood and beasts. It also serves to capture air into the room through the floor slab and the bottom of the house [2]. All creative craftsmen have made this Malay house fit into the surrounding climate. Indirectly the design is energy-saving and environmentally friendly.

Flexible design - According to [27], Flexibility is more economic in the long term. Flexible housing means housing that can adapt to the changing needs of users. This implies that for housing to be flexible a number of principles should be addressed. Basically the traditional Malay house has an organic and flexible design. Malay houses built with sophisticated technology make interior space layout able to expand and diminish according to the owner's economic ability [23]. The demand for this is based on the growing number of family members as well as their economic improvements [18].

Open space design - Malay house designs use less wall and partition in interior space planning. This condition puts good ventilation and lighting into the space . The full height of the window element from the floor to the ceiling will allow the air to move and reach the depth of space. Less used of furniture makes space more open and spaces [23]. If there is a need to meet privacy requirements such as covering the aurat, sleeping at night, the multipurpose space will use blinds, curtains, shutters and movable partition as dividers [1]. This temporary and it is easy to move and be stored when it is not in use. The use of lightweight, thinner and less heat insulation with louvres, carved and translucent design makes the room fresh and cooled. The open space reduces the dependence on mechanical equipment for ventilation and lighting purposes naturally can extend far into space.

Multifunction design - The concept of multi-function space planning makes Malay house design very sensitive to the needs of its inhabitants [23]. The interiors of the Malay houses are multifunctional as porch rooms are used to chat and welcome men while at other times, space is used for male guests in functions such as recites dua, and engagement parties. While the core house or Rumah Ibu is a room for parents and a room to greet and treat the muhrim during the daytime, at night it functions as a room for the guest's sleep by making a curtain as a space divider to not exceed the privacy limits set by the religious law. At other times this space will be used as a place of meeting and performing worship. The design of the space layout is very cost effective, economical, practical and convenient.

Proportions and scales based design - The concept of space measurement in the construction of Malay houses is referring to the proportion of the size of the human body, especially the head of the family. According to [28], the measure refers to the male body (Husband) for the height measure of the house and the woman (wife) for the size of the house. For example, the size of the height of a man is 5 '8 "is according to the size of the porch space is in accordance with its function as space to perform obligatory prayers and resting activities such as sleep at other times. The most commonly used sizes are the ginks, the legs, the cubes, the steps and the walks. Every size detail has good and bad intentions to its inhabitants. Rationally based on body size makes it meet the human anthropometric and ergonomic measurements very well to make it a diverse space [18].

Modular, expandable and transformable designs - The Malay Houses are built modestly and according to current needs such as core house/rumah ibu, kitchens, verandah/serambi, porches/anjung and other spaces. Modular construction techniques make Malay houses very organic and flexible. This flexibility allows the Malay house to expand and reduced according to the needs of their occupants [2]. The economic growth factors - income and increased family members such as marriage and new born will definitely need a new space, making Malay houses need to be expand [18]. Whereas space can be reduced if required. The current economic situation and new family factors make the home can be knock-down, and re-installed in a new location. The existence of built and knock-down system with unique joint techniques has made this process run perfectly.

Energy-conscious design - Selection of site and building orientation over the sunrise have made the traditional Malay house a passive and energy-saving design [21]. Elements of window openings, breathing walls and high spaces encourage much ventilation and lighting into space [18]. This situation has reduced the dependence on ventilation and lighting mechanically, making it a conscious and energy-saving design. Such a condition certainly provides long-term economic benefits to the residents, more environmentally friendly towards the green design. The thoroughness and accuracy of Malay house architecture from all aspects have made it a passive and energy-saving design.

5. Finding

Based on the observations conducted in the study of modern vertical dwelling housing around Lembah Kinta Valley, Ipoh, Perak, there are some findings regarding interior space planning and affecting occupants. Comparison of plan layout design and functionality has been made. The study found that there were some important elements in the interior space planning has gone missing making it a problematic space as mentioned below:

Missing area - The main spaces like a porch as the main focal point to the residential entrance have been missing. The room serves as a welcome and treats foreign guests, resting for comfort and freshness of the ventilation during hot weather. Also, space to communicate with neighbours is gone. Serambi - This foyer room has been replaced with a living room for the modern house for the purpose of welcoming and entertaining guests. Make space no privacy restriction between male and female guests and family members of the host. This situation has caused discomfort to family members when welcoming guests and during the event. Spatial distribution through floor levelling height according to hierarchy has been replaced with wall construction for privacy purposes discouraging ventilation into space and air cannot move around the space. Space will be quite hot and less comfortable. The less dependence on mechanical ventilation is high for good thermal comfort. *Selang* – As the joining space between core house-kitchen and second entrance place is space for women has not been in the planning. Spaces such as intervals or *Selang* joining core house and kitchens are used as place for sitting and chatting with neighbours and sisters. It also serves as a place to prepare for cooking as well as doing work such as weaving mats, compositions and related activities of women. There is no segregation between male and female domain towards privacy purposes make space not efficient use.

Spatial layout - Space that does not follow the hierarchy and occupants needs creates discomfort to the occupants especially when welcoming guest. From the observation found that most kitchen positions were at the front of the house and adjacent to the main entrance inside the house. The kitchen is an important space for mothers in the process of preparing food for family members and during the event. At the same time, it is also used for chatting and meal times with family members. The irregular, tidy and smelly condition will certainly not be so easy to welcome the presence of guests who are indefinite. The nature of the hot kitchen space also causes the user to open the hijab, this condition does not promote privacy inside this space especially during the guest's presence. There are several types of houses that erect walls to separate between the kitchen space and the entrance have caused the entrance space to be narrow and no sense of welcoming. Compared to the Malay house kitchens are mostly at the back of the house.

The proportion and the human scale - an observation also found that the main spaces such as living room, bedroom and kitchen are relatively small compared to the activities carried out in the space. The situation has created a crowded and narrow atmosphere, especially if there are guests present during the festive season, feast and functions. Occasionally the event cannot be performed due to the size of space that cannot accommodate the attendance of the targeted guests. The functions can only be run elsewhere with additional costs for tents rental, halls and other requirements. The visiting culture is an activity promoted in Islam and the Malay customs. There is also a problem not enough room for family members and guests who wish to stay overnight, i.e. for a remote residence. Usually, guests are placed in the living room - this situation will create an uncomfortable situation especially from the privacy perspective. Small size of the kitchen space cannot afford to accommodate family activities and food preparation process especially if there is a ceremony to be held. Today's modern home design makes it extremely inefficient and increases the cost of other unnecessary expenses.

Overcrowded – Fixed areas and layout arrangement influenced by inappropriate western designs such as living room, bedrooms, bathrooms and kitchens have made it a design that has many walls as divider space. Such a situation does not encourage the natural ventilation to enter and move around the room. Even natural lighting also does not reach the maximum level in order to reduce dependence on artificial lighting with a lot of energy sources. Consequently, the achievement of a minimum saving of electricity will not be achieved.

6. Conclusion

This paper mainly studied and analysed generally on architectural design component, design criteria and principles in space planning, space classification, function and sustainability of the traditional May house . On closer study, the Malay house is a structure completely attuned to the organic cycles of nature and perfectly benign in terms of its life-cycle impact on the environment. It represents a perfect fit to its surroundings while still fulfilling the needs of a functioning social unit – the family. The understanding of these divisions and the architectural elements such as windows, doors, opening and the opening treatments toward sustainability should be taken into considerations in designing Malay dwelling in future. From the comparison and examples as discussed earlier, it can be seen that modern vertical dwelling in the study are not only badly designed climatically, but they usually go against the basic requirements for thermal comfort. The characteristics as discuss earlier found in many modern houses making them very uncomfortable to live in

For further research, need to study more on Malay traditional house with different size of layout plan and have to research on the level of privacy of spaces that use for daily life (social interaction among family members), special occasion (e.g. Family gathering, Wedding feast, Raya feast, Doa selamat feast, Social function and Religious function) and function of the space. In order to improve the quality of life among the dwellers in the Low Cost Vertical Dwelling , it is recommended that the approach of Malay traditional house in should be adapt in Low and medium cost vertical Dwelling.

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