JOURNAL OF THE MALAYSIAN INSTITUTE OF PLANNERS

PLANNING MALAYSIA

MALAY URBAN DESIGN, ARCHITECTURE, CONSERVATION AND HERITAGE

This title is now indexed in Scopus

MALAYSIA INSTITUTE OF PLANNERS
PLANNING MALAYSIA VOLUME 18 ISSUE 2 (2020)
[ISSN 1675-6215] [e-ISSN 0128-0945]
www.planningmalaysia.org

PLANNING MALAYSIA

Journal of the Malaysian Institute of Planners

Editorial & Business Correspondence
PLANNING MALAYSIA
Journal of the Malaysian Institute of Planners
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Published By
Malaysian Institute of Planners

ISSN Number
1675-6215
e-ISSN
0128-0945

Date Published: 02nd May 2020

CONTENTS

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TPr. Saiful Azman Abd Rashid (474/03)

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PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 1 – 11

ASSESSMENT OF THE HISTORIC INTERIOR OF CARCOSA HERITAGE BUILDING, KUALA LUMPUR FOR BUILDING CONSERVATION

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Abstract

An assessment of historic buildings, its history and conditions are essential in the study of buildings conservation. Other than architecture history and building defects, the interior scheme of building, the decorations, the building's form and space interior layout are also some significant aspects that need to be analysed in building conservation study. In current practice, the change of use of any heritage building will need approval from the National Heritage Department (NHD). The report of history and building condition is the one of the main documents needed to be submitted for the approval process. The main objective of this research is to analyse the buildings based on the original materials, form, function, decoration, and layout. The methods used for this research include in-depth building investigation, analysis, and interpretation; backed up by measured drawing and historical assessment. The analysis involved the mapping of original and existing spaces and then analysed the unique characters of the interior using a series of photos categorised based on time or dates of the photos. From this analysis, the authenticity of the space can be identified and recommendations on better usage of spaces of these historic buildings can be proposed to the National Heritage Department.

Keywords: Assessment, Interior, Authenticity, Conservation, Restoration

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INTRODUCTION

In Malaysia, the conservation procedure of historic buildings follows the guidelines provided by the National Heritage Department Malaysia (NHDM). The Historic Building Conservation Guideline (National Heritage Department Malaysia [NHDM], 2017) has outlined the process and suitable methods to investigate historic buildings which are divided into three sections, namely architectural research, documentation on measured drawings, and dilapidation survey with laboratory analysis. Before starting any exploration of a historic site, the purpose of investigation needs to be determined. McDonalds (1994) in National Park Services (NPS) Preservation Brief stated that both the purpose and scope of investigation need to be determined before formulating a particular approach. For example, investigation strictly for research purposes could produce information for an architectural survey or a historic designation application at the local, state or national level. The United Nations Educational, Scientific and Cultural Organization (UNESCO) has established guidance and standard to evaluate the authenticity and integrity of a heritage building (Nara Document on Authenticity, 1994). The authenticity and historic integrity in the context of the heritage building is linked to the uniqueness of the building characteristics and the value of the historic places (Brida, Disegna & Scuderi, 2012). In other scenarios, most buildings were built with a specific reason and purpose, and the history of the buildings started when the building started to be constructed. Because of that, the object of conservation, especially a historic building, must be thoroughly researched, and it must be regarded as an object created in space and history (Weaver, 1997). Moreover, the condition, integrity and authenticity of the story line or the history of the building need to be validated (Pearson & Marshall, 2011). In this research, since Carcosa has been vacated for a while, building investigations were conducted to determine the magnitude of the damages and renovation works that have been made. The results of the study were intended to be used to present suitable proposals for future use of similar historic buildings to the relevant authorities.

HISTORICAL BACKGROUND OF CARCOSA

The Carcosa building is located near Perdana Lake Garden, Kuala Lumpur. Its construction began in 1896 by the first British Resident in Malaya, Sir Frank Swettenham. Designed by Arthur Benison Hubback and the construction was under the supervision of the State Engineer of Selangor Public Work Department, Charles Edwin Spooner, the ground floor area was built to accommodate major social gatherings and an upper floor was designed with private sitting room,

study, and seven bedrooms, each room located along a long veranda. The outbuildings included stables and several tennis courts. The estimated cost of the palatial building, built in the eclectic fusion of Neo-Gothic and Tudor Revival styles, was about 25,000 pounds (Seng, 2018). Carcosa began life as home to the Resident-General in 1898. After Swettenham, Carcosa was occupied by British high officials and as a temporary residence for the Governor of the Straits Settlements, who resided in Singapore. Throughout the Second World War, the Japanese army used the building as the head station for their officials. By 1946, Carcosa served its original function as British high-officer official residence. On January 21, 1948, the building was used as the venue to sign the document of the Federation of Malaya between the Malay Rulers and the British Empire. On September 12, 1956, the Chief Minister of Malaya, who later became Prime Minister of Malaysia, Tunku Abdul Rahman, handed Carcosa to the British government as a gift and the building has been used as the British High Commissioner building. On 5th August 1957, the building was used again as the venue to sign the document of the Independence Malaysia. In early 1987, the Malaysia government decided to convert the building into a hotel. The colonial architecture and interior designs complemented the colonial-themed hotel service perfectly. In its inaugural year as a hotel, Carcosa Seri Negara served as the temporary official residence for Queen Elizabeth II and Prince Philip during the 1989 Kuala Lumpur Commonwealth Heads of Government Meeting. The Carcosa building has been gazetted as a National Heritage Building, under the National Heritage Act 2005 (Act 645) on July 6, 2011. The building is not only historically significant but also possesses impressive colonial architectural values.

ARCHITECTURE STYLE

One of the unique architectures brought by the British to Malaya is the Tudor architecture. The Tudor era emerged in England around the 15th and 16th centuries and in Malaysia, the style had existed for almost a century. This style of architecture can be seen in the hill resorts of Fraser's Hill and Cameron Highlands, Pahang. The buildings in Fraser's Hills and Cameron Highlands, are considered as Colonial heritage buildings and are known as the Tudor Revival (Bahauddin, Mohamed, Mat Som, Irwana, & Othman, 2010). The Tudor or Tudor Revival style is an architecture design developed at the final period of medieval architecture during the Tudor period (1485–1603) and even beyond (Tudor revival architecture, n.d.). The style of Tudor Revival architecture is also found in the Carcosa. Carcosa is located in a hilly area similar to Cameron Highland and Fraser Hill. With the eclectic fusion of Neo-Gothic and Tudor Revival styles, the typical features are steeply pitched-roofs, complemented by a decorative half-timber front gable that is distinct of the Elizabethan era and an ornamental medieval parapet at the front of the building (Barber, 2007).

Figure 1: Carcosa in year 1900 (left) and the building in 2018 (right), still remain the original form and design, however the decorative timber at front gable has been painted and covered the Tudor features.
Source: Cheah (2008); Harun (2018)

HISTORIC BUILDING CONSERVATION

Harun (2011a, 2011b) highlighted the importance of historic places to be preserved and the information of these historic places to be documented for the purposes of conservation of the historic buildings. Innovations can be seen through the architectural style and design, materials and texture, and also the buildings technique and construction. However, to determine the types of restoration work done to the buildings in the past is not easy, especially if the building has undergone several building extensions or physical alterations. Buildings listed in the National Heritage list need to be carefully and thoroughly evaluated, especially if the buildings are planned to be restored to their former glory. According to Jokilehto (2007), the conservation of cultural heritage is based on the methodology driven by the decision-making process, while Rocchi (2016) emphasised that the decision on the methodology used for restoration or rehabilitation work is the basic element before the restoration work started. Although several benefits of conserving architectural heritage have been identified and discussed by scholars, the interior conservation also needs to be emphasised, especially for the future use of these historic buildings. For that matter, the historical assessment of the interior with detailed interior and exterior assessment are needed for the conservator or building inspector before they are able to draw some conclusions on the conditions of these historic buildings and later outline the interior conservation scope. Under the National Trust for Historic Preservation (Grimmer, 2017), building owners who decide to restore their historic property, need to seek advice from experts on the methods and suitable procedure to restore the historic building (see Table 1).

Table 1: The Guidance for Restoration of Historic Interior

Identify the factors that will shape the decision	Deciding whether to restore or rehabilitate and to what extent, involves understanding its history; its architecture; and the present condition of its materials, finishes, and systems.
Review the building's history	Who lived in the building and when? Did important events occur there? Did either (or both) scenarios have historical significance? If so, should consider restoring the building to that period to help interpret its history.
Know what "restore" means	To restore a house means to return its interior and exterior appearance to a particular date or period. Strict restorations – ones that eliminate everything not present during the period chosen – are rare for homes, with most owners opting to maintain modern systems (plumbing, anyone?) and sympathetically designed changes, such as later additions, that add to the house's history.
Know what "rehabilitate" means	To rehabilitate a building/house means to make it useful and functional for contemporary living while preserving important historical and architectural features. For example, a rehabilitated old house would always include modern electrical, mechanical, and plumbing systems, a modern kitchen, and other attributes typical of present-day homes.
Evaluate existing alterations	Consider the quality, design, materials, and craftsmanship of the original house as well as the changes that have occurred over time. Compatible interior and exterior changes of the same or better quality than the original house, even if done in different styles or materials, should probably be kept and restored. Remove any poorly designed or executed changes.
Design new additions and alterations with attention to detail	When adding to or altering a home, consider its scale (apparent size), actual dimension, and massing (proportion/balance). Use materials, textures, and colours similar to those of the original building
Integrate modern touches with care and caution	The key to quality rehabilitation is how well it accommodates modern technologies and living styles. Keep changes non-intrusive and compatible with the house's design and style, and do not let alterations destroy or cover historically or architecturally significant features or materials.
Take care not to falsify the history of the house	Although it might seem counter-intuitive, we want to be able to tell additions apart from the original. That

	way, the house's history is visible and transparent. Also be careful not to design additions that make the house appear to date from an earlier or later period, or alter the house's details to the extent that suggest a different architectural period.

Restoring historic interior is also interpreted as restoring the historic character of interior building property, including detailing of interior materials, mouldings and stairways, room configuration and spatial relationships, as well as structural and mechanical systems (Morton & Hume, 1983; Morton & Hume, 1997). Moreover, restoring historic interior schemes for the purposes of preserving interior features which are considered as architectural elements, are essential to the characteristic of the designated landmark (Alliance Greater Philadelphia, 2007). Therefore, to achieve this objective, the authenticity and historic integrity criteria should be followed especially in terms of its location; setting; design; material; workmanship; feeling; and association (Jokilehto, 2006; Alho et al., 2010). In terms of the authenticity and historic integrity of Carcosa building, it is confirmed that the building has undergone several renovations works due to its functional change. However, the association and location of the renovations in the interior's space can still be identified.

HISTORIC INTERIOR INVESTIGATION OF CARCOSA BUILDING

The USA secretary of the interior's standards for the treatment of historic properties United States of America (Grimmer, 2017) has published a comprehensive guideline for preserving, rehabilitating, restoring, and reconstructing historic buildings. The document can be a useful reference and practice for historic interior conservation in Malaysia. Under the chapter of historic space, features, and furnishing, the restoration treatment focuses on investigation terminology and methodology. The interior floor plan, the arrangement and sequence of spaces, and built-in features and applied finishes are individually and collectively crucial in defining the historic character of the building. Interiors are typically composed of a series of primary and secondary spaces. Primary spaces, including entrance halls, lobbies, double parlours, living rooms, corridors, and assembly spaces, are defined not only by their function, but also by their location, features, finishes, size, and proportion. Meanwhile, secondary spaces in historic interiors are generally more functional than decorative, and depending on the building's use, may include kitchens, bathrooms, utility rooms, attics, basements, mailrooms, rear hallways, and most office spaces. Based on this reference, the historical interior assessment of the Carcosa mansion aims to justify the degree of the renovation of the interior floor plan and whether they comply with the preservation standard or not. Based on figure 3 and 4, although the secondary spaces were prominent in the building's function historically, they are generally less significant than primary spaces.

Thus, secondary spaces are usually the most appropriate places to be altered, which may be necessary for a historic building, such as those that are required to meet specific codes or to install mechanical equipment. Based on this guidance, the changes in the interior layout of the Carcosa mansion can be acceptable since the changes still preserve the exterior appearance of the mansion.

CHANGES OF SPACE AND INTERIOR LAYOUT

The Carcosa mansion started its function as a hotel in 1989 and ended operation in 2016. Marketed as a luxurious heritage boutique hotel, much of the mansion's colonial architecture and interior were preserved, carefully adapted and complemented with colonial themed-hotel service. The original space and layout were designed as a mansion and British residence office. The 2-storey mansion has more than eight bedrooms, including the master bedroom and guest rooms, a spacious living room surrounded by a corridor terrace or veranda at the ground and first floor, and eleven bathrooms.

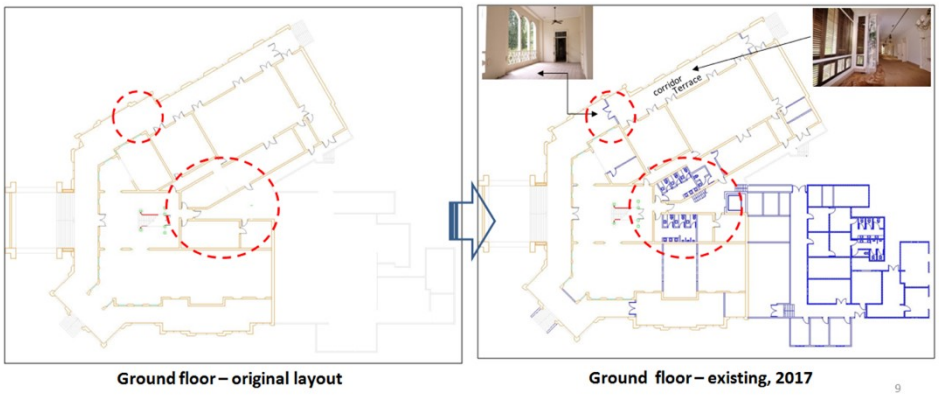

Figure 3: Corridor terrace (A) has been closed for part of expansion of hotel suite room. New toilets and refreshment room (B) has been added behind the main staircase.
Source: Harun (2018)

In 1989, during Queen Elizabeth's II visit, she occupied Swettenham's spacious suite rooms, which had been redecorated in the Victorian style (Warren & Gocher, 2007). In the year 1997, the mansion was renovated again, acquiring a spa, satellite TV, and upgraded kitchen while preserving the original appearance of the building (Warren & Gocher, 2007). Besides the interior preservation, to meet the hotel requirement, especially the number of rooms and facilities, part of the corridor and terrace at the ground and the first floor was closed for new rooms and toilets (Figure 3 and 4).

Figure 4: Corridor and terrace at first floor (A and B) closed for new rooms and toilets. The main hall (C) been renovated as hotel suite room.
Source: Harun (2018)

INTERIOR FEATURES AND FINISHES

The historical evidence of Carcosa's interior features was challenging to trace. Most of the historical documents such as old photos captured the exterior part of the building architecture. However, through the investigation of the function of the original space and rooms, the interior features of this building are luxuriously tailored to the status of the residence for the British Resident-General. The ground floor lobby area was built with a stunning wooden staircase. Since the building was influenced by the Tudor style, most of the interior decoration elements were from wood. The ceiling beams, window and door casings, wainscots, and staircases tended to be dark and heavy, made of hardwood finished with wax. Based on the site inspection, all wooden elements, especially in the lobby area, were painted in cream and thick paint had covered the carvings, the surface of the staircase, newel post and cap. This is due to the new user wanting the interior scheme of Carcosa to be appropriate with the new function of Carcosa. In this case, it is preferable that the original scheme be retained with original interior features, material and finishes.

Figure 5: Carcosa during British Resident. The historical photos captured this historic moment of the mansion; (a) The spacious rooms were lavishly furnished, (b) The grand staircase, and (c) Carcosa's spacious porch.
Source: Seng (2018)

Figure 6: The existing timber staircase. All components, including the railing, balustrade, and decorative elements had been painted in cream thick paint.
Sources: Author (2018)

FINDING AND CONCLUSION

The investigation of Carcosa's historic building has identified significant challenges in building conservation practice in Malaysia. The scope of the investigation was focused on searching the authenticity of the interior features of the historic building. The results and findings from various investigations have brought hope for the future of this historic colonial building. A study proposes the existing structure remains but removes the renovated wall of the corridor terrace and restores the original interior schemes to all rooms on the first floor. All spaces at the ground floor and terrace proposed to remain but with minor restoration of the timber material. All timber surfaces that have been painted, especially the staircase, cantilever, and wainscot panel need to be restored to its original glory. Referring to the interior historic building guideline (Rocchi, 2016; Grimmer, 2017), all interior schemes have been suggested to follow the original scheme or at least to be assimilated with the features of British colonial style through the furniture and decorations. The future use of this historic building should consider the quality, design, materials, and craftsmanship of the original building, as well as the changes that have occurred over time. Renovation done to the building that is compatible with its design can be kept and restored. By this finding and guideline, the true history of the building will be visible and the information of the architectural period, interior scheme and conservation can be

used by the future generation. In conclusion, this research can be a basic guidance in preserving historic interior for heritage building, especially when applying planning permission for conservation and adaptive re -use.

ACKNOWLEDGEMENTS

The authors wish to express a gratitude to the National Heritage Department for giving permission to access Carcosa Seri Negara as a case study for this research.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 12 – 23

HERITAGE IDENTITY CONSERVATION OF THE WOODCARVING PLACEMENT AND DESIGN COMPOSITION TYPOLOGIES ON JOHOR MALAY HOUSES

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Abstract

Woodcarving is a distinct heritage that can promote the identity of a region. However, current practices of using the design composition and woodcarving placement which do not belong to the local region pose a threat to the identity and authenticity of the original heritage. If such practices continue and the identity of the local heritage is not preserved and recorded, the traditional designs and local identity will eventually be lost. The objective of this paper is to identify the placements of woodcarving and the typology of design compositions of woodcarving which form the identity of the Johor Malay houses. Site visits were conducted to Limas Johor in which the wood carvings of 50 houses were examined, photographed and documented. Interviews were also conducted with the house owners or occupants, and the wood carvers. The samples were analyzed and the results were verified by experts. A total of 10 woodcarving placements and 23 typologies were discovered, drawn and coded. The findings of this research suggest that the typology combination of JT2-P5+KT7 of woodcarving represents the identity of Limas Johor houses. It is hoped that this study can bring recognition to Johor woodcarvings, contribute valuable guides for woodcarvers to apply these typologies into their future works to sustain and cherish the Johor local identity.

Keywords: Wood Carving, Malay Woodcarving, Malay Woodcarving Motif, Limas Johor, Traditional House, Vernacular Architecture.

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INTRODUCTION

Malaysia is well-known for her cultural diversity and rich with traditional heritage. Malay is one of the major ethnic groups in Malaysia and is considered as the majority of the country's population which contributes to the significant heritage including art, decoration and even architecture. Traditional woodcarving is an intricate Malay heritage and is the symbol of Malay art. This traditional heritage of woodcarving should be loved, preserved, treasured and passed along from generation to generation (Silah *et al.*, 2013). Woodcarving was created and designed to provide convenience and enhance the art of Malay culture (Jenkins, 2010). The decorated structural design in woodcarving serves as a symbol of high social status in the Malay community (Norhaiza Noordin, 2009). Apart from the status factor, the love and appreciation towards its beauty also has caused woodcarving developed from the nobility to ordinary people (Zulkifli Hanafi, 2007; 2015) and became quite an important element in traditional Malay houses. Despite being an important element, woodcarving is on the brink of being disregarded due to the current practices of selecting design composition and woodcarving placement which do not belong to the local region. These practices pose a threat to the local identity and authenticity of the local heritage. If such practices continue and the identity of the local heritage is not identified and recorded, the traditional designs and local identity left by the local ancestors will eventually be lost. The deficiency of dissertation, research studies and documentation relating to the Malaysian architectural identity is one of the factors that contribute to an ongoing misinterpretation on the idea of finding the architectural identity (Nor Hayati, 2015). Due to that, the objective of this paper is to identify the placements of woodcarving and the typologies of design compositions of woodcarving in order to form the identity of the Johor traditional Malay houses.

RESEARCH BACKGROUND

Traditional Malay houses are commonly decorated with woodcarvings that have beautiful motifs, placements and design composition. These woodcarvings represent the Malay culture and should be perceived, appreciated and preserved. However, vast urbanisation has actually created such a huge impact where the old houses were being renovated using modern elements and components due to the rapid development of architectural style and recent technology (Mohamad Tajuddin, 2006; Zumahiran & Ismail, 2010). Hence, it is important to conduct a research on woodcarvings found in the traditional Malay houses. Studies have been carried out in the vicinity of Kelantan, Terengganu, Kedah, Perak, Negeri Sembilan and Melaka to examine on their local woodcarving. This research examined woodcarvings on traditional Malay houses in Johor.

One of the biggest issues that create a challenge in preserving this Malay heritage in Johor is about the abandonment of traditional houses that comes with woodcarving. It is such a waste to see our heritage of woodcarving being destroyed unappreciated and undocumented. More and more traditional Malay houses are being demolished day by day. Yilmaz & Maz (2006) stated that in this era, many cultures and heritages are threatened for extinction, lost and destroyed from the memory even the memory of the family members who moved to pursue with the current trend and modernity. Those typologies that haven't been recorded will be gone and forgotten. The *Kongres Budaya* 2017 has raised up the problem regarding the destruction of cultural heritage on traditional buildings that leads to losing of identity. Mastor Surat (2012) and Kamarul Afizi Kosman (2012) have emphasised that it is important for every state to participate in the effort of preserving its own architectural heritage in line with the government's goals.

Another biggest issue is regarding the identity crisis. This issue arises when creating identity without studying on the local cultural heritage and is solely top down, created by top management or by copying what is existed in other country. Identity based on replicative copy of foreign elements is unacceptable due to the fact that it is not complimenting true to history and not referring to local design values, and as being foreign to Johor. The definition of the Johor's cultural heritage is seen as the responsibility of the highest leader in the state, which are not always looking directly on the place or its genius loci (Gurupiah & Syed Iskandar, 2016). The malfunction integrity of an architect was highlighted with a commercialism approach and the mind bondage towards top down views (Mohamad Tajuddin & Kamarul Afizi, 2005). Conflicts of identity also arise when new generations of local carvers in Johor adopted woodcarving placements and design composition typologies from other states such as Kelantan and Terengganu, as well as from foreign countries such as Bali, Myanmar and India. Strong influences of non-local features are feared to dominate and overshadow our own heritage (Norhaiza Noordin, 2017). Most carvers including the Johor local carvers learnt carving from the East Coasts and Indonesia, and some may used Bali motifs in their carvings which, unfortunately, do not reflect the local identity (Abu Bakar Yatim, 2015). This issue on identity crisis occurred because through interviews, it was found that Johor woodcarvers Johor woodcarvers has not made any detailed study related to woodcarving placements and design composition typologies on Johor traditional houses that have existed for more than 100 years.

METHODOLOGY

The research employed a case study design and the data collection methods involved field study and interviews. The research started with obtaining information about the traditional Malay houses that can be found throughout

Johor. Site visits and inventory were conducted to 110 traditional Malay Johor houses and from there, 50 houses that falls under the category of Limas Johor were then selected for the case study in which the houses and woodcarvings were examined, observed, photographed and documented. Other categories are under *Rumah Bumbung Panjang* and *Rumah Perabung Lima* while *Rumah Bumbung Limas* were chosen because this category falls under Johor identity.

These 50 houses of Limas Johor were chosen based on their age, distinctive woodcarvings and significant huge placements. The houses were built as early as 1820. The house residents were interviewed to obtain information related to the year the house and the woodcarvings were built, the influences and functions apart from the details of the house owner, address and captured ample related photographs. Interviews and analytic reviews were also conducted with professionals consisting of four local woodcarvers and woodcarving experts around Johor. Data gathered from the site visits were then analysed with narration and interpretation from these prominent local woodcarvers. The data collected and woodcarving samples were analysed and discussed with experts for verification. Apart from the Johor local woodcarvers, the interview was also done with Malaysia's leading woodcarver, Norhaiza Noordin, who is the *Yang Dipertua Persatuan Penggiat Seni Ukir Kayu Malaysia (Pengukir)*, was awarded as the *Tokoh Adiguru Kraf* of the wood in the field by the *Perbadanan Kemajuan Kraftangan Malaysia*. The analysis and findings were discussed in order to get more satisfactory results.

The timeline table of the houses were done to generate statistical graphs, bar charts and pie charts to get a typical percentage of statistical analysis review. The data were also analysed using Nvivo software application to get the relationship in order to develop the tree mapping and matrix coding.

RESULTS AND FINDINGS

All 50 houses of Limas Johor possessed interesting woodcarvings. Results and findings are as follows:

Woodcarving Placements

Based on the investigation, ten different placements have been identified of having the woodcarvings namely window railings or *jerejak tingkap*, window header panel or *kepala tingkap*, door header panel or *kepala pintu*, fascia board or *papan meleh / cucur atap*, barge board or *papan layang*, pinnacle or *tunjuk langit*, veranda railings or *jerejak serambi*, veranda door or *pintu serambi*, internal wall top panel or *atas dinding dalaman* and side panel of the floor slab or *papan cantik*.

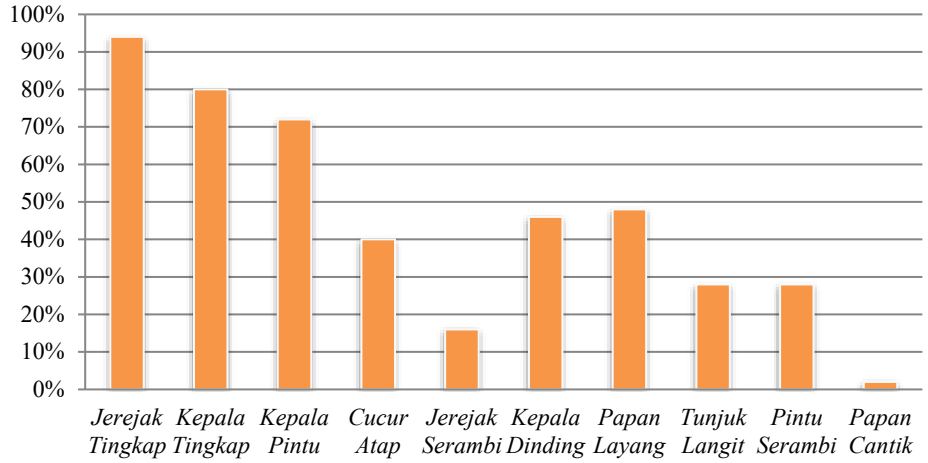

Figure 1: Result showing the percentage of woodcarving placements found in Limas Johor houses
Source: Hanita Yusof, 2018

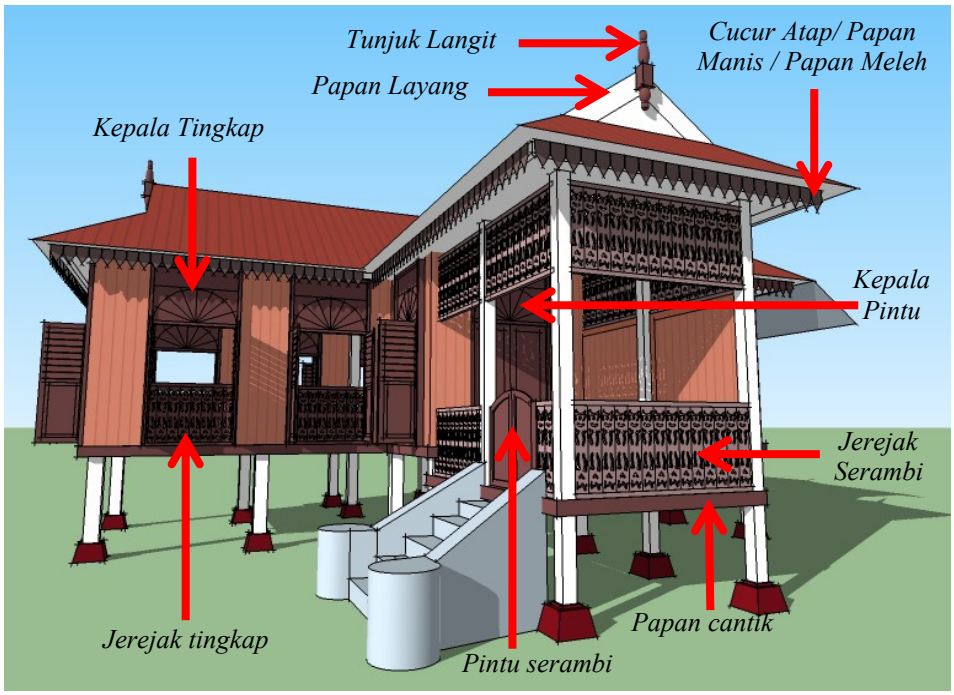

Figure 2: Eight out of ten woodcarving placements found in Limas Johor houses while woodcarving placements on the indoor are shown in figure below
Source: Hanita Yusof, 2018

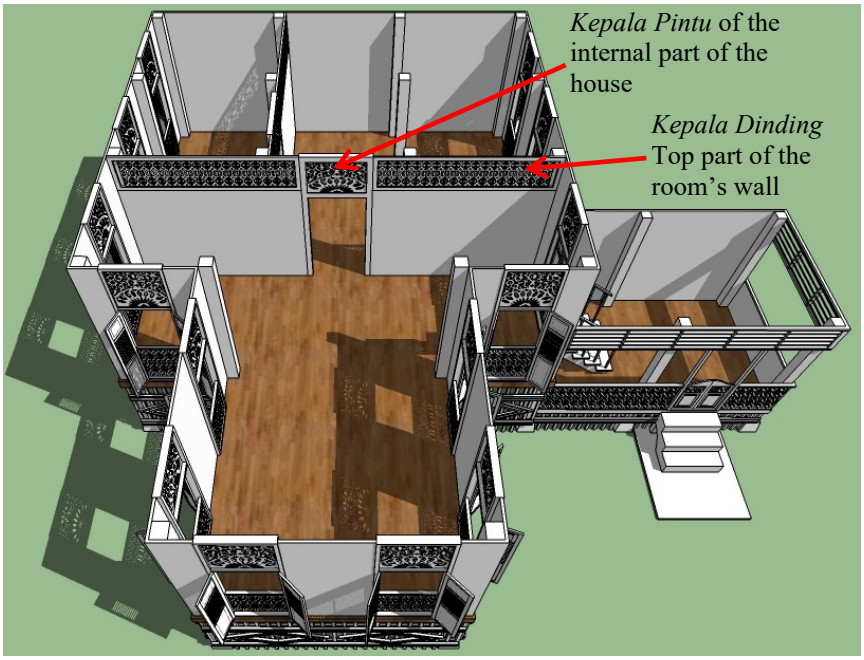

Figure 3: Two other woodcarving placements found inside Limas Johor houses which cannot be seen from the outside of the house
Source: Hanita Yusof, 2018

The result of the analysis of all 50 houses of Limas Johor revealed that nearly all houses have woodcarvings on their *jerejak tingkap* while the second highest percentage of placements that have woodcarvings are on their *kepala tingkap*. This result shows that the window is a significant element of woodcarvings placement compared to other placements in the house.

This finding revealed that the priority was given to *jerejak tingkap* to be decorated with woodcarving where it will enhance the beauty of the house from the front façade because of the position at the *anjung* is so dominant and noticeable since the *anjung* is protruded from the frontage. In addition to that, the floor level of the *anjung* is elevated more than 4 feets above the ground making the woodcarving at the *jerejak tingkap* at an appropriate point of sight where it is within the eye level viewing angle when the guest is standing outside the house. Apart from the aesthetical value occurs on the front façade of the house, it also contributes a significant function and beauty from the inside of the house. These woodcarvings provide magnificent effects as a result of the sunshine penetrating through the hollow part of the woodcarving, creating a shadow pattern on the floor. Moreover, this low placement is preferred because residents and guests are able to view the outdoor through the hollow part of the woodcarvings, aligned at

eye level, as they *bersila* (sitting on the floor) by the window. Besides, it functions well for the ventilation system compared to flat wood panel.

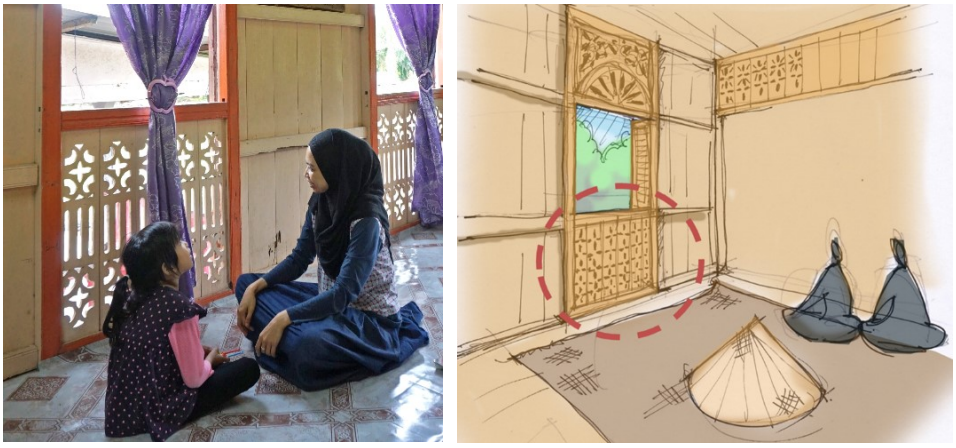

Figure 4: The placement of the woodcarving on jerejak tingkap in *anjung* is aligned within the occupants or guests' eye level viewing angle when *bersila* in the house that it also can function as ventilation as well
Source: Hanita Yusof, 2018

Design Composition Typologies

The result of the analysis revealed 23 woodcarving design composition typologies that were found which 7 typologies for *jerejak tingkap* and 16 typologies for *kepala tingkap* placements. All 23 different typologies were drawn and coded. This research also contributed codings for the design composition typologies which are JT for *jerejak tingkap*, P for panels of the wood and KP for *kepala tingkap* for easier understanding and unique identification.

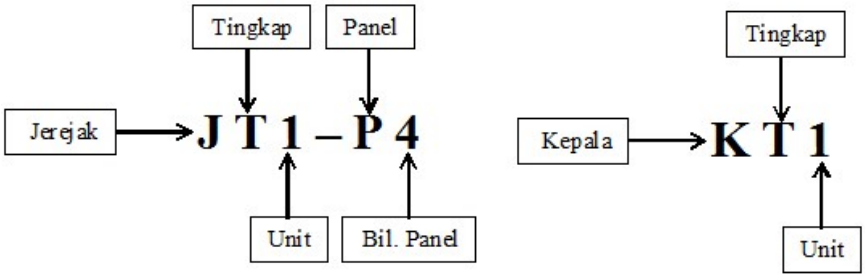

Figure 5: Figure above shows the coding for woodcarving design composition on *jerejak tingkap* and *kepala tingkap*
Source: Hanita Yusof, 2018

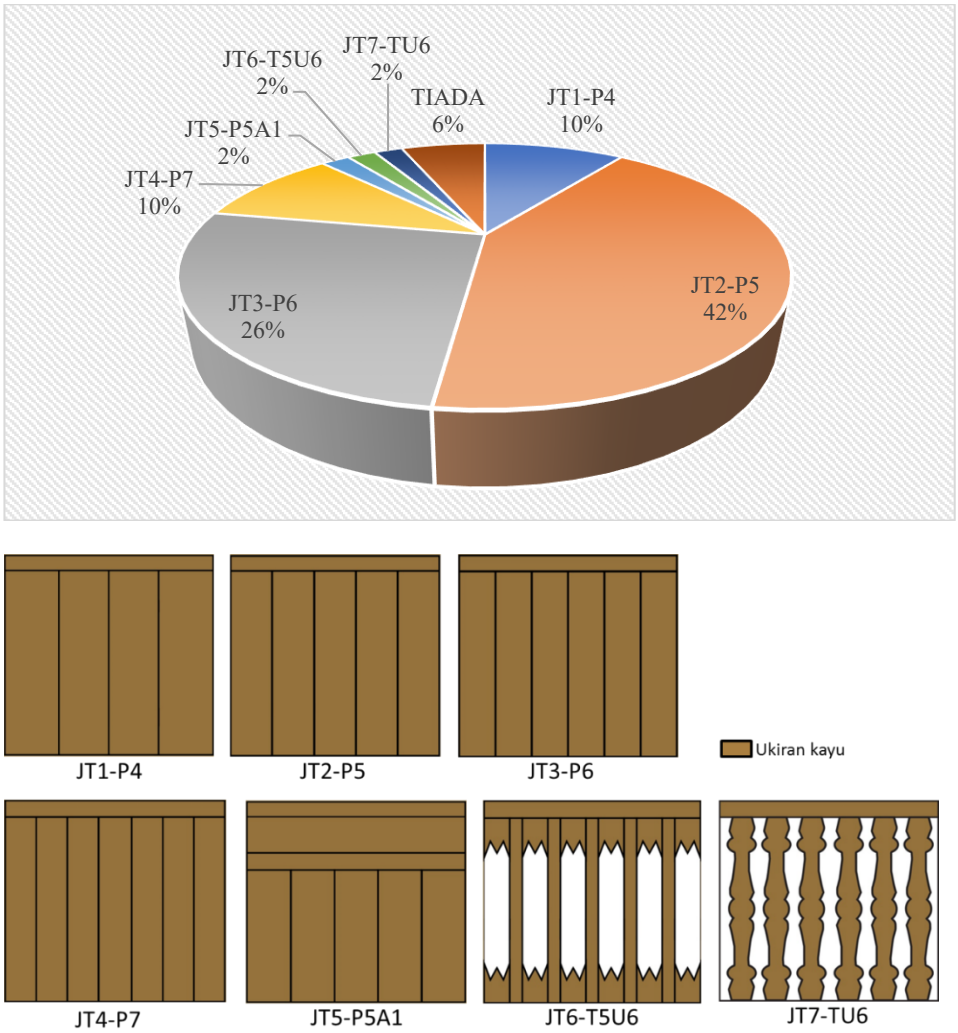

Figure 6: Seven typologies of the woodcarving design compositions found on the *jerejak tingkap* on Limas Johor houses and the percentage of each existence
Source: Hanita Yusof, 2018

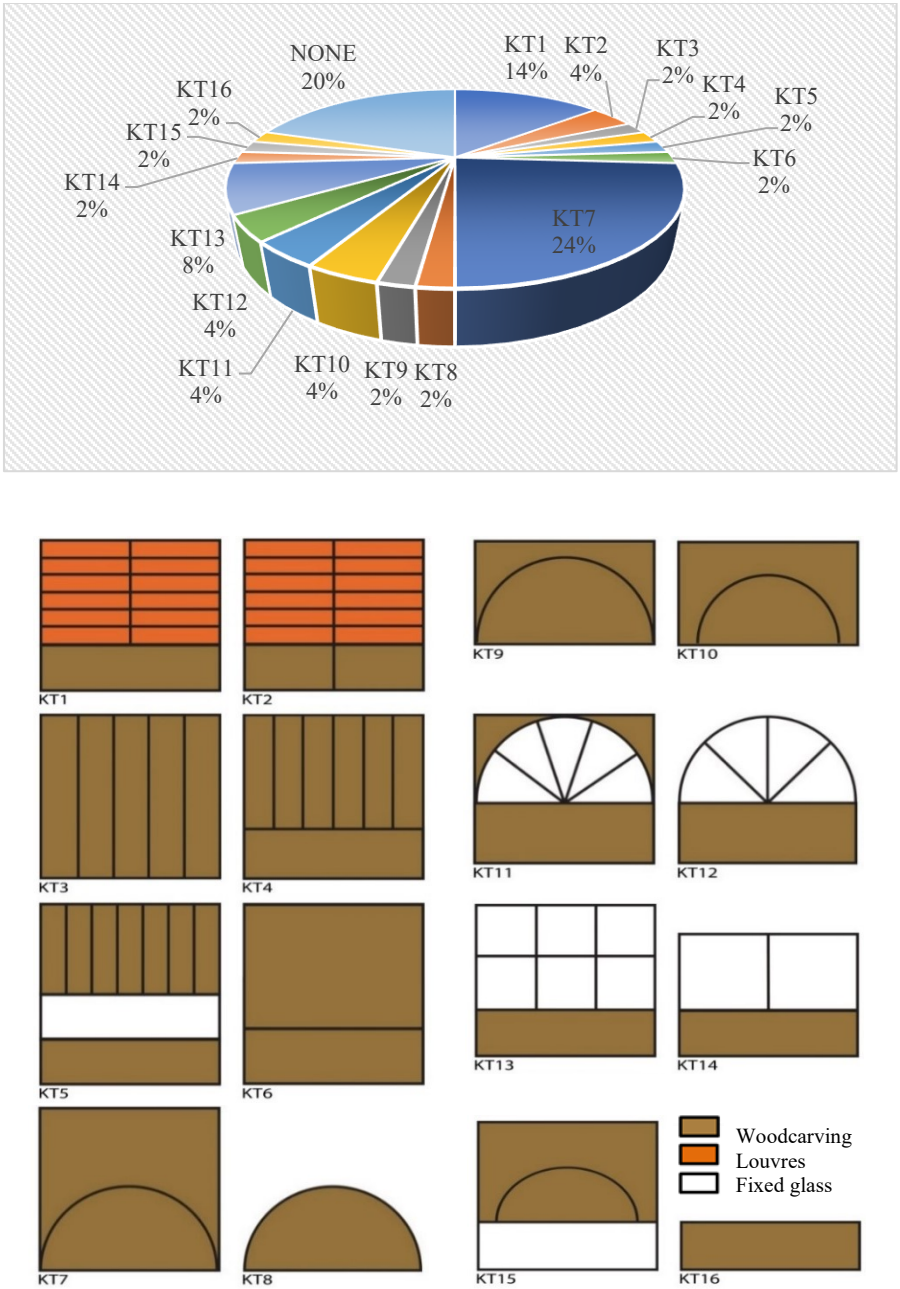

Figure 7: Sixteen typologies of the woodcarving design compositions found on the *kepala tingkap* on Limas Johor houses and the percentage of each existence
Source: Hanita Yusof, 2018

Identity

As for the Limas Johor, the identity of the house is the limas roof. Apart from the roof, the *anjung* is one of the elements that contribute to the identity of Limas houses as it forms the limas roof. Since the *anjung* is protruded from the frontage and elevated above the ground at an appropriate point of sight where it is within the eye level viewing angle, the existence of woodcarving on the windows in the *anjung* is very noticeable and prominent. The placement of woodcarvings on the *jerejak tingkap* and *kepala tingkap* in the *anjung* is very dominant for the Limas Johor houses. The findings unite two placements of woodcarvings in the *anjung* under the typologies JT2-P5 + KT7 as an identity for design composition. This is because JT2-P5 has the highest percentage for *jerejak tingkap* and KT7 is the highest typology for *kepala tingkap*. The combination of both is very compatible and harmonious as the size of a *jerejak tingkap* is nearly similar to the size of the *kepala tingkap* of 33-36 inches. Thus, the findings of this research suggest that the placements of *jerejak tingkap* and *kepala tingkap* with the typology combination of JT2-P5+KT7 represents the identity of woodcarving design composition for Limas Johor houses.

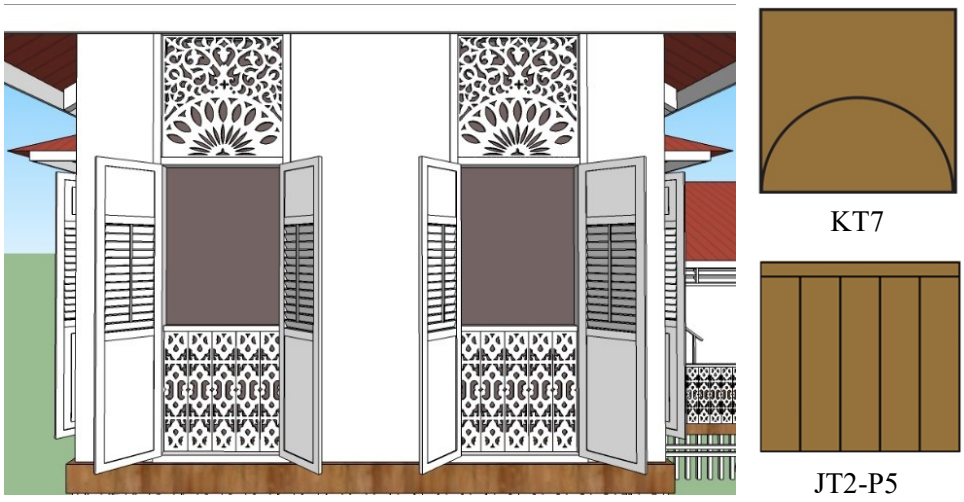

Figure 8: The combination of two typologies JT2-P5 + KT7 of the woodcarving design compositions that dominates the Limas Johor houses
Source: Hanita Yusof, 2018

This merging of two most dominant typologies is eligible to be proposed as an identity for the woodcarving design composition of Limas Johor houses. It is very momentous and significant to the Johor community due to its existence in the majority of the Limas Johor houses.

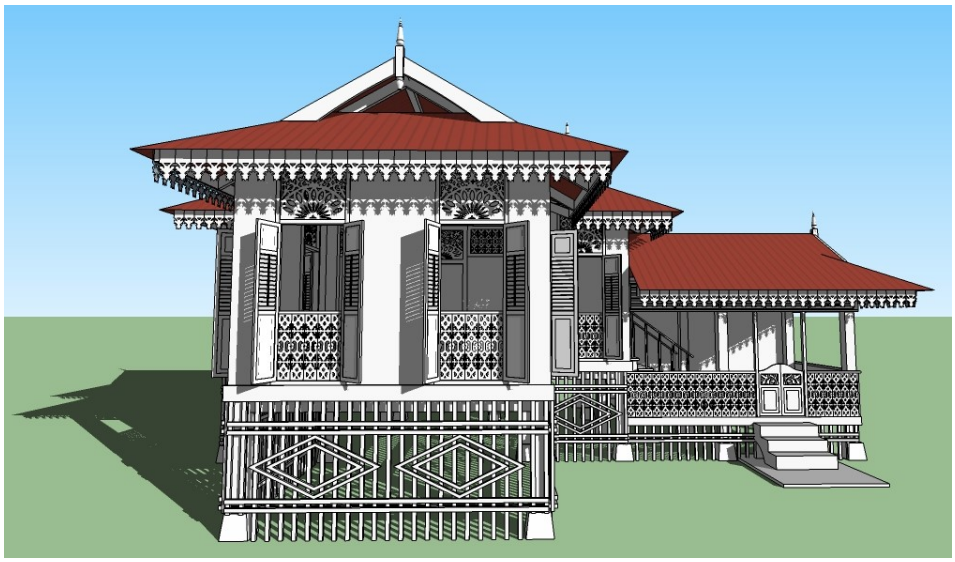

Figure 9: Front elevation showing the combination of typologies KT7 and JT2-P5
Source: Hanita Yusof, 2018

CONCLUSIONS

The findings revealed 10 woodcarving placements with the highest percentage of placements were found on the *jerejak tingkap* and *kepala tingkap*. 23 woodcarving design composition typologies were drawn and coded for both placements. The findings of this research suggest that the woodcarving placements of *jerejak tingkap* and *kepala tingka*p in the *anjung* with the typology combination of JT2-P5+KT7 represent the identity of woodcarving design composition for Limas Johor houses. These are really significant to the local architectural heritage of Limas Johor as it portrays the unity of the local people since 1820. All 10 placements and 23 compositions can be maintained as it can be used for the building of current Limas houses in Johor. It is important to promote the local identity and sustain the local belongings without imitating the identities of other countries. It is hoped that the findings will help to acknowledge Johor woodcarving unique identity, to be used for future generations. In addition, the findings could also provide valuable guides for woodcarvers to apply these typologies into their future works to sustain and cherish the Johor identity. Therefore, the local identity and the authentic value of the local heritage can be preserved.

ACKNOWLEDGEMENT

The authors wish to express their gratitude to the Centre of Research for the Study of Built Environment in the Malay World (KALAM) UTM.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 24 – 36

THE TYPOLOGY OF RUMAH LIMAS BUMBUNG PERAK (RLBP)

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Abstract

One of the treasured heritages of Perak is the traditional house of *Rumah Limas Bumbung Perak (*RLBP). With the current wave of rapid development and the other contributing factors, RLBP is threatened with extinction. Besides, the lack of research and documentation effort has made this threat worsen. The objective of this research is to analyze the typology and classify the style of RLBP throughout the state of Perak. The research is conducted using the on-site field survey where the data was collected through observation. An overall of 260 RLBP houses has been analyzed using typological analysis. The research findings have identified an overall of 5 styles of RLBP, namely, *Rumah Limas Bumbung Perak Gaya Utara* (RLBPGU)*, Rumah Limas Bumbung Perak Gaya Perak (RLBPGP), Rumah Limas Bumbung Perak Gaya Kembar (RLBPAK), Rumah Limas Bumbung Perak Agam (RLBPA) and Rumah Limas Bumbung Perak Gaya Selatan (RLBPGS).* The findings of this research contribute towards the understanding of identity and the enhancement of architectural theory from the perspective of architectural typology and evolution of the traditional Malay house architecture, especially in Perak.

Keywords: Typology, Rumah Limas Bumbung Perak, Style, Types

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INTRODUCTION

Perak is one of the states that has a rich and long history in the overall history of Malaysia. The enthronement of its first Sultan, Sultan Muzzaffar Shah started in Tanah Abang (of what is now Teluk Bakong) (Basri, 2016) and since then, the early settlement had started to flourish along the fertile riverbanks of the main river of Perak– the Sungai Perak. Along with the flourishing of this settlement is its architecture, and for this reason, many architectural traces and remnants of traditional houses, palaces, mosques and royal tombs are scattered along the main stretch of Sungai Perak (Rashid, Mat, & Amat, 2009). From previous research, there are two 2 types of traditional Malay houses of Perak- the *Rumah Kutai* and the *Rumah Limas Bumbung Perak* (Abd Rashid, Fadzil, & Mat, 2010). *Rumah Kutai* is the oldest type of the traditional Malay houses in Perak, while *Rumah Limas Bumbung Perak* (RLBP) is the latest version of the traditional house of Perak which has started to become popular in the architectural landscape of Perak since the 1900s. For this historical and architectural significance that it offers, Perak has become one of the preferred areas of research. It is understood from the previous research, most research focused on the *design of Kutai house* and only a few on the *Rumah Limas Bumbung Perak* (RLBP).

A recent research published in 2019 had identified a few types of *Rumah Limas Bumbung Perak* (RLBP) that exist in the small area of Kampung Aji. In addition, the research warned about the extinction and damages of many *Rumah Limas Bumbung Perak* (RLBP). It should be noted that most of the past research, focused only on a small vicinity of a kampong in the Perak Tengah district. As recommended by previous research, (Rashid, Mat & Amat, 2009, Abd Rashid, Fadzil, & Mat, 2010, Saleh, Mahat & Nayan, 2018, Rashid, Choo, Ramele, Baharuddin & Alauddin, 2018, Rashid, Alauddin, Baharuddin, Choo, 2019), there is an urgent need in studying the architectural typological pattern of *Rumah Limas Bumbung Perak*(RLBP) in the whole of Perak. Considering the historic architectural significance of the *Rumah Limas Bumbung Perak* (RLBP) as the traditional Malay house of Perak, the objective of this research is to analyse and categorise the typologies of *Rumah Limas Bumbung Pera*k (RLBP) which is vital in safeguarding the architecture history of Perak.

Traditional Malay Houses of Perak

The architecture of the traditional Malay house has been developed and evolved over the generation adapting to the needs, culture and environmental factors in Malaysia (Yuan, 1987). Throughout Malaysia, there are various types of traditional Malay houses in every state. Each state has its own prominent style that eventually characterized the regional character of its traditional houses. Ali (1983) classified the types of traditional houses of the Peninsula Malaysia into four (4) areas, namely the northern style, the east-coast style, the west-coast style, and the southern style. The style and the architecture of the traditional houses

throughout the whole of the Peninsula are governed by the two major types of roof, the *bumbung panjang* (long roof) and *bumbung limas* (limas roof) (Nasir & Aziz, 1985). *Bumbung panjang* is the oldest form of roof which is mostly used by the Malays to build houses in the early period (Rasdi, 2005). It is characterized by a simple yet practical form of roof. Nevertheless, with the coming of the westerners during the colonization period, *bumbung limas* were slowly introduced. From the aspects of construction, *bumbung limas* is easier to build than *bumbung panjang* (Rashid, 2017) which makes it quickly become a favorite roof design by the carpenters and the people.

Rumah Limas Bumbung Perak (RLBP)

Bumbung Limas Perak has originated from the simple, early version of the limas roof where the roof form is known as *"Perabung Lima*". This roof is characterized by the 3-dimensional character where it consists of 1 main ridge in the middle of the roof followed by the smaller ridge, descending down to the roof eaves (Nasir & Teh, 1996). The origin of *bumbung limas* remains unknown. Nevertheless, according to an old carpenter in Lenggong Perak, the word "limas" has originated from the word "lima", depicting the five ridges of the limas roof (Nasir & Teh, 1996). *Bumbung Lima*s also known as *Bumbung Potong Belanda* (Rashid, 2017).

Colonisation period plays an important role in the evolution of Bumbung Limas Perak, where according to Nasir & Aziz (1985), it gives inspiration for the local carpenter and house builder to explore other types of roof forms. This gave birth to other types of bumbung limas which were more interesting and luxurious in terms of its looks (Harun, 2005). *Bumbung limas* had undergone an evolution in terms of its shape where other types of *bumbung lima*s were used in the other states such as Johor, Melaka, Kedah, Kelantan and Terengganu. In Johor, *Rumah Limas* were constructed under the architectural influence from the Bugis, Jawa, Banjar and Belanda (Nasir & Aziz, 1985). The roof of bumbung limas Perak, is slightly different from the *Bumbung Perabung Lima* where the latter has a distinguished feature of a smaller triangular shape space of its gable end (Nasir & Teh, 1996). According to Nasir & Aziz (1985), *Rumah Limas Potong Perak* was known in Terengganu, as *Rumah Duduk Fesyen Belanda, Rumah Bujang Barat* and *Rumah Duduk Bujang Bersorong.* Despite these myriads of east coast terminology, *Rumah Limas Bumbung Per*ak was widely used and well known in the west coast region of Peninsula Malaysia.

Figure 1. Rumah Limas Bumbung Perak *Source: Author*

The basic spatial characteristic of *Rumah Limas Bumbung Pera*k (RLBP) is that it comprises several spaces. The entrance of the house started with a *serambi* or a balcony. The *serambi* is attached to the *anjung*. *Anjung* is a public space in the house. This is the space where the guests are entertained and activities such as reading Quran, festivity celebration, circumcision ceremony and other public activities took place. This is also a space where the male guest enters the house (from serambi to the anjung). The middle of the house comprises the *rumah ibu* or the main house area. *Rumah ibu* is attached directly to the anjung and this is the space for the female guest. Next to *Rumah ibu* is the *rumah selang*. *Rumah selang* functions to connect the *rumah ibu* and the kitchen. It also functions as the secondary entrance of the house where it is used by the female guest to enter the house (Rashid, Alauddin, Baharuddin & Choo, 2019). The kitchen is located at the back of the house and functions as a cooking space and a food preparation area for the household. This spatial characteristic of the *Rumah Limas Bumbung Perak* (RLBP) is not fixed and changes based on the increasing needs of the household (the growing family members of the household). Nevertheless, any extension work to the house is extended from the back portion of the house, and not to the side portion of the house. This is said to relate to the "humble" culture and principle of the Malay of being moderate, shy and not being extravagant and showing off (Saleh, Mahat, & Nayan, 2018). The roof of the anjung comprised the Bumbung Limas Perak, while the serambi adjacent to the anjung is roofed with a simpler roof, that is the bumbung pisang sesikat. The façade of the *Rumah Limas Bumbung Perak* (RLBP) is enhanced with decorative elements. Overall, there are nine decorative elements that exist in the Rumah Limas Bumbung Perak (Rashid, Choo, Baharuddin, & Alauddin, 2018). The serambi is decorated with a decorative gerbang of jejala motif. It is one of the prominent characteristics of the decorative elements of *Rumah Limas Bumbung Perak (*Rashid et al., 2018). Nevertheless, the availability of the decorative elements in the house depends on

the house owner's status where a house with completed decorative elements is commonly owned by the rich or the noble people of the community.

RESEARCH METHOD

On-Site Field Survey

This study was conducted based on the exploratory research basis. The primary data collection was done using the on-site field survey approach through observation. The field survey conducted covers the whole region of Perak where 13 districts in the state were explored. The districts were grouped into 4 areas: Northern, Coastal, Central and Southern Area. All houses identified in these 4 areas were recorded in the form of visual and physical data. This methodology allows the researcher to explore, experience, and record the data at the site and to gain a more accurate data.

Observation - Visual and physical data

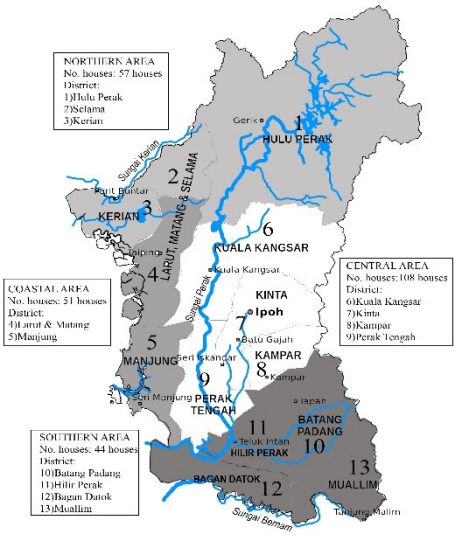
The data gained during the field visit survey were in the form of photos and technical sketches. Photos were collected using the DSLR digital camera and on-site freehand technical sketches. The photos taken covered the front, rear and side view of the houses as well as detailed interior components such as the entrance, door, window and decorative elements. The location of each of the houses was recorded and tracked using the GPS coordinates through Google Maps. The selection of RLBP houses selected for this study was based on several criteria as per described below;

i. The roof of the house (the rumah ibu) is of the *Limas Bumbung Perak* roof
ii. The house demonstrates the identifiable visual and spatial characteristic of a *Rumah Limas Bumbung Perak* (RLBP)
iii. The house is decorated with decorative elements

Data Analysis – Typological Analysis

A total of 260 houses were identified and recorded from the on-site field survey covering 13 districts of Perak. The districts were divided into 4 major areas of the northern, coastal, central and southern areas. The number of houses identified within the study areas was as described in the summative diagram of figure 2. The data collected were sorted and coded accordingly into a database. The parameter of this research focuses on the front spatial and the façade characteristic of the *Rumah Limas Bumbung Perak*. The data is analyzed using the typological analysis and categorized based on the front, the spatial and the façade characteristic of the *Rumah Limas Bumbung Perak*. Typological analysis is an analysis that was globally used by researchers of various fields to identify and establish a typological pattern that emerged from a large database. Typology

in architecture has been defined as the classification or archiving of certain types of form based on architecture styles which then reduced to architectural elementary forms and elements (Altaş, 1997). It is a systematic analysis that is used to identify and clarify certain phenomena, that include "reduction, abstraction and schematization" (Ayyildiz, Ertürk, Durak, & Dülger, 2017). In the field of traditional Malay architecture, from the review conducted, the typological analysis was employed by prominent researchers such as Ali (1983), Talib (2006) and Utaberta et al., (2012).



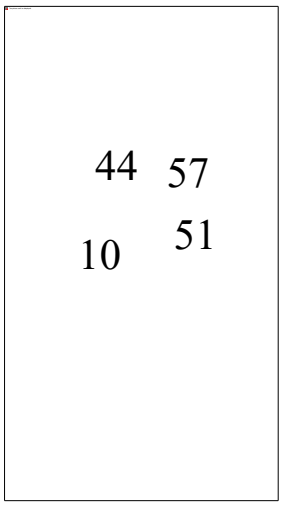


Figure 2. Classification of district per area and number of RLBP identified per area.
Source: Author

FINDINGS AND DISCUSSIONS

Typology of Rumah Limas Bumbung Perak (RLBP) in Perak

Based on the analyses of 260 houses conducted in this research, revealed that there are 5 major styles of *Rumah Limas Bumbung Perak* (RLBP) existed in the state of Perak. The styles are *Rumah Limas Bumbung Perak Gaya Utara (RLBPGU), Rumah Limas Bumbung Perak Anjung Kembar (RLBPAK), Rumah Limas Bumbung Perak Gaya Perak (RLBPGP), Rumah Limas Bumbung Perak Gaya Agam (RLBPGA) and Rumah Limas Bumbung Perak Gaya Selatan* (RLBPGS). Based on each style, there are several sub-categories defining the character of the major styles.

Type	Rumah Limas Bumbung Perak Gaya Utara (RLBPGU)				Rumah Limas Bumbung Perak Gaya Perak (RLBPGP)				Rumah Limas Bumbung Perak Anjung Kembar (RLBPAK)				Rumah Limas Bumbung Perak Agam (RLBPA)					Rumah Limas Bumbung Perak Gaya Selatan (RLBPGS)	
Sub-type	1(a)	1(b)	2	3	1(a)	1(b)	1(c)	2	1(a)	1(b)	2	3	1	2(a)	2(b)	3	4	1	Total
Northern	8	3	3	5	14	3	5	2	1	1	7	0	0	0	0	5	0	0	57
Coastal	0	4	0	0	21	0	0	3	1	1	7	2	1	0	0	10	1	0	51
Central	0	0	0	0	77	1	1	12	0	0	2	0	0	0	5	8	2	0	108
Southern	0	0	0	0	21	0	0	17	0	1	1	1	0	1	0	1	0	1	44
Total	8	7	3	5	133	4	6	34	2	3	17	3	1	1	5	24	3	1	260

Figure 3. Summary of houses based on 5 major style and sub-types. *Source: Author*

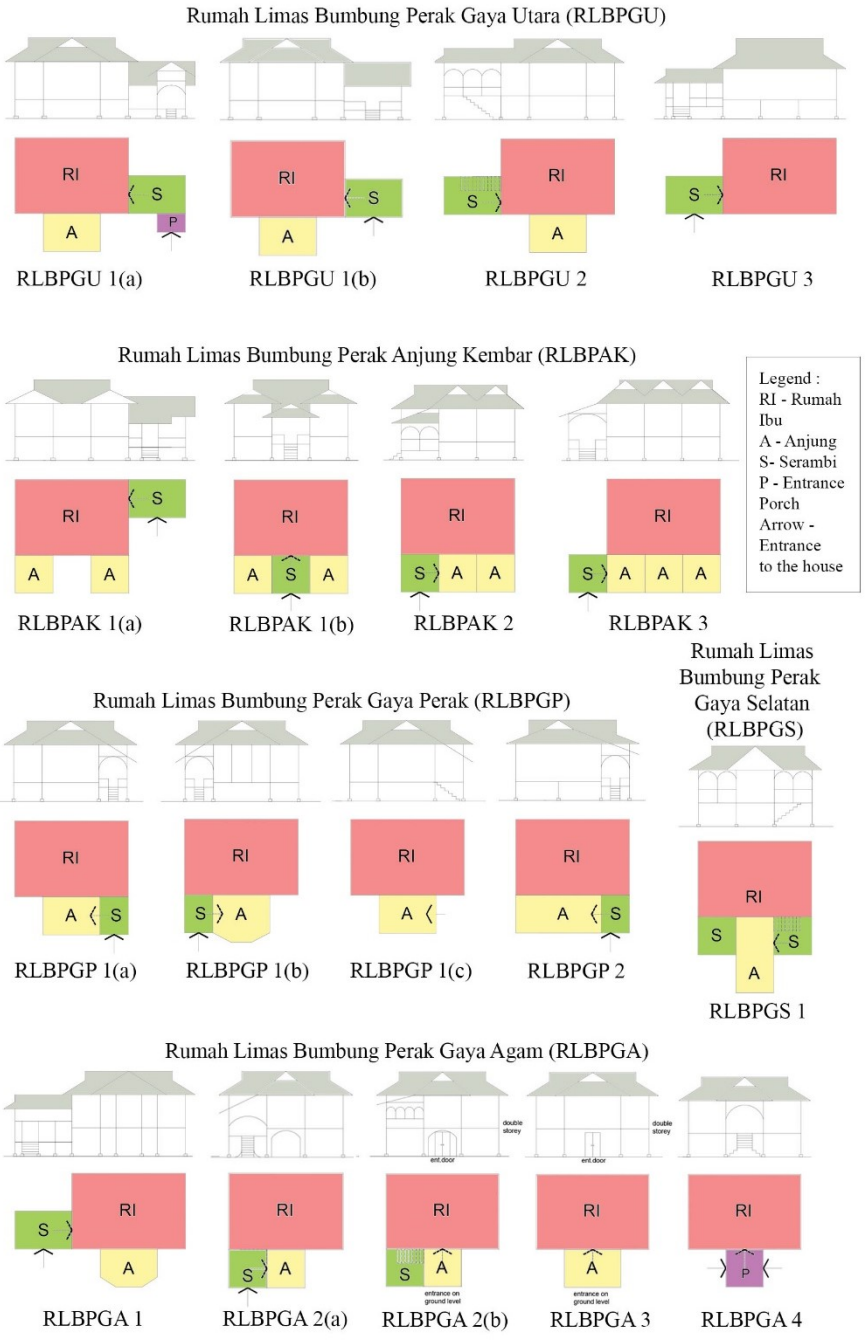


Figure 4. Typological diagram of 5 major styles & sub-types of Rumah Limas Bumbung Perak (RLBP). *Source: Author*

Rumah Limas Bumbung Perak Gaya Utara (RLBPGU)

The research has identified 4 variations of houses under the RLBPGU style. From the analysis, a common front characteristic that existed in all houses under the RLBPGU is the spatial position of its serambi. The serambi of the house is attached directly to the *rumah ibu*, as opposed to the common RLBP where the serambi is attached to the front anjung. Other variations existed in this style were that some houses were found to have a porch at the entrance where it has an open or semi-open characteristic of serambi; the location of the entrance stairs can be found either at the front, side or under the serambi; the roof types of the serambi used either bumbung panjang or bumbung limas; the height of the serambi were lower or at the same height with rumah ibu; and lastly the absence of the anjung. In all 4 types of houses under the RLBPGU style, it can be identified that Type 1a has the most visually and attractive façade compared to the other houses under the RLBPGU style. Meanwhile, the simplest house within this style is Type 3, where the house has no anjung and its serambi is stylized with the *Bumbung Limas Gajah Menyusu*. The façade of Type 1a is highly decorated with decorative elements such as *ande-ande (papan manis), kepala pintu, kepala tingkap* as well as the *lubang angin* styled with intricate carving panels. In terms of its architectural characteristic, this type closely resembles the traditional Malay house of Kedah (e.g; *Rumah Seri Banai*, Alor Setar). From the research conducted, most of the houses with the RLBPGU style are mostly found to be located in the northern area. This locational pattern explains the reason behind the concentration of RLBPGU in the northern area. The architectural style of RLBPGU is influenced by the northern style of the Traditional Malay House of Kedah. This may be due to the location and the background of the tukang rumah (the house carpenter) are mostly from the north ie Kedah.

Rumah Limas Bumbung Perak Gaya Perak (RLBPGP)

The analysis revealed that out of the 5 styles, the RLBPGP is the most recorded style of all the houses identified in this research. The RLBPGP is the common house style that is found in almost any region in Perak, making it the common style of RLBP. Most of RLBPGP can be identified at the central Perak. Historically, the central Perak (specifically the vicinity of Sungai Perak) is the early settlement in Perak and it can be considered that the RLBPGP is the oldest type of RLBP since most of RLBPGP were found along Sungai Perak. A common front characteristic of the house is the serambi of the house is attached directly to the anjung, while the other character is similar as mentioned in other literature review. Nevertheless, from the study conducted, it is found that the RLBPGP variations can be divided into 4 sub-types. Those variations include the octagonal shape of the anjung, the location of the entrance stairs (front approach, side approach), the absence of serambi (mostly in RLBPGP with side approach), the availability of a wider anjung size (size of combined two anjung) and the roof

types of the anjung – bumbung limas perak or bumbung panjang. From the study, it can be found that most of the RLBPGP houses in the southern region are from the RLBPGP Type 1. Nevertheless, there is a slight variation where the roof for the anjung is styled with a bumbung panjang roof. The gable end of the southern houses are decorated with the rising sun motifs, a motif widely used in the traditional house of Selangor. From the cross review conducted, this variation of the RLBPGP located in the southern area is influenced with the southern style of the traditional Malay house of Selangor. From the summary table, it is found that the Central Area recorded the most houses in the RLBPGP style. The reasoning behind this is because the central area (specifically along the vicinity of Sungai Perak) is the site of the early settlement of Perak and had continuously become the preferred settlement area due to the ease of river transportation, until the modern road was introduced in the later years.

Rumah Limas Bumbung Perak Anjung Kembar (RLBPAK)

From the analysis that has been conducted, the Rumah Limas Bumbung Perak Anjung Kembar (RLBPAK) style consists of 4 types. The common characteristic shared by all of the types is as per its name, the number of anjung is more than one and its number ranges from 2-3 anjung in a house. It is found that type 1(a) and 1(b) consist of separated anjung while Type 2 and Type 3 have the attached type of anjung. The other variations are the position of the serambi where some are attached to the rumah ibu or the anjung; the position of serambi where it is located in the middle or side; and the roof types of the serambi either using the bumbung limas or bumbung panjang or, bumbung pisang sesikat. The front spatial form of Type 2 and Type 3 is the same as the spatial form of the RLBPGP. The only difference is the number of anjung, which have more than one compared to the RLBPGP which consists of only one anjung.

Meanwhile, the front characteristics of Type 1(a) and Type 1(b) are closely related to the front characteristic of the RLBPGU. The serambi is attached to the rumah ibu, while the difference between these two is the number of anjung. The prominent characteristic of Type 1(a) and Type 1(b) is that the twin anjung is separated in the middle. From the cross-literature review that has been conducted, Type 1(a) and Type 1(b) closely resemble the traditional houses that are located in the southern area of Thailand where they consist of the twin, separated anjung. Meanwhile the Type 2 (with the twin attached anjung) and Type 3 (with the 3 attached anjung), according to Nasir & Aziz (1985), is the type of Rumah Limas Bumbung Perak (RLBP) mostly found in Kedah and Perlis. From the summary table, it can be summarized that Type 2 is the most commonly found type of RLBPAK in all of the areas explored.

Rumah Limas Bumbung Perak Agam (RLBPA)

For the Rumah Limas Bumbung Perak Agam (RLBPA), there are 5 types that exist in this style. Architecturally, RLBPA differs slightly from the rest of the 4 styles where the design is a fusion with colonial-style architecture. Nevertheless, from the analysis it can be identified that the front spatial characteristic of most of the RLBPA types resembles closely to the common style of RLBPGP. The obvious differences of the common type of RLBPA with RLBPGP are the absence of the serambi (in most of RLBPA common type) and the height and scale are slightly higher and bigger due to influence of colonial design. The common characteristic of RLBPA is that the house is of two-storey building where the entrance for the house is from the ground level and the size and the height of the house is higher and bigger. From the analysis conducted, there are 5 various types of RLBPA. Those variations include the position of serambi- attached to rumah ibu or anjung; the shape of the anjung- octagonal or rectangular anjung; the characteristic of serambi– no serambi or semi open serambi like in RLBPGU; the number of storeys; availability of entrance porch and the absence of the serambi. Type 3 is the most common type where it can be found in all of the 4 areas that have been explored. This is because most of the buildings built during the colonial period were two or more storey buildings. Most of the aristocrats and elite during that period tended to build their house bigger and in a two-storey building which showed their social status and income.

Rumah Limas Bumbung Perak Gaya Selatan (RLBPGS)

From the analysis, it is found that there is only one type of Rumah Limas Bumbung Perak Gaya Selatan (RLBPGS). In the RLBPGS, there are 2 serambi with an anjung located in the middle. Based on the analysis of all RLBP types, it was found that the RLBPGS is the only building that has 2 serambi attached to the middle anjung. The roof of the middle anjung is styled with the bumbung panjang roof. The entrance stair is located under the serambi (under the house). This type is the rarest type and it is only found in the southern area. However, in terms of the decorative elements of the RLBPGS the study found that it is almost similar to the RLBPGU, where the decorative elements of the house are focused on the intricate carvings of the kepala tingkap and pintu.

CONCLUSION

This study highlights the 5 major styles that are found from the study of 260 numbers of Rumah Limas Bumbung Perak (RLBP) throughout the 13 districts of Perak. Out of these 5 styles, variations of RLBP types were found to have originated from the single common style of the RLBP. This variation signifies and reflects the architectural evolution and exploration of the RLBP as part of the traditional architectural landscape of Perak. Geographical and location of these houses do influence the difference characteristic of the RLBP houses.

Furthemore, the people of different ethnicities (example ethnicity of Siak, Kampar, Mandaling, Jawa and etc in Perak) residing in Perak do influence and contribute to the spatial, façade and character RLBP building. The advancement of traditional construction technology, as well as the availability of materials and machines, has made the variation in the design of RLBP possible for the builder. The colonization period has influenced the design and led to the colonial fusion style of the RLBP. The novelty of this research lies in the classification of RLBP styles and types and this classification of RLBP contributes to the enhancement of the architectural theory from the perspective of architectural typology and the traditional Malay architecture evolution. In conclusion, it is recommended that continuous research and conservation effort be done by relevant authorities in order to preserve this national and cultural heritage in the future.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the Centre for Knowledge and Understanding of Tropical Architecture and Interior (KUTAI), UiTM Perak. Thanks also go to the owner of the houses that are studied in this research for allowing their house to be recorded in this study for academic purposes.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 37 – 46

ACTIVE FIRE SAFETY MEASURES IN THE HERITAGE TIMBER BUILDINGS IN MALAYSIA

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Abstract

Malaysia has a significant amount of heritage timber buildings located in every part of the country. The buildings symbolised the origin of the country's vernacular architectural style as well as the historical representation of the local community culture and its surrounding context. However, due to the combustible nature of timber, these heritage timber buildings are highly exposed to the risks of fire. Currently, there are no proper fire safety guidelines specifically for heritage buildings which can act as a good reference for the building owners or conservators in safeguarding the heritage buildings. The purpose of this study is to identify existing active fire safety measures in selected heritage timber buildings in Malaysia. The study was conducted through literature findings and observation of four selected heritage timber buildings. The study had identified that all four heritage timber buildings were equipped with very basic active fire safety measures.

***Keywords**:* Fire Safety, Fire Risk, Heritage Buildings, Heritage Timber Buildings, Preservation

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INTRODUCTION

For any civilisation or country, one of their most valuable historical assets is the existence of their heritage buildings. Heritage building can be easily depicted as a building constructed in the past which contains various historical value within its design or existence. The presence of heritage buildings contributes towards providing a general glimpse of the past of a specific community or civilization through the craftsmanship and technology used in the building's design and construction. In addition, the National Heritage Act 2005 further explained that the heritage building is defined as a building or groups of separated or connected buildings that stand out amongst the rest either due to their architectural essence, their cultural homogeneity, or even their placement within the surrounding landscape from the perspective of history, arts, and science.

Fire is a recurrent risk towards most buildings and its contents due to the various types of destruction and damages that it may cause. In the case of a heritage building, fire is considered a significant threat towards the historic essence of the building and its context especially with the increasing age for most of the building's material and lack of safety provision in most of the heritage buildings. Maxwell (2005) stated that fire usually occurs due to the presence of three main elements which includes heat, oxygen, and fuel. The spread of fire within the building also easily take place when it is unhindered from any types of separation. This is the main concern to heritage buildings since most of them were constructed using traditional methods and tend to include numerous voids that fire can easily spread through.

RESEARCH BACKGROUND

There had been reported that most of heritage buildings are exposed to fire risks (Nurul Hamiruddin & A Ghafar, 2009; Othuman Mydin, Md Sani, Abas & Khaw, 2014; Farid Wajdi, Wan Syarifah Nadirah & Baaki, 2016). Among the common factors are (1) existing structures weak on fire resistance; ageing or decaying building materials and combustible materials; (2) inadequate fire prevention and protection systems, notably passive fire protection; (3) poor fire safety awareness among the building owners, managers, staff and the public; (4) low standard of management, housekeeping and maintenance; (5) locations of a few heritage buildings are at the busiest area or narrow road with no good access for fire brigade; (6) existing electrical wiring had not been upgraded or replaced accordingly; a few heritage buildings are still using old electrical wiring that may cause electrical fault; (7) storage for many flammable artefacts or heritage collections; (8) a large number of visitors; most heritage buildings open daily to the public; (9) the danger from renovation works; (10) possible danger from natural factors such as lightning, overheating etc.; and (11) the danger of carelessness or arson.

Statistically, electrical faults are reported as the second highest cause of building fires in Malaysia (Table 1).

Table 1: Statistic on the cause of building fire in Malaysia from 2015 to 2018

Year	Fire Caused by Electrical Faults	Total Fire Incident	Percentage (%)
2015	1,233	22,456	5.6%
2016	2,005	44,672	4.5%
2017	1,737	27,681	6.3%
2018	1,563	34,769	4.5%

Source: https://www.bomba.gov.my

Rozrinda and Shahrul Yani (2017) highlighted that a few studies had been conducted on fire safety for heritage buildings in Malaysia. The findings found that the level of the fire safety management system at heritage buildings in Malaysia is still low.

METHODOLOGY

This study employed a combination of both quantitative & qualitative methods that divided into four (4) stages. The first stage involved a literature review, where both conservation and general fire safety literature were reviewed to identify key issues and recent research that relate or were significant to the research topic. The second stage involved the collection of primary data through interviews and observations. The interview sessions specifically involved the fire expects (e.g. the Fire and Rescue Department Malaysia (FRDM) officers and fire engineers). The interviews were conducted mainly to gather information on the current active fire protection systems and their application in heritage buildings.
In the third stage, four (4) heritage timber buildings were selected as the case studies to observe directly the application of active fire protection measures in the buildings. The selected buildings are (1) Istana Ampang Tinggi, Seremban, Negeri Sembilan, (2) Negeri Sembilan Traditional House, Seremban, Negeri Sembilan, (3) Muzium Matang, Perak, and (4) Muzium Kota Kuala Kedah, Kedah. In the observation stage, the existing active fire protection measures in the buildings were briefly audited and manually recorded in a Fire Safety Checklist Form (a modified version of Form I (Reg. 2) of the Fire Services Act 1988) as well as taking photos for research purposes. In the last stage, conclusions were made based on the analysis of the literature and the collected data.

HERITAGE TIMBER BUILDING

Traditionally, timber was the main choice of material for the construction of traditional palaces, masjids and houses in Malaysia. Timber was considered as the easiest accessible material and the most economical building material at the time. There is a significant amount of heritage timber buildings in Malaysia and most of them are still in existence until today (Table 2). The buildings are categorised into five (5) main building typologies, namely place of worship, residential, office, palace and commercial building. Most of the buildings gazetted under the National Heritage Act 2005 as National Heritage Building or Heritage Building.

Table 2: List of several prominent heritage timber buildings in Malaysia

Building Typologies	*Name of Buildings*
Place of worship	1. Masjid Mulong, Kota Bharu, Kelantan 2. Balai Adat Kampung Putera Jelebu, Negeri Sembilan 3. Masjid Kampung Laut, Kelantan 4. Masjid Insaniah Iskandariah, Kuala Kangsar, Perak
Residential	1. Rumah Tiang Kembar & Rumah Tiang Limas, Terengganu 2. Rumah Penghulu Mat Nattar, Jasin, Melaka*
Office	1. Bangunan Sanitary Road, Taiping, Perak 2. Muzium Islam, Kota Bharu Kelantan 3. Kota Ngah Ibrahim, Taiping, Perak
Palace	1. Istana Lama Ampang Tinggi, Negeri Sembilan* 2. Istana Jahar (Muzium Adat Istiadat Diraja), Kota Bharu, Kelantan* 3. Istana Kenangan (Muzium Diraja Perak), Kuala Kangsar, Perak 4. Istana Seri Menanti, Kuala Pilah, Negeri Sembilan*
Commercial	1. Gedung Raja Abdullah, Klang, Selangor*

* Buildings gazetted under the National Heritage Act 2005

Source: https://www.heritage.gov.my

HERITAGE TIMBER BUILDING RISKS TO FIRE

A fire has a variety of reactions when exposed to a different type of materials. The type of materials used for the construction of a building can greatly influence the building's resistance to fire. This has always been a major concern since most of the heritage buildings in Malaysia were constructed using timber as the main

material. Due to the combustible nature of timber materials, heritage timber buildings are greatly exposed to the risk of fire. According to Gerard & Barber (2013), the presence of exposed timber material will contribute to the combustible fuel load as well as the room fire behaviour and structural fire resistance. Several heritage timber buildings in Malaysia have been damaged or destroyed by fire which results in a severe loss as shown in Table 3.

Table 3: Fire cases involved heritage timber buildings in Malaysia

Date	*Building*	*Estimated Loss (MYR)*
2 May 2003	8 units of double-storey wooden shop houses (1950), Batu Kawa Bazaar, Kuching	
25 July 2003	138-year old semi-wooden girls' dormitory, St Joseph Home, Penang	100,000
20 Oct. 2003	Rumah Pak Ali (1876), Gombak, Kuala Lumpur	>1 mil.
5 May 2008	38 units of Punan Bah longhouse, Belaga, Sarawak	>500,000
5 Feb 2009	5 units of Heritage houses, Chew Jetty, Penang (In World Heritage Site Zone)	
24 Feb 2010	Ho Ann Kiong Temple, Kampung Cina, Kuala Terengganu	

In comparison to other materials, the reaction of timber when exposed to fire consists of several different stages before the material is fully burned. According to the U.S. Department of Housing and Urban Development (2007), there are roughly four different stages of timber combustion. The first stage will occur at 100-150°C, which the water inside the timber will start to evaporate and turn the timber brown. Upon reaching 200-250°C, the charring process will slowly begin and non-combustible gas will be released. The third stage will occur at roughly 300°C where volatile and combustible gas is released, and smoke particles are becoming more visible. Finally, the fire will start to ignite at around 400-450°C and the charring process will occur at a steady rate. This will result in permanent loss of strength causing the breakdown of the timber.

Timber is considered to have an unpredictable combustion nature since the charring rate varies according to the type of timber exposed to fire. According to Lowden & Hull (2013), the process is influenced by several different factors which include density, continuity, oxidation-resistance, thermal insulation properties and permeability. In order to overcome this situation, the Department

of Standards Malaysia (2001) had identified a notional charring rate of Malaysian timbers according to their strength group as a solution to ease the calculation of residual section as shown in Table 4. Through this reference, the process of estimating the amount of time needed to escape and fire prevention will be much easier.

Table 4: Notional rate of charring for the calculation of the residual section

Strength Group	Charring Rate
SG 1: Balau, Bitis, Chengal, Penaga	0.5 mm/min
SG 2: Belian, Kekatong	
SG 3: Keranji, Kelat, Kembang Semangkok, etc.	
SG 4: Giam, Malabera, Merbau, etc.	0.7 mm/min
SG 5: Tembusu, Bintangor, Gerutu, etc.	

Source: Department of Standards Malaysia 2001

FIRE SAFETY APPROACH IN HERITAGE TIMBER BUILDING

In order to prevent any potential risks of fire, great consideration should be made towards the implementation of an appropriate fire safety system for the heritage timber building. According to National Fire Protection Association (NFPA) (2015), one of the main objectives of historic preservation is to fully utilise the level of protection of the heritage building against damage and loss to fire. However, as highlighted by Kidd (2010) and Nurul Hamiruddin (2011), there are six different conservation principles to be considered during implementation of fire safety in a heritage building, which include (1) Essential, (2) Appropriate to risk, (3) Compliant with legislation, (4) Minimally invasive, (5) Sensitively integrated and (6) Reversible.

As stated by Urquhart (2007), fire safety can be generally defined as a systematic approach which combines the usage of structural materials, building components, and protective system. Besides, fire safety is generally divided into two separate categories: 'active' system and 'passive' system. The passive system mainly focuses on the physical aspect of the building such as compartmentation, escape routes, and ventilation system while the active system makes use of additional equipment or a group of system to detect and suppress the presence of fire. However, from a heritage conservation point of view, the active fire safety system is more practical since it rarely disturbs the original physical properties of the building. It is widely accepted by building conservators that the implementation of the fire safety system should contain the utmost minimal physical impact on the fabric and decor of the building. This is vital for heritage timber buildings since most of the physical elements of the buildings are irreplaceable and more fragile compared to another type of building materials.

Specific legislation was issued by every respective authority to provide a general guideline towards the implementation of the fire safety system in a

building. Still, in most cases, these legislations did originally mean for new buildings and may not be compatible with the existing buildings including heritage buildings. According to Nurul Hamiruddin & A Ghafar (2009), most of the legislations in Malaysia are still lacking in terms of a proper guideline for fire safety implementation in heritage buildings. Nonetheless, Kidd (2010) stated that while it may not be applied to the heritage building, it is important to not overlook the fundamental point of its implementation. These legislations can be used as a reference to provide a performance-based standard that best fit into the objectives of heritage building fire protection measures.

FIRE SAFETY MEASURES IN HERITAGE TIMBER BUILDINGS

Selection of Case Study

In order to determine the ideal fire safety measures in heritage timber buildings, it is important to identify the methods that are currently used by most of the heritage timber buildings in Malaysia. Malaysia has a considerable amount of heritage timber buildings around the country, in which, most of the buildings were adaptively re-used as museums or public attractions. Yet, heritage timber buildings that are easily accessible to the public tend to have a higher level of fire risk potential. Thus, these buildings need to incorporate an appropriate level of a fire safety system to not only protect the visitors but also the building itself.

Currently, most of the well-known or gazetted heritage timber buildings are under safeguarding by the state governments or private institutions. These buildings tend to have a specific budget allocated for the implementation of fire safety measures to a certain degree. This may include the usage of the detection system, suppression system, and methods of escape. The selection of buildings as a case study was determined by the age of building of more than 100 years, building availability to the public, and building that is under safeguarding by federal or state government agency. Based on the above factors, four (4) heritage timber buildings were selected which are (1) Istana Ampang Tinggi, Seremban, Negeri Sembilan, (2) Negeri Sembilan Traditional House, Seremban, Negeri Sembilan, (3) Muzium Matang, Perak, and (4) Muzium Kota Kuala Kedah, Kedah.

These four buildings are currently gazetted as a heritage building under the National Heritage Act 2005. Both Istana Ampang Tinggi and Negeri Sembilan Traditional House are under the care of the Negeri Sembilan Museum Board. Whereby, Muzium Matang and Muzium Kota Kuala Kedah are under the direct supervision of the Department of Museums Malaysia. Nevertheless, each of the selected buildings is provided with a specific allocation for fire safety implementation annually. In terms of function, all four buildings are currently used as a museum except for Istana Ampang Tinggi and Negeri Sembilan Traditional House, which are used as part of the museum display. These buildings are easily accessible to the public and mostly open throughout the year.

ANALYSIS & FINDINGS

Upon the completion of the observation, several similarities and differences in terms of fire safety measures were identified in each of the four buildings. These measures include the usage of the detection system and suppression system as well as the method of escape. The summary of the fire safety measures in all four buildings is shown in Table 5.

Table 5: Summary of active fire safety measures in the heritage timber buildings

Building	*Detector System*	*Suppression System*	*Other*
Istana Ampang Tinggi	Smoke detector	ABC fire extinguisher	Emergency light
Negeri Sembilan Traditional House	None	ABC fire extinguisher	Emergency light
Muzium Matang	CCTV	ABC fire extinguisher CO_2 fire extinguisher	Emergency light Exit sign
Muzium Kota Kuala Kedah	CCTV	ABC fire extinguisher	None

One of the similar methods which can be identified in all of the four buildings is the usage of ABC Powder fire extinguisher as the main fire suppression system. However, due to the small size of the building, only one ABC Powder fire extinguisher is provided each for Istana Ampang Tinggi and Negeri Sembilan Traditional House. While, Muzium Kota Kuala Kedah is equipped with two ABC Powder fire extinguishers. Since Muzium Matang consists of two separate floors and larger floor area, it is equipped with six ABC Powder fire extinguishers, one on the ground floor and five on the first floor. Also, two CO_2 fire extinguishers are equipped on the ground floor of Muzium Matang. This is most likely due to the presence of the control panel used for the alarm system next to the registration counter. While ABC Powder fire extinguishers are commonly used in most situations, CO_2 fire extinguishers are deemed as an appropriate type of extinguisher when dealing with electrical fire since it is harmless to electrical equipment.

As for the detection system, only Istana Ampang Tinggi incorporates the usage of a photoelectric smoke detector inside the building. Even though Negeri Sembilan Traditional House is situated just right next to Istana Ampang Tinggi, no fire detection system can be found within the building. Similarly, both Muzium Matang and Muzium Kuala Kedah also did not incorporate any fire detection system but rely solely on the usage of closed-circuit television (n) system to monitor building security. The system is closely monitored 24-hour a day by the security guard on duty. However, the smoke detector system is

considered a more viable option since it can detect the presence of smoke particles faster which may not be visible or easy to be seen through the camera.

Except for Muzium Kota Kuala Kedah, each of the heritage timber buildings is equipped with light-emitting diode (LED) emergency lights. These lights will help the occupants to navigate through the exits or escape routes during the evacuation process of the building in the event of loss of primary power. The location of each light is spread out throughout the whole building to provide the minimum level of coverage to each area of the building.

From the observation, each of the selected buildings is generally equipped with an appropriate amount of active fire protection system. However, the selection of equipment for each building is different when compared to one another. This is due to the difference in terms of the size of the building as well as the content inside the building. Since Istana Ampang Tinggi and Negeri Sembilan Traditional House are smaller than the other two buildings, the implementation of active fire protection measures is slightly minimal and less complicated. Moreover, there is hardly any content or valuable item on display inside both buildings. Therefore, the main focus of the building's fire safety is only to evacuate the occupants and prevent further damage to the building from the outside.

In comparison, Muzium Kota Kuala Kedah and Muzium Matang are bigger in terms of size especially Muzium Matang which comprises two floors. Unlike the two buildings from Negeri Sembilan, both buildings contain precious artefacts as well as various kinds of display items. Thus, this would also raise security concerns aside from fire safety-related matters. The usage of CCTV system is considered as the most viable option since it can act as both the surveillance system as well as fire detection system at the same time. However, the main concern is that the system relies too much on a human presence to monitor the status of the building.

CONCLUSIONS

The study had identified that all the selected heritage timber buildings are equipped with very basic active fire safety measures. All the buildings rely on the limited portable fire extinguishers as the main suppression system. Indeed, the system is cost-effective and minimally invasive to the buildings but with limited functionality. Thus, due to the main building material is using timbers, the buildings are still considered highly exposed to the threats of fire. The study also found that financial constraints remain as the main setback in providing good active fire safety measures in the selected heritage buildings. Furthermore, fire safety awareness among the building owners is still very low in which the security aspects are given more priority instead of safety. Therefore, reliable fire safety management should be in place to protect the safety of people (visitors) as well

as the safety of the heritage timber buildings. A fire accident can happen at any time that may cause the priceless building badly damaged or destroyed.

ACKNOWLEDGEMENT
This research was funded under the Fundamental Research Grant Scheme from the Ministry of Higher Education Malaysia (FRGS15-192-0433).

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 59 – 72

RISK COST ANALYSIS IN MALAY HERITAGE CONSERVATION PROJECT

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Abstract

Risks in conservation projects are believed to be different from risks in new building projects. There are different methods and processes that need to be adopted in order to handle a conservation heritage project. Heritage projects form a valuable inheritance with sentimental values that tell a certain history, culture or tradition which needs to be preserved. Nevertheless, many have reported that conservation projects frequently suffer failures in meeting the delivery goals of time, quality and budget, which lead to contractual disputes during the post-contract stages of a conservation project. Conservation work is riskier due to the inclusion of many activities such as preservation, restoration, and refurbishment. Thus, this research aims to identify the risk cost analysis in carrying out conservation projects through conducting semi-structured interviews and using the survey research method. The objectives are to highlight the importance of conserving Malay heritage and identify risk affecting cost of conserving heritage buildings. This research applied strategy survey through semi-structured interview and questionnaire survey. It was found that project risk consists of hidden works and uncertainties is the highest among other risk categories. The outcome of this research is considered to be significant and relevant as it contributes towards the conservation sector by minimising the risk of cost analysis taken on conservation projects by the project team involved.

Keywords: Conservation, heritage project, risk

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INTRODUCTION

Construction project is not simply restricted to the new buildings only but it also includes restoration and maintenance of existing building. Heritage can be one of the whys and wherefores. The National Heritage Department (2016) defined heritage as a valuable inheritance that can be categorized under tangible and intangible components.

A construction project can be considered successful or not through project management triangle; time, cost and quality. Roy and Kalidindi (2017) has unfortunately reported that for conservation project, the performance in terms of time, quality and especially cost is far from satisfactory. Bowen et al. (2002) claimed that neglecting any one factor would affect other two factors. This shows that factor of cost for conservation project is important to be highlighted in order to prevent delay and low quality of the conservation project. Currently, the industry is facing several issues that have caused cost and time overruns and also contractual disputes during post-contract stage (Lee & Lim, 2010; Hisham & Hassan, 2015). Surprisingly there are actually many countries facing the same difficulties when dealing with heritage building. Roy and Kalidindi (2017) said that Canada, Italy, Australia and India are some of the countries that reported frequent failures in meeting the delivery goals of time, quality, scope and budget.

One of the factors of failing to reach the budget of conservation project is because of limited research on costing aspect of conservation project (Hisham & Hassan, 2015; Wee & Lim, 2010). Kamal et al. as cited in Wee and Lim (2010) explained reason for limited research on costing aspect of conservation works is because building conservation practice in Malaysia is relatively new compared to some other countries. This is supported by Lim (2017) where he claimed that conservation processes may be broadly studied by researcher, however, the same cannot be said for the cost management aspect, namely cost control, cost budgeting and cost estimating. This shows that more research on costing of conservation project must be performed so that issues on cost overrun that often occur in the project can be successfully prevented and solved.

Lack of complete costing information for conservation project causes consultants to face difficulty in preparing cost budget for conservation projects (Hisham & Hassan, 2015; Wee & Lim, 2010). The absence of costing information, together with lack in understanding by consultants on nature of conservation project tends to result in missing important items related to conservation project during estimating budget. Wee and Lim (2010) are another author that also agreed there is still lacking in costing information and documents pertaining to conservation work. They are having difficulty in collecting data for their research as only a total of 16 buildings can be selected since many projects have incomplete breakdown of costing information, as some projects did not follow the full tendering procedures.

Thus, it is important to determine project risks that influence cost of conserving heritage building in order to protect our Malay heritage. Therefore, the objectives of the research are; 1) to highlight the importance of conserving Malay heritage and 2) to identify risk affecting cost of conservation of heritage buildings.

MALAY HERITAGE

Ariffin, Dodo, Nafida and Kamarulzaman (2015) added that the World Heritage Convention defines heritage as 'monuments, groups of buildings and sites. The National Heritage Act 2005 implemented in the ninth Malaysia Plan was to provide protection and conserve various tangible and intangible cultural heritages and was promoted for the tourism industry. From the Kuala Lumpur Structure Plan 2020, it is reported that areas with an attractive character and strong sense of identity need to be preserved and enhanced and, where possible, other areas need to be upgraded to provide an enhanced sense of identity and place. Bachek, Zainudin and Haron (2014) said that this include historical and heritage buildings.

Rashid et al. (2018) found in their study that traditional Malay houses in Perak located along the Sungai Perak are old Malay palaces, traditional houses and mosques. In addition, colonial architecture also is primarily found in several towns along the river, such as Kuala Kangsar, Parit, Bota, Pasir Salak, Kampung Gajah and Teluk Intan, including houses, schools, offices, rest houses, mosques and hospitals which are still in use until today.

In short, Malay heritage is important as it maintain the history and belief of society, protect significance of architecture and culture, portrays value of historical building, shows image and identity of the city, and provide continuity and stability in built environment.

CONSERVATION WORKS

Roy and Kalidindi (2017) and Hisham and Hassan (2015) define heritage conservation as all the processes by which a place is cared for in order to retain its historical and/or architectural and/or aesthetic and/or cultural significance, including the maintenance, preservation, restoration, reconstruction and adoption or combination of more than one of them. Ali, Kamaruzzaman, and Salleh (2009, p.56) explain that "refurbishment refers to upgrade, major repairs work, renovations, alterations, conversions, extensions and modernization of existing building, but exclude routine maintenance and cleaning work". Meanwhile, Zolkafli et al. (2012) added classification of conservation projects can divided into difference categories, which are preservation, restoration, rehabilitation, and refurbishment.

According to Article 8 of Burra Charter by ICOMOS (2003), 'new construction, demolition, intrusions or other changes which would adversely affect the setting or relationships are not appropriate.' If the activities such as

preservation, refurbishment or reconstruction, is performed with the intention to keep and build back the originality of the building, it is considered as one of the conservation projects.

In a nutshell, conservation project is different from the new building project in terms of scope of work, nature and principle of the work. Conservation project is believed to be riskier than new building project. This is because conservation work required non-standard scope of works, different approaches and special project management experience. Moreover, conservation project tends to be riskier as so much care must be done in terms of material and skills workmanship in order to maintain the building authenticity.

COSTING IN HERITAGE CONSERVATION PROJECT

Managing cultural heritage assets, such as building heritage, is considered expansive and expensive for some people, which is usually funded by government or private institution (Ismail, Masron & Ahmad, 2014). In Malaysia, the Ministry of Information, Communications and Culture (KPKK) is responsible for national heritage.

Smith (2005) explains that in planning of a conservation works, it involves different stages, scope and timing of the proposed work, which requires a budget. It is complex and difficult to prepare estimates for conservation work due to the difficulties to predict the nature of such work in terms of the final content, scope and specification. In addition, the exact work can be known only after the structure is open and demolished. Structures of existing old building is one the major factors that determine a project overall cost. Nevertheless, mechanical and electrical work costs are often high because of the complex nature of the installed systems.

Thus, by understanding the major factors that determined the budget in conserving a building, a quantity surveyor will ensure work-specific items to be included in the tender which lead to a better cost estimate.

RISK IN MALAY HERITAGE CONSERVATION PROJECT

Conservation work involved risks where Zolkafli et al. (2012) believe that risks in conservation project are actually much higher than new building project. Game, Fitzsimons, Lipsett-Moore & McDonald-Madden (2013) mention that "understanding risks to project success should influence a range of strategic and tactical decisions in conservation, and yet, formal risk assessment rarely features in the guidance or practice of conservation planning". Risk management in conservation projects had been poorly practiced and applied nowadays (Zolkafli et al., 2012).

Risk is defined as uncertain event or condition, which has negative effect on the successfulness of project objective if it, occurs (Mbachu & Taylor, 2014; Rezakhani, 2012; Safayet, Hamidul Islam & Shakil Ahmed 2018; Zolkafli

et al, 2012). Therefore, risk is an exposure to economic loss or gain arising from involvement in the Malay heritage construction project.

Risk assessment will prioritize which risks need to be managed in Malay heritage conservation project. An appropriate and systematic methodology, knowledge, and experience will be demanded in order to have an effective and proper risk management approach (Safayet, Hamidul Islam & Shakil Ahmed, 2018).

There are six categories of risk in Malay heritage conservation project as highlighted in Table 1. This can be identified before and during construction (Safayet, Hamidul Islam & Shakil Ahmed, 2018). Construction project is associated with many risks affecting the cost of a project including conservation project.

Table 1: Risk categories

Risk	Description
Project	In Malay heritage conservation project, uncertainties are common such as hidden work or unforeseen items as project team cannot find out the detail of certain part of historical building without opening it.
Design	Design risks might arise such as design error or discrepancies due to limited and inaccurate information regarding the original design. (Safayet, Hamidul Islam & Shakil Ahmed, 2018)
Material	Availability of the identical of original material for construction is one of the challenges in Malay heritage conservation work.
Labour	Some of the buildings might use services of talented artists when it was first built. In order to re-produce the crafts, similar skilled artists need to be hired but very hard to find.
Cost / Financial risk	Risks in capital investment, government taxes and materials price must be considered especially in a long-term project due to inflation and other factors.
Human risk	Successful of conservation project largely depend on the professionalism of the project team. Barnes (as cited in Xiang, Jia & Li, 2018) observed that human risk factors must be taken seriously.

RESEARCH METHODOLOGY

This study focussing on risks affecting cost of conserving Malay heritage buildings. In conducting this study, the authors applied strategy survey through semi-structured interview and questionnaire survey. The authors selected construction professionals whom understand and knowledgeable in a conservation project whom consist of Architect The questionnaires are given to 360 participants. From a total of 360 questionnaires, only 126 respondents returned the questionnaire with proper answer which represents 35% of response rate. The authors selected construction professionals whom understand and knowledgeable in a conservation project whom consist of Architect (33%),

Quantity Surveyor (14%), Building Surveyor (17%) and Town Planner, Engineer (15%). The tabulation of data as per Figure 2.

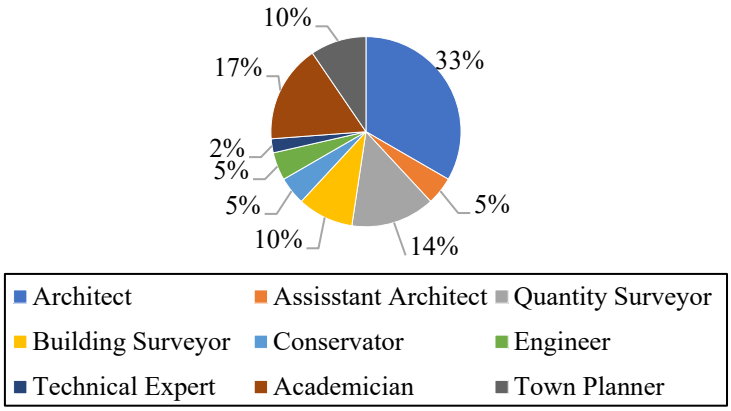

Figure 1: Percentage of respondents by occupations

For the results from the questionnaire, Statistical Package for the Social Sciences (SPSS) is used to analyse the data. The data is analysed through descriptive statistics. Rank for risks concerned in conservation project is obtained using reliability analysis in the SPSS. Ranking the risks is important in order to measure the crucially of each risk in conservation project.

Statistical Package for the Social Sciences (SPSS) is used to analyse the data through descriptive statistics. Rank for risks concerned in conservation project is obtained using reliability analysis in the SPSS. This is in order to measure the crucially of each risk in conservation project.

The result is then validated through semi-structured interview with a quantity surveyor, two conservators, a building surveyor and a heritage coordinator who have more than 10 years experiences in conservation of heritage buildings.

ANALYSES AND DISCUSSION

Malay heritage is related to the way of life of Malays society. The way of life is how it differentiates Malays with other races. Panel 05 mentioned that religion, culture, location, geographical, and also hierarchy affect the way of life. Different forms and spaces are created because of the way we live. In addition, it supports literature when she said that Malay heritage is important to protect the history, culture of Malays, and for tourism.

In the questionnaire, there are 7 categories of risks expressed including identified and collected from literature review; project risk, design risk, material risk, labour risk, financial risk, human risk and data risk. Under each of the

category, there are various example of risks can be found as illustrates in Table 2;

Table 2: Lists of risk under different risk categories.

Category	Risk
Project risk	1. Hidden works 2. Uncertainties
Design risk	1. Hidden work found during construction causes design to be changed or modified 2. Changes of original design because of funding constraint. 3. Design information are vague and inaccurate.
Material risk	1. Unavailability of material needed. 2. Limited availability of original type of materials. 3. Alternative material used caused heritage building to lose its value.
Labour risk	1. Unavailability of workmanship needed.
Financial risk	1. High cost for using original and authentically materials and components. 2. Large amount of money spend on variation. 3. Inadequate or insufficient funding. 4. High payment on skilled artist. 5. Unavailability of reliable historic cost information.
Human risk	1. Limited knowledge of consultant, expertise and specialist in conservation project. 2. Contractor's poor capability. 3. Miscommunication between parties. 4. Contractor price items without performing site survey or only based on assumption
Data risk	1. Missing and lack of related documents. 2. Uncooperative parties during collecting data and information. 3. Tender document is confusing due to lack of critical information.

Hidden works

Hidden works in conservation might affect the design process, which then affects the performance of conservation project in terms of cost. The design is changed during construction if there is a discovery of new information or hidden works in the existing building. Usually in conservation project, hidden works causes variation order. On the other hand, in new building project, the variation order

can be due to changes in client's need, advance in technology, or additional design effort by architect.

Inadequate and insufficient funding

Conservation project is also exposed to risk of insufficient funding. Due to funding constraint, client and project team might have to change their decision such as choice of originality material used for the project.

Uncertainties

An uncertainty in conservation project can only be viewed once the construction works start. Conservation project is riskier than new project. This is because of the existing structure of the historical building. Repairing structure of a building required client to spend large amount of money. And would lead to additional cost. Uncertainties also relate to hidden work. Hidden work is one of uncertain items that might or might not appear in conservation project. Consultants are required to do precise assumption during design stage until completion of work to minimize risk of uncertainties in a project.

Unavailability of materials and skilled labours

There is always risk of unavailability of original material and skilled labour since historical buildings are hundreds of years old. They might not be available due to the sources of the material and skill is extinct. Cost will increase when contractor needs to import material from foreign country.

They cannot simply change it without any valid reason, as they must bear in mind to maintain the authenticity of the building. However, there is a tendency to loss building value if project team use different material from the original since the authenticity of the building lay in the material itself. Preserving authenticity of heritage building is another reason conservation is riskier than new building project. Respondent 21 said that 'even renovation is challenging enough, let alone conservation work'. Similar to new building project, chosen of material for renovation work can be decided by building owner. However, just to know materials to be used for conservation project, there must be test and research conducted which also required money.

Poor performance by parties involved

Most of the QS consultants are inexperienced in conservation construction due to limitation numbers of conservation project. Thus, the tender document is confusing due to lack of critical information.

Figure 2: Mean of risks

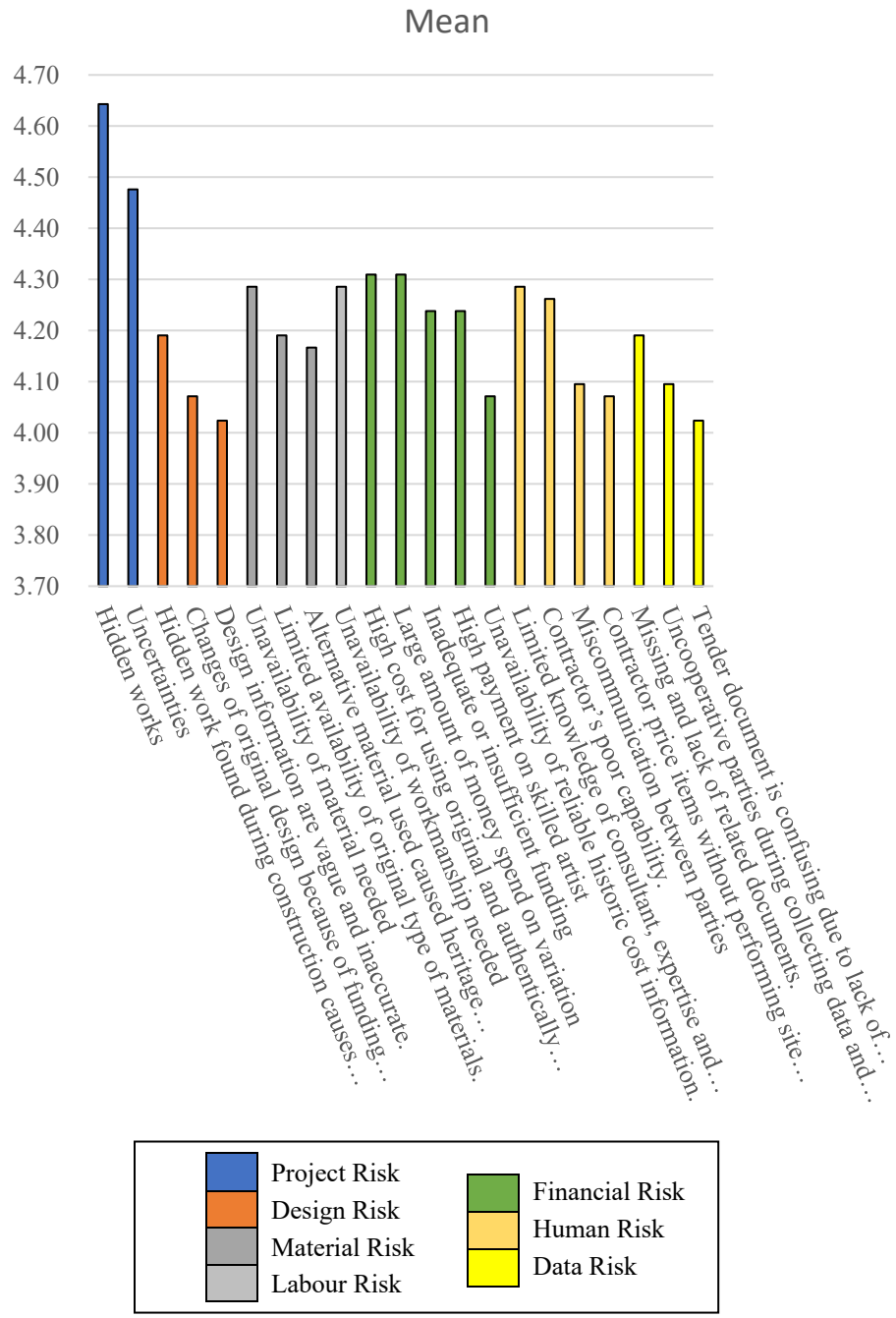
Mean
4.70
4.60
4.50
4.40
4.30
4.20
4.10
4.00
3.90
3.80
3.70
Hidden works
Uncertainties
Hidden work found during construction causes…
Changes of original design because of funding…
Design information are vague and inaccurate.
Unavailability of material needed
Limited availability of original type of materials.
Alternative material used caused heritage…
Unavailability of workmanship needed
High cost for using original and authentically…
Large amount of money spend on variation
Inadequate or insufficient funding
High payment on skilled artist
Unavailability of reliable historic cost information.
Contractor's poor capability.
Miscommunication between parties
Contractor price items without performing site…
Missing and lack of related documents.
Uncooperative parties during collecting data and…
Tender document is confusing due to lack of…
Project Risk
Design Risk
Material Risk
Labour Risk
Financial Risk
Human Risk
Data Risk

Table 3: Top risks concerned by respondents

Risks in Malay Heritage Conservation Project	Mean	Rank
Hidden works.	4.6429	1
Uncertainties.	4.4762	2
High cost for using original and authentically materials and components.	4.3095	3
Large amount of money spend on variation.	4.3095	3
Unavailability of material and workmanship needed.	4.2857	4
Limited knowledge of consultant, expertise and specialist in conservation project.	4.2857	4
Contractor's poor capability.	4.2619	5
Inadequate or insufficient funding.	4.2381	6
High payment on skilled artist.	4.2381	6
Hidden work found during construction causes design to be changed or modified.	4.1905	7
Missing and lack of related documents.	4.1905	7
Limited availability of original type of materials.	4.1905	7
Alternative material used caused heritage building to lose its value.	4.1667	8
Miscommunication between parties.	4.0952	9
Uncooperative parties during collecting data and information.	4.0952	9
Changes of original design because of funding constraint.	4.0714	10
Unavailability of reliable historic cost information.	4.0714	10
Contractor price items without performing site survey or only based on assumption.	4.0714	10
Design information are vague and inaccurate.	4.0238	11
Tender document is confusing due to lack of critical information.	4.0238	11

There is problem arise in some of the Malay heritage conservation projects because of the contractor who prefer not to follow specification provided. Generally, contractor bids document without properly understand especially related to the conservation work report. Conservation project has a different skill sets demand. However, project team handles Malay heritage conservation project the same as new building project which actually required different skill sets, then problems will arise along with the risk.

CONCLUSION

One can see that conservation project is different compared to new building project in terms of principles, processes, and procedures. But similar to new building project, conservation project also confronts and deals with risk. The risks consist of project risk, design risk, cost risk, and etc. Respondents from questionnaire survey agreed that project risk is most crucial to be addressed in conservation project. This is also agreed in validation with conservation professionals. Under category of project risk, there are risk of uncertainties and hidden work. Literatures by other authors also claimed that conservation project has a lot of uncertainties compared to new building project. A newly found risk in this research is the risk of no real value and return from historical building.

Conservation is a process of protecting the authenticity and originality of a Malay heritage building. Thus, risk of losing building value of this Malay heritage building is expected to be mostly concerned by key players compared to other risks in conservation project. However, result shows otherwise. Therefore, a study on the significance of Malay heritage building value to parties in conservation project can be performed by future researcher.

ACKNOWLEDGEMENTS

This study is funded under Fundamental Research Grant Scheme (FRGS RACER 19058 - 0058), provided by the Ministry of Higher Education and International Islamic University Malaysia. The researchers would also like to thank all respondents for their contributions in this research.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 59 – 72

IDENTIFYING THE PARAMETERS OF THE MALAY CLASSICAL ARCHITECTURE

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Abstract

As modernization and urbanization grow, there has been a rising interest in townships with historical elements in their urban landscape. The identification and classification of Malay architectural language are crucial to architects seeking to instill history and culture into the new design. The paper traced the characterizations of classicality in Malay architecture through a thorough study of palaces and aristocrat buildings in Malaysia. Morphological analysis of 50 case studies was mapped but only six palaces from different sites and eras were marked as samples in this paper. The focus of the study not only on their origins, typology, history, and stylistic characters but also on the proportions and elemental attributes of the frontal façade. These case studies were selected as sentinels or samples of successive evolutionary phases in classical Malay architecture which had a huge gap and carried different historical evolutions. It was argued that while the earlier palaces reflected all Malay style attributes, the later expression reflected the cultural pressure of globalization via colonialism diffused from colonial institutions. The study extracted the five parameters of the Malay classical architecture, whereby it was found that even under such pressure, certain features were still maintained to root the identity of the Malays and later developed as new city urbanscape.

Keywords: Classical Malay, Malay Identity, Malay architectural language

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INTRODUCTION

As modernization and urbanization grow at a rapid rate in developing tropical Asian cities, there has been a rising interest in townships that use historical elements of language in their urbanscape. Recent townships by renowned Malaysia developers have utilized imported Classical language to add historical interest to the new township and adorn their commercial and institutional facades. The rise of using 'Classical' stylization is due to the homogeneity of modern 'bare' styling. Mohamad Tajuddin Mohamad Rasdi (2001) stresses that there is local language that can add historical interest to commercial urban landscape, urban forms, and frontages, rather than cut-and-paste solutions. Zhang et al. (2018) said the issues of scale, proportion, what constitutes the essences of local aesthetic characters and parameters that can be used to interpret traditions to the modern building are challenging issues. Global expression and stylistic in public large modern multilevel structures in the Asian city are increasingly modeled upon the Western model or the Arabised-Islamic template. Concerning Malaysia, for example, the interest in the vernacular is due to the dominance of Modernist style public buildings which had spurred a counter-movement.

The identification of Malay templates and resources is also crucial for architects and urban designers seeking to instill history and culture into new building design and development. Within this area, architects are also searching for resources and broad principles and models that can guide them. Within this area, the evolution of construction techniques and works have a dual criticality in Asian tropics, as the materials range from the fragile timber into the modern masonry techniques. Hence classification would not only allow one to recognize the overall stylistic tenor of the work but to gain quick access to technologies and techniques of conservation specific to the material at hand. The aspect and demand for authenticity have additionally highlighted the importance of architectural heritage classification. Llamas et al. (2017) for example, concludes that typological assessment and assessment of heritage into specific classifications is crucial to the preparation of vulnerability analysis and diagnostics, and differentiate building stock according to specific eras and periods, as different classification may require a different approach to the definitions of guidelines and strategies. To provide a cutting line between the Malay architectural language 'from the roots of Malay architecture; from the external Colonial 'tree' of style; one must outline the parameters of the Malay architectural style and its defining character from the roots and branches evolved under the specific cultural and climatic tropical conditions of the Malay architectural tree which is a distinctive vernacular architecture with identifiable features such as layered ventilated roofs, large windows, wide verandas, and ventilated gables. (Ju, Kim, & Ariffin, 2015)

LITERATURE REVIEW

Development of policies and strategies and guidelines towards refurbishment, restoration, and enhancement of architectural heritage inherently requires not only a morphological analysis on the evolution of site features of the place but a process of architectural identification and classification. Lee (2015), Llamas et al. (2017) and other summates of the identification of specific styles and classification as part of the conservation process. In architectural design, similar classifications are needed to identify certain approaches to design, without going into the separated elements. Hence according to Lee (2015) and Zhang et al. (2014), one must uncover specific intrinsic yet shared characteristics of architectural heritage to classify them. The southeast Asian tropical region is indisputably rich in diversity of traditions, heritage structures and traditions. Amongst the most characterizing structures are palaces and aristocratic mansions, yet there is a lack of effort to classify and identify common categories of the architectural language of our Malay identity. The difficulty lies in its diversity and transcending such diversities. Thus, the aim must be to identify common identities. Architecturally, Sabrizaa (2014), Mohamad Tajuddin Mohamad Rasdi (2001) and others have debated and discussed in depth the diversity of vernacular houses focusing on traditional houses and also mosques of this region and particularly within the Malay world, there is a rising interest due to the need to establish frameworks of place-making and cultural identity.

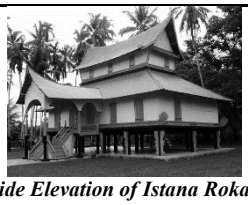
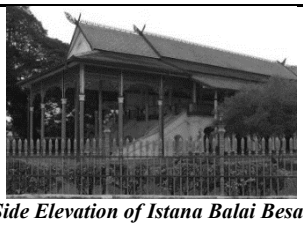
An architectural style is characterized by the features that make a building historically identifiable. (Baker et al., 2002) said a style may include elements such as form, method of construction, building materials, and regional character. The evolution of architectural form can be classified as a chronology of styles that had changed over time. (Ju et al., 2015) These changes, at times, are gradual and at times, are abrupt - reflecting changing fashions, beliefs, and religions, or the emergence of new ideas, technology, or materials globally. As a typology, ‘palaces’ hold a significant position in the Malay community and civilization. They not only represent the center of past socio-political life but are locations of the public life of the past in spatial and temporal terms. Physically and architecturally, they represent the peak of aesthetic sensibilities and capabilities of Malay populations, and collectively represent the identities of these regions of its ‘Classicality’. On the definition of Classicality, Frampton (1992) has elaborated: The ‘classical’ is always conceived as a ‘continuous tradition from ‘antiquity’, and by the mid-18th century, the Classical was a historicist style. ‘Classicality’ can thus be argued as a temporal attribute related to a kind of refined level and the epitome of civilizational taste, including its styles and symbols, simple in form and comprising a simple hierarchy of formal elements.

METHODOLOGIES

The methodology adapted to this research is through mapping based on frontages, comparative analysis, and literature reviews. Over 50 case studies of palaces and aristocratic buildings built from the 1700s to 1930s throughout the Malay region were mapped and identified as local evolutions, common parameters and classifying milestones were observed. All of the regions are sharing similar styles and attributes, either the same historical sultanate/ patrons, intermarriage between regions, craftsmen and skill workers, cultural influences and others. The mapping of the Malay palaces and aristocrats helped to categorize the buildings into a group for characterizations. In analyzing this essence, the methods of (Clark & Pause, 2012) are adapted. The research is not exhaustive; instead, examples are designed to illustrate the nuances of the idea and theory. The analysis of the building frontal façades and forms derived from the consequence of multiple interpretations, dominant patterns and formative features of the buildings by extracting the similar styles/ character of each case study. Sir Banister Fletcher which was known as his Book of History of Architecture had ruled up the importance of categorizing the architectural elements and history through its origins, timeline, and styles.

The subsidiary attributes of culture, politics and others will not be discussed further in this paper as the focus is more on developing the parameters of architectural languages. These will include the building's style, type, proportion, scale, and design principles. The aesthetic styles and functions which focus on the frontage form and façade are defined as the front portion with public spaces. Another main reference for developing the parameters is Palladio from his Ten Book of Architecture. The theory of architecture developed by numerous scholars had clearly shown how to characterize architecture according to groups and clusters. The studies help to convey essential characteristics and relationships of a building frontage which classified a style with specific physical attributes between type, proportion, scale, and composition (Llamas et al., 2017). A parameter or milestones had been developed from the mapping and to be discussed as a comparative analysis between six selected case studies. The attributes to measures the characteristics of the Malay architectural language in this context derived from literature reviews, interviews with craftsmen, designers and historians. The case studies were selected accordingly to represent different major periods, i.e. the early 1700s, late 1700s, late 1800s, early 1900s and eventually the 1930s, consist of Istana Rokan Sumatera, Istana Balai Besar Kedah, Istana Hulu Perak, Baitul Rahmah Perak, Istana Sepahchandera Kedah and Istana Woodneuk, Singapore represent the temporal and geographical differentiation were compare in table 1.

Table 1: The Comparison of Case Studies

Case Studies	
Istana Rokan, Sumatera, Indonesia. Built-in the Year 1770 Rokan Palace is a relic of the 200-year-old 'Nagari Tuo" sultanate has a unique collection of Royal Rokan IV Koto carving, with dragon-carved engravings, plants ornamentations, and unique form of building.	 ***Side Elevation of Istana Rokan***
Istana Balai Besar, Kedah, Malaysia. Built-in the Year 1730 The form survived through the tumultuous era of the late 1800s and early 1900s of external attacks, fire, and colonization but still retained the essence of Malay architecture even though with infusion of masonry and technology of cast iron.	 ***Side Elevation of Istana Balai Besar***
Istana Hulu, Perak, Malaysia. Built in the Year 1903. It was believed that Captain Maurice Alexander Cameron, the Deputy Colonial Engineer (1883 and 1892), was the one who designed the art forms and construction of this castle but with orders by Sultan, the essence of Malay architecture still can be found.	 ***Side Elevation of Istana Hulu***
Baitul Rahmah, Perak, Malaysia. Built-in the Year 1911 It is an example of a Malay-Perak variation of a Classical vernacular language. At the corner part of the roof fascia of the villa are elements decorated with carving inspired by the character of honey bees. It was designed to complement the 'buton' woodcarving elements.	 ***Side Elevation of Baitul Rahmah***
Istana Che Sepahchandera, Kedah, Malaysia. Built-in the Year 1911 The Sepachendera Palace was built for the wife of Sultan Abdul Hamid Halim Shah (1882-1943) Che Sepachendera. The palace is built with three floors and has a flat roof. On the ground floor is the public area while upper floors are for royals.	 ***Front Elevation of Istana***

Istana Woodneuk, Singapore. Built-in Year 1930s. Istana Woodneuk was built for the Sultan's fourth wife Sultana Khadijah in 1890 and took two years to complete. The blue-roof palace consisting of the main building with two smaller houses by its side.	 ***Side Elevation of Istana Woodneuk*** *Source: Battalion AIF Association*

FINDINGS AND DISCUSSION

The Malay Frontage Character

Throughout the mapping of the 50 case studies was observed, the parameters of the Malay evolving style to differentiate from the colonial tree of style had been developed. The frontages may evolve into masonry versions, yet still be identified as Malay, if it complies with essential rules of character based on parameters of identification. These can be used to assess a language despite the pressure or evolution of change. These variations are rooted in a series of ancient models which is also the highpoint of aesthetic language. From the 50 or more case studies, the Five parameters of defining a classical Malay Architectural language rooted in Malay world summarised as follows:

1) **Origins and Typologies**
2) **The Stylistic Grammar**
3) **The Building's Shape and Form; Ratio and Proportion**
4) **Expression of Structure and Construction**
5) **The Detailing of Decorative and Architecture Elements**

a) The Origins and Basic Typologies

To define whether a frontage is Malay Classical, one must refer back to the theory of origins as the center of its culture. In the Malay world, the center of its culture arises from its history which is rooted back into the Riau Srivijaya region and these sites have been mapped and documented where their expressive language traced (Reid, 2004). Its rootedness must be traced towards the point of its dissemination into the neighboring region, diaspora and other parts of the region (Shireen, Kassim, Hanita, & Majid, 2017). Many historians (Andaya, 2008; Milner 2011) support the views that the Southeast polities of Sumatera are primarily the Malay ancestral homeland. Thus, a Malay Classical architecture; can be traced back to the roots of its style. Its patron or proponent **must have originated and located within the Malay Kingdom** or 'Nusantara Land'. The buildings should **be owned or built by Malay aristocrat or patron or owners and dominated by decisions by a Malay patron who is instrumental in** asserting Malay architectural identity.

Table 2: The Origins and Typologies Characteristics: The Six Case Studies

Case Studies	Istana Rokan	Is. Balai Besar	Istana Hulu	Baitul Rahmah	Istana Sepachendra	Istana Woodneuk
Location	Riau	Kedah	Perak	Perak	Kedah	Singapore
Years Built	1750	1735	1903	1911	1882	1890
Built For	Sultan	Sultan	Sultan	Sultanah	Sultanah	Sultanah
Built By	Local people	Local People	Local people	Local People	Siamese & Local	Local & Chinese
Designed By	Sultan	Sultan & Artisan	Sultan & British	Sultan & Artisan	Sultan & Artisan	British

Though located within the 'Malayness territory' (Reid, 2004) certain designs and forms were initiated by foreign architects or advocates although the patron is a Malay. As refer to table 2, for Istana Sepachendra and Istana Woodneuk, although these seem eclectic or British, the advocates or patrons are Malay and design administered by a Malay. For Istana Hulu, the frontage is designed by a British officer, but the Sultan had asserted a degree of the identity of Melayu in the design. A sample of this identification is in Table 4 below. The attributes below marked how the palaces were being designed as such and how it is carried out. All of these attributes and influences lead to the authenticity of the architecture.

b) The Stylistic Grammar

An architectural style is characterized by the grammar of language whose elements make it notable or historically identifiable. A grammar is a set of elements or technique which may include such elements as form, a method of construction and regional character. Any local decorative style can be influenced by the **design style such as Neo-Gothic, Baroque and Neoclassical, Dutch Patrician, Art Deco and International Style** (SeoRyungJu & Omar, 2011). Malay architecture cannot avoid certain evolutions and hybridization. Although a Malay style can be infused by Colonial or 'global' elements, if a case contains more than 50% of the Malay detailed elements, then it is classical. From a range between the poles of **'Malay to Globalization'** and **'Globalization to Malay'**, the degree of Malayness is the more than half -fulfillment of these elements to define the dominant style of Malayness in the overall language of the building. Table 3 shows the stylistic characters of the case studies. For Istana Hulu's conflicting character i.e. the roof form, fascia, and finial but lack the Malay columns, thus the front part of its elevation is essentially colonial while the side elevations are Malay Classical. Istana Sepachendra has foreign influences with elements of the Corinthian grammar; thus, it is not Malay Classical but essentially an eclectic language with a Malay form due to its central portico and the

triangular shape of gable end with slender columns. The building's architecture can be deemed as essentially an eclectic language due to the influence of the reigning Jawi Peranakan style in British Penang at the time with a Moorish-shaped déco and features of local ornaments found at the railings.

Table 3: Shows the Stylistic Grammar of The Case Studies

Case Studies	**Istana Rokan**	**Istana Balai Besar**	**Istana Hulu**	**Baitul Rahmah**	**Istana Sepachendra**	**Istana Woodneuk**
Stylistic	Malay Classical	Malay NeoClassical	Malay Colonial	Syncretic Malay	Anglo Malay	Modern
Malay To Global	√	√	√	√	-	-
Global To Malay	-	-	√	-	√	√

c) The Shape, Form, Ratio, and Proportion

Figure 1 below represents the Generic and Variant Forms of Malay architecture, essentially derived from the five 'generic' Classical formal typologies of Malay aristocratic frontages and facades (Anis et al., 2018). The work of Clark, & Pause (2012) was used to identify essential types of the Malay façade based on aristocratic compositions and elevations. All frontage can be classified and organized according to the five types, despite variations due to neighboring influences and variations according to evolution or dominant material (Refer to Figure 1 and Table 1). Example of Istana Baitul Rahmah Perak has a binuclear form with the 'double' extended portico or verandah organized with roof finials and decorative panels, similar to Istana Hulu with two vertical towers on the left and right side of the building.

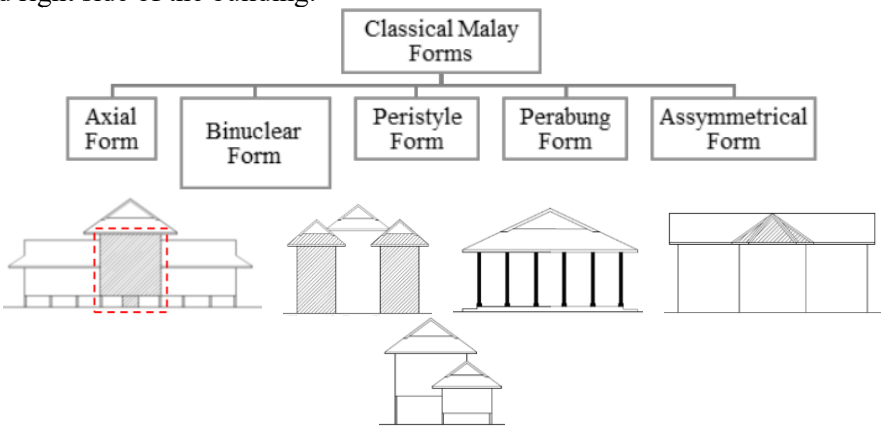


Figure 1: Observed Typologies of Classical Malay Forms
Sources: Anis et al., 2016

While the Colonial Classical is defined by Greek-based proportions such as 1: 7 in defining column proportions, the Malay column proportion exceeds this ratio. Anis et al. (2018) and Sabrizaa (2014) has discussed the ratio of solids and voids. Similarly, the Malay classical style would have its specific ratio of the proportion of ground floor to the upper floor, roof and wall and openings and wall. Table 4 below highlights a certain ratio found. The form description refers to Figure 1.

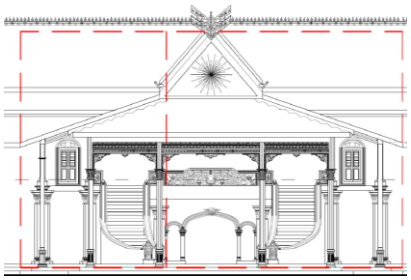
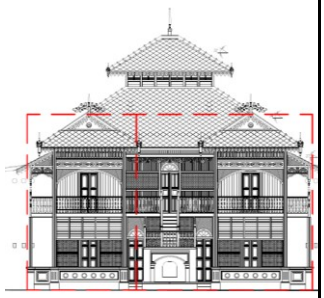
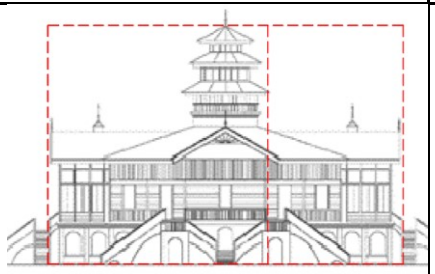
Table 4: Form, Ratio, and Proportion of six Frontages

Case Studies	**Istana Rokan**	**Is. Balai Besar**	**Istana Hulu**	**Baitul Rahmah**	**Istana Sepachendra**	**Istana Woodneuk**
Form	Axial	Peristyle	Binuclear	Binuclear	Axial	-
Proportion Roof: Wall	1:1	1:1	1:1	1:2	0.5:1	1:2
Column: Diameter	1:16	1:25	1:7	1:7	1:11	1:7
Openings: Wall	1:1	1:1	1:2	1:1	1:2	1:3
External Ornaments	√	√	√	√	√	x

-The Malay Sense of Aesthetic Proportion

Despite differences in formal typology, the sense of proportion still exists as frontages fit into the Golden ratio. Table 5 below highlights how the Malay frontages reflect an innate sense of proportion by the Malays who are consistently building based on the human proportion. When assessed using the Golden ratio, it is found that many facades obey the essential parameters of the Golden ratio i.e. 1.618. As the case studies were tested on a series of these Malay frontages, the anthropocentric and balance composition were found. It can be deduced that due to the Malay anthropocentric way and method of measurement. Certain findings by the Western cannot necessarily be generalized across cultures but can be the reference for the Malays to have one.

Table 5: The Malay Frontage Reflects Sense of Proportion – Golden Ratio Survived through the Evolution of Malay Frontage

	Case Studies	
Sense of Beauty Partly Innate. The dotted lines show the anthropocentric found in Malay Classical style	 ***Elevation of Istana Balai Besar*** *Source: Heritage Lab, KAED, IIUM*	 ***Elevation of Baitul Rahmah*** *Source: Heritage Lab, KAED*
The intuitive sense of beauty and proportion of two diffrenet compositions but still portrays balance.	 ***Elevation of Istana Tanjung Pura***	 ***Istana Leban Tunggal*** *Source: Heritage Lab, KAED*

d) Expression of Structural System and Construction

The origins of the Malay architectural language is typically discussed as a timber-based vernacular style (Said, 2005), which had to absorb other influences evolving into a hybrid language of timber, masonry and cast iron (Jahn Kassim, Puteri Shireen, Abdul Majid, Noor Hanita, Nawawi, 2017). The Malay vernacular tradition then had undergone a transposition of such forms and principles onto fundamental functions, typologies, construction, and methods (Zumahiran Kamarudin & Ismail Said, 2008). There is a synchronization between the Colonial language and the Malay language, infused with elements of neighboring influences. Figure 2 below summarises the five evolving hybrid types of materials and constructions of Malay frontages in palaces. The Malay essential style expresses its structural system rather than cloaking it. As discussed by Zhang et al. (2018), a vernacular style will evolve from timber into a total masonry expression. The Malay Classical style would assert its tectonic expression as it evolves into masonry. The Malay character evolving hybrid style, with different extents of timber and masonry. Although it has the essential hybridity identified in Table 6, the Malay Classical style would assert its tectonic language that expresses its structure and constructional system (Frampton, 1981).

M-T1 M-T2 M-T3 M-B1 M-B2

Figure 2: Observed Five hybrid models based on Construction Methods of the palaces

Table 6: shows the coding for the materials according to the case studies

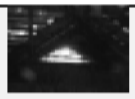
CODING	*Materials*
M-T1	All Timber
M-T2	All Timber Except Staircase and Ground Column
M-T3	Ground Column and Wall Are Bricks, Others Timber
M-B1	Only Ground Fl. Brick, Others Timber
M-B2	All Brick Except Roof Components

Case Studies	Istana Rokan	Balai Besar	Istana Hulu	Baitul Rahmah	Istana Sepachendra	Istana Woodneuk
Materials	M-T1	M-T2	M-B2	M-T1	M-B2	MB2

e) The Detailing of Decorative and Architecture Elements

There is a controlled ornamentation in the definition of the Malay character in its visual form. The Malay ornamentation is essentially art formed from a specific pattern and environment with a specific composition of motif which links the Malay style back to an essentially ecological style of nature's vegetal and flora patterns (Ismail Jasmani et. al., 2019) whose elements adorn the edged of functional elements of frontages and roofs. These are an essential part of the spirit of the Malays who had observed and coordinated their designs by specified principles and ornamental expertise usually produced for a particular local identity and to sustain the aesthetic elements in establishing a local identity. Table 7 below highlights the presence of these elements in each case study mentioned. List of stylistic characters and attributes were collected from literature reviews, interviews with wood craftsmen and historians.

Table 7: Some of The Crafted Detailing of Malay Decorative Architecture Elements

Stylistic Character	Istana Rokan Riau	Istana Balai Besar, Kedah	Istana Hulu, Perak	Baitul Rahmah,	Istana Sepa chendra
Roof Finial					X
Barge Board			X		
Gable End			X		

Istana Woodneuk does not have any of these attributes. This stylistic character's table/chart helps to measure the authenticity of a Malay building with stylistic elements that are supposed to be found in Malay buildings.

CONCLUSION

Despite the huge gap in time and changes in architectural evolution and style, there are common parameters that survive. The characters and the main elements of the Malay Classical style are also highlighted due to their consistent appearance in the public aristocratic architectural language. The study helped to identify and classify, which were genuinely Malay architecture and have gone through assimilation and changes. It was until at certain parameters or milestones, that a building could no longer be accepted as classical Malay architecture. From the findings, now people can measure the levels of authenticity of Malay architectural language, the attributes and principles a Malay architecture building should have. The principles of the character from the root to the last branch of the Malay essence can be discovered by following the five parameters. Classical Malay architecture can be very well transmuted with modern technology as long as we know which character should be highlighted in the design. Amidst the disappearing of identity in the modern world, this can be developed and become the public language for the new cities and urbanscapes, which must go beyond any cosmetic or cut-and-paste architecture and reflect the region. These architectural styles will be the benchmarks in society, leaving a lasting legacy that continues the future.

ACKNOWLEDGMENTS

The authors would like to acknowledge the Transdisciplinary Research Fund TRGS/1/2016/UIAM/01/5/2 from the Ministry of Higher Education for the support of this research.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 73 – 84

A GENERIC PROCESS OF DOCUMENTATION AND DATA MANAGEMENT FOR HISTORICAL MALAY ARCHITECTURE USING BIM

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Abstract

Historical Malay Building Information Modelling (HMBIM) is a prototype library of historical Malay BIM objects, which are developed based on historical study on the architecture of Malay heritage. The objective of this paper is to outline a generic process of documentation and data management (data collection, modelling and retrieval using BIM), specific for the preservation and conservation effort of Malay architecture. This research employs multiple case studies technique and the process begins with the collection of data using multiple reliable sources namely archival reports, measured drawings and scan-to-BIM. HMBIM is enriched using reverse engineering approach where the information about building components are semantically identified according to Malay architecture characteristics and enriched into data coding system. Since there is no standard approach for conservators in the work of conservation, assembly and disassembly of Malay buildings in Malaysia, HMBIM is anticipated to be able to suggest 'standard' for the work. The main output for this paper is the creation of framework in demonstrating the processes involved.

Keywords: BIM, Malay architecture, data management, BIM library, HBIM

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INTRODUCTION

This research aims to highlight the processes in studying the documentation of historical Malay architecture using Building Information Modelling (BIM) technology. Since there is no standard approach for conservators in the work of conservation, assemblies and disassembly of Malay buildings in Malaysia (Ab Rashid & Daud, 2014), this paper is anticipated to suggest 'standard' for the work. There are differences in current practices in the documentation process. In contrast, previously, information was gathered and stored within thick documents and was difficult to access, but with BIM (which is empowered by improvement in technology), information can be managed in a more efficient way using computers and databases.

Although the concept of BIM was introduced in the 1970s by Charles Eastman, the adoption of the approach is still slow and low in a country such as Malaysia (CIDB, 2017; Zakaria, Nasly, Haron, Marshall-Ponting, & Abdul Hamid, 2014). BIM enhanced by the existence of an abundance of data; however, these data need to be managed and turned into 'smart-data'; to facilitate the use of BIM effectively. This research considers two underlying issues currently exist; i) Malay architecture is diminishing in developing South East Asia countries such as Malaysia and ii) slow adoption of BIM approach in Malaysia despite BIM is now considered as the standard of doing works in AEC industry worldwide.

The attempt on this issue has never been widely addressed before, particularly in Malaysia; where the tangible historical Malay buildings components are turned into digital data using BIM technology and later, translated into a cultural BIM database. Through the study on historical Malay architecture using multiple case studies, employing multiple data collection techniques such as 'scan-to-BIM', measured drawings and archival reports, the processes of collecting data are documented as a framework model where the output is anticipated to act as a guideline in preserving cultural heritage using BIM.

BIM Library as Data Documentation

A BIM library can be defined as 'a digital database of semantically rich BIM objects that are contributed by open access sources, unified to the specific parameter format, and integrated into a well-defined library structure" (Lu, Chen, Wang, & Xue, 2017). Previous researches (Dore & Murphy, 2017; De Luca, 2013; Ali, Ismail, Has-yun, Suhaimi, & Mustafa, 2018) have reported that the usage of BIM for historical buildings have many advantages. However, these advantages can only be achieved if the model and its database are successfully realised (Ab Rashid & Daud, 2014). Oreni et al., (2014) and other BIM practitioners such as Autodesk and National Building Specifications have suggested that the realisation of the model and its database can be expounded

through the creation of BIM library, with an easy and straightforward retrieval system.

Moreira A., Quattrini R., Maggiolo G., & Mammoli R., (2018) and Lu et al., (2017) observed that designers would drag various objects from a library and add extra semantics such as materials when practicing BIM. There are lots of BIM objects libraries available nowadays. Without the readily available well-defined objects, designers have to draw all the objects from scratch and form them into a BIM (Lu et al., 2017). This would be costly and burdensome for them. The abundance of BIM objects in the libraries available worldwide have indicated that there are lots of data available for BIM practices, despite it is observed that most of the objects available focus on contemporary designs instead of historic (cultural) design. However, regardless of the available amount of data, the management and usage of the data carry a more substantial concern.

BIM libraries can be advantageous if it is used in a 'smart' way, but most of the libraries are generic since currently, there is no standardization in the way of handling them. If appropriately used, BIM libraries will give users the leverage to optimise their spending and establish higher profitability in conducting their activities. Since there are various attempts by various parties worldwide, the standard format in building information exchange must be made standardised. This is to ensure better readability of data and increased data usefulness. In Malaysia, especially in the context of utilizing BIM for cultural heritage preservation, little effort has been carried out (Zakaria et al., 2014). Confusion on data available is among the problem. In conservation work, due to uniqueness of Malay architecture which can be disassembled, where during re-assemblement of components, conservator is exposed to the risk of mistaking components' location. This is because currently, there is no specific format on the historical building information exchange. However, in practicing BIM for new buildings, there are some guidelines outlined by National Building Specifications (NBS), highlighting the usage of similar formats such as Uniclass and Omniclass, which can be referred.

METHODOLOGY

This research employs multiple case studies method which uses three different data collection techniques, namely i) archival reports, ii) measured drawings and iii) ‘scan-to-BIM’. Historic Malay palaces were selected as this research case study because the ‘istana’ (palace) is believed to be able to provide more data as compared to other Malay buildings such as the traditional Malay houses due to its size and complexities (Mustafa, Ali, Ismail, Hashim, & Suhaimi, 2019).

The archival reports are among the method of documentation in the early days. Documentation for cultural heritage buildings is driven by the information and sources used to build them and the real value proposition of it to analyse data (Baik, Boehm, & Robson, 2013). These conventional methods of

architectural documentation on existing building are done manually by a measured drawing. Measured drawings are carried out to retrieve information such as dimension and the form of a building in the architectural study (Harun, 2011). This technique used measuring tools; a measuring tape, adjustable set square rulers, ladder, graph papers and pens, conducted in a large group of 10-20 people. The measurement recorded will be drawn on the butter paper and re-drawn for documentation. On the other hand, measured Computer Aided Drawings (CAD) is a more advance source of documentation compared to paper documentation. The production is still via measurement on-site, but instead, the data was recorded into hardcopies, it was re-drawn using newer technology such as computers, thus minimizing errors as compared to hand-written drawings.

Lastly, the third approach which utilizes laser scanning technology is deemed to be known as the most advanced method of documentation available nowadays in the industry. Terrestrial Laser Scanner (TLS) is an automatic tool used to measure the 3D coordinates based on the scanned object in X, Y, and Z-axes. An object's data can be collected and are based on the scanned surface which reflects an encoded angular orientation in the form of point clouds, thus making the object collected into 3D data (Amparo, Pozuelo, Marimón, & Mesa, 2012). The usage of TLS for BIM is also known as Scan-to BIM approach.

ANALYSIS FOR THE DEVELOPMENT OF FRAMEWORK

In order to develop a BIM- process framework for Malay historical architecture documentation, three case studies exploring three different documentation approaches for BIM are explored. From the collected data, the buildings were modelled into BIM using Autodesk Revit.

BIM is an emerging trend in the architectural documentation scenario; as it is a representation of physical and functional features of facilities in digital form, BIM is an approach in which different players act by sharing data through digital models in a coordinated process. As the adoption of BIM grows, designers and contractors will require model-based BIM-ready information (Baik et al., 2013) to integrate the data into their building model. Thus, there is an urgent need to get fast and efficient ways to shift from raw data to a complete and information-enriched building components model. At the same time, also in the domain of heritage building, the ability to manipulate structured 3D models has become an increasing need to handle conservation, restoration, modification and to support their management (Hichri, Stefani, De Luca, & Veron, 2013). Thus, it is essential to ensure the collected data is classified and structured in an agreed way so that different stakeholders can easily find what they need and are able to understand the data. Figure 1 shows the process for data collection, and digitalization of BIM using the multiple approaches and Table 1 shows the result on the comparison of data collection technique used in this research.

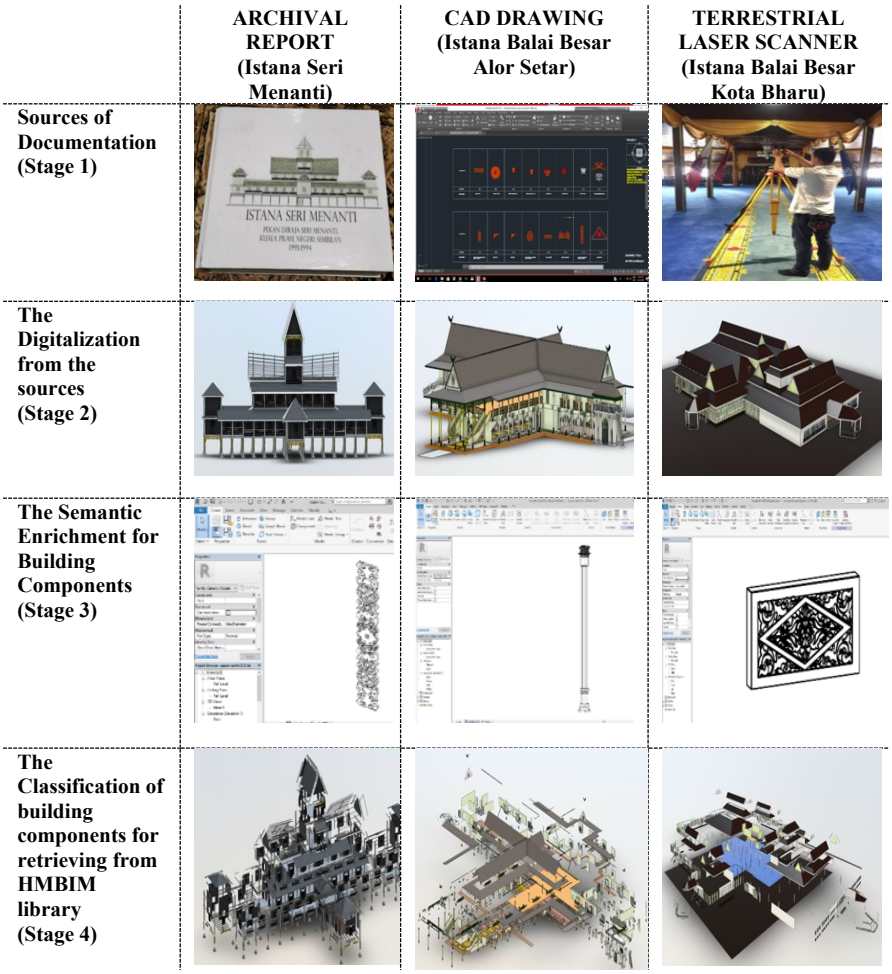

Figure 1: The process and result for BIM digitalization using multiple approaches
Source: Authors (2020)

Table 1: The comparison of multiple data collection techniques for HMBIM

Approach / Observation	**Archival Reports**	**Measured CAD**	**Terrestrial Laser Scanner**
Dimension (Height, width, length)	Relatively accurate	Relatively accurate	Accurate
Visibility	Low	High, *depending on availability of elevations*	Very high
Detailing	As photographed	As drawn	High
Data Size	Small	Big	Very big
Availability of Intangible information	Yes	No	No

Source: Authors (2020)

The digitalization took some challenges such as on the tracing for intricate geometric classical designs. As cultural buildings have lots of ornamentation, the process of modelling took some time. Some problem also was faced, such as the limitation of the BIM software to draw 'sharp lines' where design with some very curvy angle was concerned. The lines were unable to close the loop if the spline is continuously drawn. This has made the work of remodelling intricate designs such as ornamentation to be tedious and troublesome. Ornamentation design was traced within Revit, and this limitation was overcome by non-continuous tracing technique. The result is similar to a continuous line drawing, but it does consume more time compared to continuous line tracing. The work can be troublesome when the software only notifies the modeller after continuous line technique was used, to know that the form cannot take place using the tracing technique. This will make the modeller remodel them from scratch again. Another consideration is better if Revit has a loft feature such as in Autodesk Solidworks. A loft feature is an important tool for surface modelling. The loft feature creates a shape by making transitions between multiple profiles and guide curves (Barazzetti, Banfi, Brumana, & Previtali, 2015). However, Autodesk is most likely will not do so since Revit is not intended to be the do-all type of software. It does have a limitation so that other software from Autodesk can be utilized as well. Another Revit's limitation is that it was never designed to be a rendering platform and nor should it be.

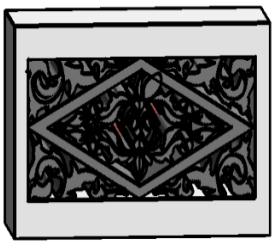

Figure 2: The BIM production of ornamented vent
Source: Authors (2020)

In digitalizing historical Malay architecture, some of the ornamentation design do have voids such as vent found in Istana Balai Besar Kota Bharu (Figure 2). To model this design, it is vital to identify the basic shape as the first step. The symmetrical parts of the design must be identified. This is to ensure no redundancy in modelling the same shape within a design because in the software, 'mirroring' is possible. An example is like the one found in the intricate ornamentation of Istana Seri Menanti (Figure 3). Failure to identify the basic grammar shape of the design will lead to a much longer modelling work. The shape grammar of architectural work was extensively discussed since the 15th century and were documented in the Four Books of Architecture (Palladio, 1570).

Figure 3: Example of complex ornamentation in Istana Seri Menanti
Source: Authors (2020)

One of the most essential features of the BIM model is the ability to insert attributes as embedded information within the model. After the digitalization process, information enrichment needs to be conducted. Since this research deals with historical buildings with more than 100 years of history, the process of gathering information about the building can be challenging. Some information is limited and may be difficult to be retrieved. However, with the data collection approaches conducted, it can be seen that some information such as the buildings' dimension, total floor areas and quantities of elements inside the building can be recorded. Apart from that, enrichment from the aspect of semantic can also be carried out. Semantic enrichment is deemed necessary since the design of the components in the historical buildings may represent heritage significance for a culture. This is what is being adopted as the main argument of this process: the digitalization is an approach of preservation and documenting traditions that were in use when the buildings were made and subsequently, maintained throughout its life as part of the effort to ensure the authenticity of cultural properties. This is comparable to Riegl's claim (1903) that any historical building's authenticity and genuineness are related to the substance acquired through its history.

In this research, the process of semantic enrichment did face some challenges such as unavailability of data and confusion on the terminology used as some sources were recorded in classical language, which needs an explanation from linguists and historians. For example, the usage of a variant of Tiang Menungkat Pisang Sesikat (structural column) that are found in the case study of Istana Balai Besar Alor Setar. The usage of semantic for ‘Pisang Sesikat’ might carry various meaning to some practitioner. Phenomenologically analysed, it might have gotten its name from a banana (Pisang) tree, which is generally found in the yard of a building. However, surprisingly, the term is unique when this research re-discovered that the 'Pisang Sesikat' is referring to the front entrance roof (Nasir, 1985). The name Tiang Menungkat Pisang Sesikat is actually referring to a specific column that, generally found at the front zone of a building, which holds the front entrance roof. A “Pisang Sesikat” is a small extension made on one side of the building which incorporated a lean-to roof (Endut, 1993). This richness of this culturally unique semantic can be inserted into the BIM model as attributes and also information to be passed on to future generation. As technology grows, the approach of preserving works also need to be parallel, so that these efforts will be future-proof.

After the data enrichment stage, the work should be able to be distributed so that the work can be utilized and remain relevant. The practitioners should be able to retrieve the work for their undertaking and to some extent, challenge the information embedded inside the model, as to encourage development. The next stage requires the data to be able to be 'smartly-identified' for easy and functional retrieval. This is the most crucial stage in establishing the work.

The concept of BIM documentation is to allow convenient and informative retrieval approach, where specification and BIM object are sourced from the same location and driven by the same database. The concept of a specification is to provide documentation of specified elements of a project. This can be generated through the interpretation of building ontology and taxonomy theory as had been previously suggested by Lee, Min, Lee, Kim, & Kim (2008) and Mustafa et al., (2019). Their suggestions draw upon what is chosen to clarify why it is used. Abidin (1981) and Mustafa et al., (2019) also highlighted the importance of comprehension of the buildings spaces and components as the specification should be designed through the creation of a preformatted guide design. Figure 4 demonstrates a suggested retrieval specification which is based on the study of historical Malay architecture and buildings. At this point, from the exercise, researchers were able to come out with a model for the works discussed. The final production on the framework is shown in Figure 5.

Building	**Floor**	**Trade**	**Zone**	**Area**	**Element**	**Material**	**Variant**
Balai Besar Alor Setar	Ground Floor	Structural	Front Zone	Serambi	Column	Concrete	Pisang Sesikat
Balai Besar Kota Bharu	First Floor	Non Structural	Main Zone	Ruang Tamu	Wall	Timber	Janda Berhias
Istana Seri Menanti		Decoration	Rear Zone	Pelantar	Window	Glass	
			Kitchen Zone	Dapur			

Building/ Floor/Trade/Zone/Area/Element /Material /Variant
BBAS/ GF/ Deco/ Front/ Serambi/ Col/ Con/ Pisang Sesikat

Figure 4: Retrieval specification for HMBIM data
Source: Authors (2020)

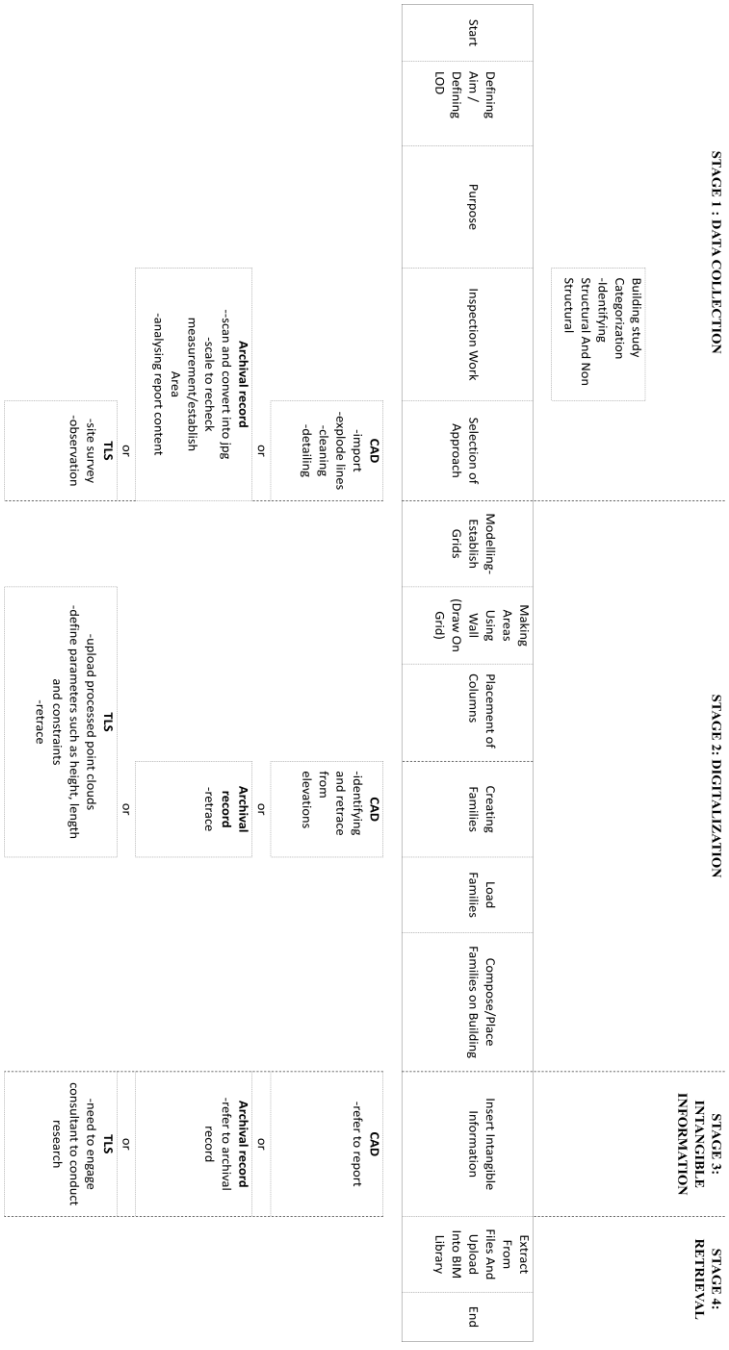

Figure 5: The Framework on Documentation and Data Management for HMBIM
Source: Authors (2020)

This research undergoes the processes in utilizing BIM as a tool for documenting historical Malay buildings. From this, it can be outlined that within a generic process of documentation and data management (data collection, modelling and retrieval using BIM, there are 4 phases within the framework. In embracing Industrial Revolution 4.0, the utilization of tools such as BIM is encouraged by the government of Malaysia when they mandated that starting 2020, construction projects must be BIM-operated. Therefore, it is essential to create a system that is universal and expandable that reflects the character of Malay building, to ensure the continued relevance of the effort. Multiple approaches of existing data collection are utilized and made as a standard in documenting and managing data related to historic buildings, especially in terms of their intangible information such as semantic data since historic buildings are rich with cultural names and terms. The framework is anticipated to act as the basis for further exploration in this area.

CONCLUSION

The main output for this paper is the creation of framework in demonstrating the processes of documentation and data management (data collection, modelling and retrieval using BIM). HMBIM particularly is addressing the issue which is not widely addressed before in Malaysia, where the tangible historical Malay buildings components are turned into digital data using BIM technology and later, translated into a cultural BIM database. Through the study on historical Malay architecture using multiple case studies, HMBIM is anticipated to provide access to industry players to consider components with Malay identity in their design. By having this kind of effort, it will increase the productivity and creativity of the industry, other than encouraging the players to be more competitive using output from a scientific research. Apart from that, by utilizing BIM approach, the government's aspiration to contribute to the world's sustainable goal development also can be addressed.

ACKNOWLEDGEMENTS

This research was supported by a grant (TRGS/1/2016/UIAM/01/5/3) from the Ministry of Higher Education Malaysia (MOHE). This research is also supported by Kuliyyah of Architecture and Environmental Design (KAED) and Kuliyyah of Engineering of International Islamic University Malaysia.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 85 – 96

3D GEOSPATIAL TECHNIQUE IN ANALYSING THE MALAY HERITAGE BUILDING STRUCTURES

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Abstract

Malay buildings are synonym with the unique design of full decorative on motive, unique façade design, and roof structured. Most of heritage buildings had been demolished and left out without proper documentation and preserving the building database. Latest mapping systems provide an efficient technique for acquiring dense point clouds in analysing the building structure. This paper aim to explore on the technique acquiring the data for distribution and the façade of building with the Malay architecture design using the laser scanning. Data acquisition was taken for two sites which are Kota Bharu, Kelantan and Alor Setar, Kedah with two different techniques were applied for data collection which are TLS and MLS method. Both methods had succeed in capturing the detail of the features and building in the study area in point cloud form and the analysis of the data was able to analysed on the classification and identification of the Malay building elements and features which still preserved Malay design at the facade and roof element in the study area. As the final results and findings, there were big gaps between the building which still preserved the Malay design in the study area where Kota Bharu recorded 71 units building meanwhile Alor Setar only 15 buildings. The results showed that, most of the Traditional Malay building still being preserved in Kota Bharu compared to Alor Setar.

Keywords: Heritage, Malay House, Laser Scanning, 3D geospatial

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INTRODUCTION

Laser scanning technology is one of the widely used technology in surveying and geospatial information and data collection since early 1990s (Beraldin et al. 2010). The use of the laser scanning is not just bind for surveying only, but also widely spread towards much more field of study and data collection, such as heritage studies, urban design and urban planning studies, crime scenes investigation, and even for construction industries. Most of this field of studies require the most effective method for the data acquisition, analysis and importantly for data storage system. The primitive method by using drawing, or 2D database are a bit challenging and required a lot of work and the data storage system and analysis were fragile and lead to confusing in understanding the data form and function. According to Guan et al. (2015), the automatic 3D scene analysis using Light Detection and Ranging (LiDAR) point's clouds has been a challenging task in research fields of photogrammetry, remote sensing, computer vision and robotics for the past 10 years back. Compared to field surveys and photogrammetry technique, the laser scanning captures very highly accurate 3D points clouds with a high point high point density in a relatively short amount of time (Haala et al., 2008; Chehata et al., 2009; Ussyshkin 2009). Today, the method of data acquisition for points cloud dataset can be varied as the development of the technology, such as using the terrestrial laser scanning (TLS), airborne laser scanning (ALS) and mobile laser scanning (MLS) (Guan et al.,2015). Airborne laser scanning usually used scanning large-scale area of interest with relative low point density and for MLS and TLS technique applied for dense and accurate 3D scene analysis and documentation especially in the context of urban areas and focused structure. This paper intends to document the process and technique used in data acquisition in recognizing the Malay heritage building structure using different laser scanning technique which are terrestrial laser scanning (TLS) and mobile laser scanning (MLS) for two different studies which are in Kota Bharu and Alor Setar.

Laser Scanning Application in Heritage Conservation

The demand and the importance of data acquisition with high precision and accuracy in various fields such as, heritage, archaeology, and cultural landscapes have led to the development in the application and tool in data collection (Haddad, 2011). The capability of the instrument or tools to provide large amount of data and high performances especially the capability for single operator can run the survey or data collection process in short time are the main value added in selection of the technique during data collection (Nesi, 2013). Even though the technology is only a tool to ease the research progress, the capability of technology to bring up the hidden information that are simply not visible to the naked eyes was very helpful in a research. Laser scanner is a tool which is able to measure the position of thousands of points in the space that will define the

surface of the scanned feature (Nesi, 2013). According to Grussenmeyer et al. (2016), laser scanning was an active, fast and automatic technique for data acquisition using laser light for measuring without any contact in a dense regular pattern, 3D coordinates of points on surfaces. The laser scanner emits and receive their own electromagnetic radiation which can be categorized as active data collection compared to photography which rely on reflected ambient or artificial light which can be categorized as passive data collection (Nesi, 2013). The output from the laser scanning is to produce the high density of point cloud database which reflect the surface of the measured or scanned object. Point clouds was the result from the scanning process which consist of millions of points placed in the space according to the XYZ coordinates that can be used to recreate the 3D model of the scanned objects. For the paper, the use of the data point cloud was focused to analyse the historical element which associated with the Malay design using the terrestrial laser scanning and mobile laser scanning in order to integrates the geospatial approach in heritage and conservation field of study.

Terrestrial Laser Scanning

The Terrestrial Laser Scanner (TLS) was effective in recording and documenting due to its capability providing better spatial information of a building or structure in complex 3D scenes in a short period of time. The data acquired using TLS via laser beam that travel towards the area being scanned and back to the laser lenses consist of 3D coloured point clouds data with accuracies range from millimetres to centimetres (Lee, 2013). This data contains of millions of points with geometric coordinates (X, Y and Z) can be used to give a realistic impression of a building or structure for users to interactively navigate the viewpoint around it, viewing base on all the position and the angles required.

Mobile Laser Scanning

The term "mobile laser scanning" (MLS) means a laser scanning system is mounted on any moving platforms like vehicles or boats, except for the aircraft. The MLS system means that the laser scanning system is mounted on the top of a land-based vehicle (Lemmens, 2011). MLS has become a rapidly developing technology nowadays, especially for accurately mapping roads and building (Sun et al., 2018). As one of 3D data acquisition technologies, the MLS system not only has the advantages of TLS system characterized by high accuracy and point density, but also has advances in rapidly and cost-effectively capturing dense 3D point clouds for a large area. Although a variety of MLS systems have been built by diverse manufacturers, nearly all of them are based on navigation systems through integration of Global Navigation Satellite System (GNSS) and Inertial Measurement Unit (IMU) for directly obtaining geo-referenced LiDAR point clouds. As a contrast to possessing an ultra-high point density and spatial resolution, the point cloud of MLS has a relatively and evenly distributed point

density due to the movement of the scanning platform. Furthermore, multiple measurement stations are not mandatory when conducting a mobile laser scanning, so that the complex registration process can be avoided to some extent. Therefore, for further 3D analysis of large-scale urban scene especially for acquiring 3D dataset of street views and building facades, MLS is considered to be the primary choice (Sun et al. 2018).

Malay Building Heritage

Buildings have an immense effect on the lives of their users. In particular, houses are required to allocate spaces for individuals to feel safe, relaxed and satisfied to do what they desire, such as eating, sleeping, entertaining guests and many other functions based on their aspirations (Clements-Croome, 2006; Rapoport, 1990). The traditional Malay buildings such as palaces and religious building are originally adaptive design from the Malay house design and the variation of the building use, form and design changed due to change in the climatic and cultural factors. The traditional Malay building or Malay house was a timber house raise on stilt and basically a post and lintel structure with bamboo or wooden wall as façade design (Abdul Halim Nasir & Wan Hashim Wan Teh, 1996). The Malay house evolved by the Malays over generation adapting the current needs, environment, climatic and also culture. Various of traditional and hybrid Malay houses form can be identified in Peninsular Malaysia and can be classified according to their roof shapes and the façade design.

Characteristic of a Malay Roof

There are a few basic roof forms being adaptive to the Malay house such as, *bumbung panjang, bumbung limas, bumbung perak* and *bumbung lima*. The most common one is the *bumbung panjang* or a long gable roof and believed that most of them are existed over a hundred years old (Abdul Halim Nasir & Wan Hashim Wan Teh, 1996). According to Zumahiran (2015), the long-roofed house can be found in Northeast part of Malay Peninsula which are Kelantan and Terengganu which existed since 1800s to 1920s. The house has unique dwelling form with distinctive features and characteristic house.

RESEARCH METHODOLOGY

For the research methodology part, the initial phase was identifying the study area based on the historical data and literature review. The study area can be divided into two major elements which are the heritage building and the earliest Malay city in Malaysia. The data collection method based on one of the geospatial techniques which is using the laser scanning method. The use of laser scanning was mean to capture as much of data with less time consumed for the data collection. There are two laser scanning method being used for the paper which

are terrestrial laser scanning and mobile laser scanning. The main output data expected from the data collection was the point cloud-based data.

Case Study

For this paper, the selection of case study was two Malay royal town in Malaysia, Kota Bharu, Kelantan and Alor Setar, Kedah. Both of these study areas were amongst the earliest Malay city which were established since early 1700s and based on the sultanate ruling systems. Moreover, both of the study areas have unique similarity such as the relationship between the states with Siam, and free from British colonization until 1910. Besides, in term of the geographical and locational both of the palace as the city administrative centre which closed to the river estuary. Estuary towns such as Kota Bharu, Alor Star, Kuala Terengganu and Johor Baharu had already expanded and formed the early urbanisation of the Malay Peninsula and were referred to as Early Malay towns in Malaysia. Their status now remains as city states and conserved as heritage cities in Malaysia.

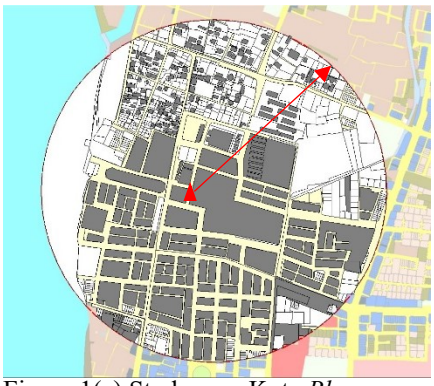

Figure 1(a) Study area Kota *Bharu*

▲ Istana Balai Besar Kota Bharu

Figure 1(b) Study area Alor Setar

▲ Balai Besar Alor Setar

Figure 1 (a) and 1 (b) show the study areas which were selected within 500 meters from the centre where in this case, the palace has been identified as the centre for the study area. The establishment of Kota Bharu Kelantan as the Malay state has been started after the completion of Istana Balai Besar in 1845, while for Alor Setar, the completion of Istana Kota Setar and Balai Besar was in 1735.

DATA COLLECTION

For the data collection, there are two laser scanning techniques being applied for both sites which are Terrestrial Laser Scanning and Mobile Laser Scanning. For TLS, data acquisition technique had been applied to the heritage building which are Istana Balai Besar Kelantan and Balai Besar Kedah, while on the other hand,

MLS was applied to the city area and settlement area which was identified earlier during the field survey that consists of Malay heritage building structure.

Terrestrial Laser Scanning

Capturing the data using the TLS required details planning before and during the data collection in order to capture the highest accuracy of data. For the Istana Balai Besar Kota Bharu, the TLS data acquisition was carried out using the Scan Station P40 laser scanner by Leica that offers highest versatility including long range capabilities during the scanning and data capturing process. This scanner is able to deliver highest quality 3D data and HDR imaging at an extremely fast scan rate of 1 million points per second at horizontal ranges of up to 270 m away from the scanner. The model used for the data collection process which involved two main procedures which are, laser scanning using P40 and photographing the textured images with the RGB values of the geometric object were captured by a high-resolution digital camera Nikon d3000.

There were 26 stations had been identified for the location of the scanner during scanning process. Besides the identification of the location and number of stations before scanning process, the target symbols are printed out in black and white colour on white paper before being pasted on the wall. Then, the symbols are circled around each of the scanning station and practically more than 5 targets placed around the 3D scan station to prepare the target for the scanning process. The target symbol is important to make sure the registering of the scanning data during the data processing stages. The placing of the target must meet the requirement of minimum 3 corresponding points in two different stations. This necessity was needed to smooth the post processing work. Besides, the numbers of total scan station depend on the size and complexity of the structure. Hence, appropriate scan station needs to be established for better coverage to cover all the details of the monument.

Meanwhile, for the Balai Besar Kedah, the TLS data acquisition was done using the GLS-2000 which has the 350m maximum covering wide measuring range with scanning rate 120,000 point per second. The accuracy of this laser scanner is 3.5mm at 150m with built in 5 Megapixels camera. There are 29 stations identified before the scanning process. The selection of the stations was based on the overlapping area and visibility of the objects, which in this case were Balai Besar, Alor Setar. Each of the scan station's georeferenced coordinate was based on the GPS coordinate which transmitted via Global Navigation Satellite System (GNSS). All of the data scanned for the 29 stations are combined based on the coordinate data to become single point cloud data.

Mobile Laser Scanning (MLS)

For both of the study areas, for MLS technique, the scanner use was the TOPCON IP-S3 HD1 3D Mobile Mapping System. The selection the area for the MLS

scanning was based on the area within 500-meter radius from Istana Balai Besar Kelantan, and Balai Besar Kedah. For Kedah, the scanned area was along the Lebuhraya Darul Aman road and spread to the surrounding area within the radius. There are a few steps as shown in Figure 2 for the data collection of the mobile laser scanning process which are selection of the area and routes, kinetic calibrating, data collection, and final kinetic calibrating. The software used for the data collection was Magnet Master Field.

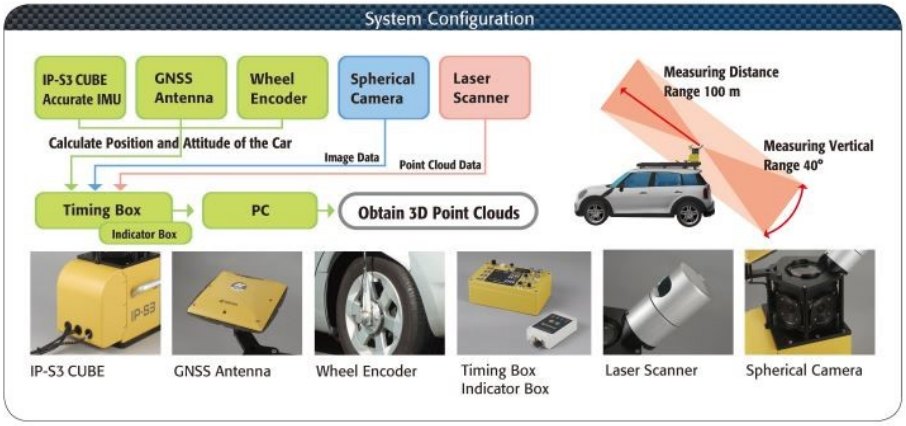

Figure 2. Data collection step for MLS

Collection of Ground Control point also has been carried out during the data collection. The RTK method was applied in collecting the GCP for each site during data collection. The GCP point contains the georeferenced coordinate and elevation of the control point which later will be used as the control point during the data processing. For Kota Bharu, there are 17 points, while there are 13 points for Alor Setar. The distribution of all points was based on the size of overall study area.

RESULT AND ANALYSIS

There are two main parts of finding in the paper, which are the point cloud produced from the TLS and point cloud produced by the MLS. Both techniques will undergo processing stages to produce the point cloud output dataset in. rcp format for further analysis. As one of the objectives in the paper is to recognize the building structured with Malay heritage element based on point cloud, the two elements from the data which are roof and façade of the building were emphasizes for the analysis. For the TLS data, the specific building has been identified as the heritage building which are Istana Balai Besar Kelantan and Balai Besar Kedah, while for the MLS data, the specific Malay Heritage building structure will be identified based on the point cloud database.

Laser Scanning Result

Based on the data acquisition using the MLS and TLS for Istana Balai Besar, Kelantan and Balai Besar Kedah, the point cloud data has been produced from the processing stages in. rcp format. The data can be open using Recap software which is one of the Autodesk software and can be used for detailed 3D modelling constructing in Revit software. From the recap software, the measurement and identification of the elements of the Malay heritage design can be identified and the point cloud data can be used as base for 3D reconstruction modelling and as information storage system of the form and design for existing heritage building structure.

Meanwhile, for MLS data from the data collection was processed using the Magnet Collage software to produce the output dataset point cloud in .rcp format. The point cloud data contains information of the georeferenced points, elevation and textured of the scanned object and the intensity of the scanned data. The intensity shows the ability of the laser beam to re-emit the laser data and converted into the data during the scanning process. From the Recap software, the data is analysed to recognize the heritage building structured that still exist for Kota Bharu and Alor Sear area. The determination of the building was based on the façade and roof design where the roof design for Kelantan House was based on *'bumbung panjang'* roof design (Zumahiran, 2015). Figure 3 (a) and 3(b) shows the MLS data in point cloud for Kota Bharu and Alor Setar.

Figure 3 (a). Kota Bharu MLS Point Cloud

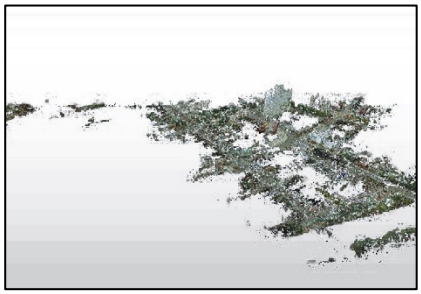

Figure 3 (b). Alor Setar MLS Point Cloud

DATA ANALYSIS

For the analysis part, there are a lot of analysis that can be produced by the point cloud database and the point cloud data one of the effective and comprehensive database especially in the heritage-based industries. The distance between each point up to millimetre unit give the high accuracy of the database. Besides, the ability of the points cloud database in stored the textured and georeferenced data also one of the salient points for data acquisition using the laser scanning technique. For the paper, the MLS data will be used in captured the form and

design of the structure for further reconstructing process of 3D model of the building. The data such as roof form, building height and element measurement will be analysed from the data. Meanwhile for the MLS dataset, the form, design and locational of the heritage Malay building will be analysed and extracted out based on the point cloud data.

Laser scanning analysis

The building form for study area in point cloud form from TLS, is analysed to be further used for detailed 3D modelling reconstruction using the Recap software for the elevation, façade design, unique motives and the measurement of the building. For detailed 3D model, this data was exported to the Revit software for detailed 3D modelling. Figure 3 (a) to 3 (d) show the example of analysis carried out from the point cloud data, where it involved the building elevation, structure and façade recognition and building measurement.

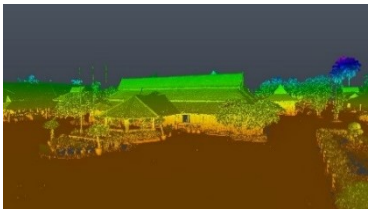

Figure 4 (a). Elevation data of Istana Balai Besar Kelantan

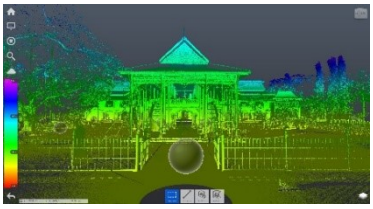

Figure 4 (b). Elevation data of Balai Besar Kedah

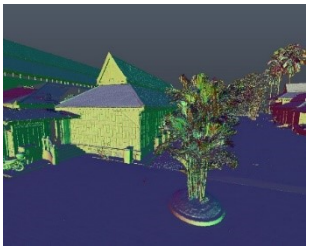

Figure 4 c). Janda Berhias façade design for Istana Balai Besar Kelantan

Figure 4 (d). Kerawang design at Balai Besar Kedah

Figure 4 (a) and 4 (b), shows the elevation analysis using the Recap file where each scanned point stored the elevation data offset from the mean sea level which captured during the scanning process. The elevation analysis represented by the colour intensity which varies according to the height range from -5 m to 30 m. From the elevation analysis, the floor level and roof based can be identified for the 3D modelling process. For Figure 4 (c) and 4 (d) the façade design, and motive design for both building can be analysed, where the design of "*Janda Berhias*" mounted on the facade Istana Balai Besar Kelantan and motive design

on the railing and column structure for Balai Besar Kedah which represent the Malay Architecture design.

Point cloud data from MLS different was compared to TLS due to technique and scanner's location during the data collection process. Synonym with the term "mobile", the positioning of the scanner mounted above a moving vehicle is able to capture the point cloud along the route taken by the vehicle with 360 degree of scanning object and image captured. The analysis on concentrated point cloud for Kota Bharu shows higher intensity than Alor Setar. This is due to the street network and land use arrangement in Kota Bharu are more compact compared to Alor Setar. Alor Setar faces higher development progress rate than Kota Bharu. In recognizing the building structured of Malay building, point cloud data was analysed based on the form and architecture design for the all scanned building. Figure 5 (a) to 5 (d) shows some of the roof structured and façade that shows the heritage Malay architecture design for the area.

Figure 5 (a). Façade design for MAIK building, Kota Bharu

Figure 5 (b). Roof design for communal housing building in Kota Bharu

Figure 5 (c). Balai Nobat, Alor Setar

Figure 5 (d). Masjid Zahir, Alor Setar

RESULT AND DISCUSSION

The use of laser scanning technique was an effective method in data collection and can act as the effective medium for data information storage system. The ability of the producing the point cloud data with all the required information stored in each of the points was very helpful in data acquisition process and for data analysis. For both TLS and MLS method that has been carried out in this paper, both of the method achieved the main objective of the paper to recognize the Malay heritage building structure for both Kota Bharu and Alor Setar. From the TLS data analysis, both of the main buildings that are significant to the Malay city element was able to capture all the information needed to be used for further reconstructing of detailed 3D model using Revit software.

Meanwhile, using MLS method, it gave better result for Kota Bharu, as the study area still preserved most of the Malay heritage building such as,

Istana, Mosque and even the communal house. Based on the analysis, there are still buildings with structures that still preserve the Malay architecture which exist for almost more than 100 years old. For Alor Setar, the rapid development changes at the study area, resulted many original buildings had been demolished and replaced with the new building structure but still preserved for the main Malay city element such as palaces, mosque, street pattern and spaces for the main concentrated area in front of Balai Besar.

For Kota Bharu there are 71 buildings within the study area has been identified with the Malay element either on roof design or on the fade design, meanwhile for Alor Setar, there are only 15 buildings which still had the Malay identity and most of its were palaces. Differ with Kota Bharu, where the Malay design still can be detected even on the communal houses. This shows that, within the same radius, the development of Alor Setar was changing rapidly and most of the Malay houses were replaced with the modern buildings.

CONCLUSION

Malay buildings have a very unique and special characteristic with a unique architecture design, material use that compatible with the climatic condition, the roof form, motives design and the whole building structure that need to be preserve and capture for the data information of the building. This paper has identified the effective method in survey and data acquisition related to the recognizing the Malay heritage building structure for Kota Bharu and Alor Setar. Although TLS and MLS method were the only the tool used for data captured, but the process during the data scanning must be appropriate with the level of the data requirement, where the precise scanning process will provide more detailed and accurate dataset in point cloud. Besides, point cloud data which stored much of data type can be further explore for more analysis such as producing the flood prone area, and determine the shaded area from the nearby buildings.

ACKNOWLEDGEMENTS

The authors greatly acknowledged the International Islamic University of Malaysia for a research grant on Trans-Disciplinary Research Grant Scheme (TRGS/1/2016/UIAM/01/5/1), Ministry of Higher Education Malaysia for providing invaluable respective data used in this study.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 97 – 108

TOWNSCAPE APPRAISAL AND CONTRIBUTION OF PHYSICAL FEATURES TOWARDS THE CHARACTER OF IPOH OLD TOWN

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Abstract

Urban character refers to the combination of elements that constitute a town. Ipoh is one of the colonial towns that portrays the character of an old town, where physical heritage elements within its historic area remain intact. However, Ipoh is now developed with many new modern developments and this impacted the physical features of the old city. This paper explores the character of the historic buildings in the old part of Ipoh through townscape appraisal and urban morphology focusing on the building plot. Besides, the study aimed to evaluate the changes in urban fabric following the changes that occurred to the old and historic buildings in Ipoh. The study revealed that rapid urbanisation and changes in urban form resulted in the diverse change of urban characters of Ipoh Old Town. An important contribution can be made to the conservation and management of urban built heritage in Ipoh Old Town, on the one hand, explaining the typologies and evolution of heritage buildings as part of important urban elements could improve the understanding about the building issues so that best conservation practices are suggested.

Keyword: urbanisation, morphological studies, physical features, physical elements

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INTRODUCTION

Urbanisation in Malaysia has taken place since the British colonial era, when the first local authority was established in Georgetown. Since then, urbanisation had proliferated in towns of Malay States, where the building of shophouses contributed to population increase in town areas. Besides, several administration buildings, service facilities, as well as transportation infrastructure, such as train stations were built (Harun & Jalil, 2012). Ipoh is one of the towns considered as an old town, where many of the physical elements still exist today. Nonetheless, being the state capital of Perak, the development of the town has been ongoing. Numerous events have changed the landscape, which has been affected by modernisation. However, many old shophouses which carry significant historical values, have managed to survive through intense urban development, and have contributed to the continuation of local activities, such as retailing within the old town circle. There is an increased variety of activity patterns within the old town area, as the physical elements in the urban space have been improvised and diversified to cater to current needs. This paper is commissioned to identify how those physical features in Ipoh had contributed to the changes in the character of the town itself. Besides, the urban character is also determined based on the urban morphology of the town from the pre-colonial era until the present.

RESEARCH BACKGROUND

The elements within a town have often brought people together to create a collective of enjoyment. When the elements are related to each other, they offer an aesthetic pleasure that attracts people to experience the diversity of visual and aesthetic elements through time. Consequently, a town has a specific visual impact on the people who live in it or on those who visited the town. In this context, the visual effect is represented by the changes in the landscape and appearance due to physical development (James Hutton Institute, 2014).

Under those circumstances, the physical forms of a town and its related activities contribute to urban quality. It is known as an urban character when the combination of available elements creates a lively and vibrant urban setting that typifies a living town. For the recognition of a town's existence, it is necessary to give a positive impact that is crucial to the urban environment. However, the urbanisation pattern nowadays can affect the former identity or character of an old town, which might endanger the cultural heritage value of the nation.

The morphological study of towns in the Malay Peninsula showed that urban form characteristics date from 5000 BCE to the early 19th Century. The evolution can be classified into four phases of timeline, namely the ancient Malay Settlements, ancient Malay port cities, early Malay towns, and old towns which can be divided into 2 groups: Malay Royal Towns and Colonial Towns (Mohmad Shukri et al., 2018).

Old towns that are still standing today are evidence of the evolutionary phases of Malaysian history, besides showing different and various identities of urban forms through the history of their morphology (Harun & Jalil, 2012). Most city centres in Malaysia were initially developed as colonial towns with pre-war buildings, such as Georgetown, Kuala Lumpur, and Ipoh (Omar et al., 2016). Today, Kuala Lumpur is well known as the capital city of Malaysia, whereas Georgetown is well-recognised as a UNESCO World Heritage Site since 2008 (Georgetown World Heritage Incorporated, 2018).

Ipoh maintains historical significance that represents its identity as an old town. In fact, it is a historic area that remains intact with heritage elements built within it. Ipoh Local Plan 2020 and the National Heritage Act acknowledged 14 buildings and monuments out of 1,540 in total as significant heritage buildings (Majlis Bandaraya Ipoh, 2012). Ipoh is one of the early towns opened by the British, with a unique character in terms of urban form through building architectural styles and urban morphology with colonial characteristics (Harun & Jalil, 2014).

However, nowadays Ipoh old town is affected by the construction of new buildings to fulfil development needs and to meet people's current demands. With more modern buildings erected around the old colonial town, a sort of competition is generated between the old and new town, which endangers the existence of the old town (Omar et al., 2016). The study attempted to identify and understand Ipoh old town, in terms of morphological and physical features that form a unique urban character. Physical features of a town are often considered as living evidence that characterises its historical attributes and strengthen its 'sense of place'. Hence, the character of an old town and the physical features can be seen and felt through the environmental significance.

RESEARCH OBJECTIVES

The first objective is to study the urban morphology of the Ipoh old town from the pre-colonisation period until the present, while the second objective is to identify and compare the changes of the urban character based on its physical features seen in the town.

Townscape as the combination of physical properties and environmental aspects in urban area

The concept of townscape can be defined as a part of a city that has significance in setting the character of a city. Cities with a clearer image, identity, and sense of place, tend to have townscapes that can strongly express certain visual qualities and enhance the sense of belonging. Therefore, the success of a city lies in the creation of its identity and sense of place, determined by the critical role of townscape that reflects the relationship among the elements which compose the urban fabric. Townscape is the primary key to a symbiotic interaction, various

interchanges of economic activities, architectural ideas, and socio-cultural diversities (Shamsuddin, 2011). The concept of townscape should be implemented in a city to ensure the creation of a strong character that can potentially contribute to a lively sense of place. Most importantly, this can be beneficial to people in their daily activity patterns and routines. Indeed, it is essential to realise that a pleasant townscape is determined by the quality and attractive attributes of the components.

The process of strengthening townscape requires the combination of physical properties and environmental aspects, such as nature, social life circle, economy, and cultural environment. Townscape integrates economic, socio-cultural, and environmental concepts into a city (Shamsuddin, 2011). It can symbolise a social life with a harmonious relationship and bring character to the culture. Historic old towns rely on physical attributes so its nature can be resilient as it should be.

The main elements in urban spaces play a role in providing significant meanings to a location or a place, which contribute towards the character of the case study. These elements include streets, squares, buildings, and activities that can be classified as the urban fabric. The activities and physical characteristics of the physical features within the case study were concluded to have created a unique identity for the historic urban space; hence, in the context of this present study, it is referred to as the character of the historic old town.

In general, old towns in Malaysia have many significant attributes that preserve various unique heritage values. Urbanisation is essential, but at the same time, old towns must be conserved to emphasise their unique characters, so that they can be appreciated as an identity.

Townscape Appraisal

The best approach to evaluate the extent of the components' usefulness in representing the townscape is by applying townscape appraisal, a vital tool to assess and evaluate the relationship among elements that form the urban fabric and the generation of movements and activities. Such evaluation is necessary to identify the effects of a townscape to the city, which creates the city's character.

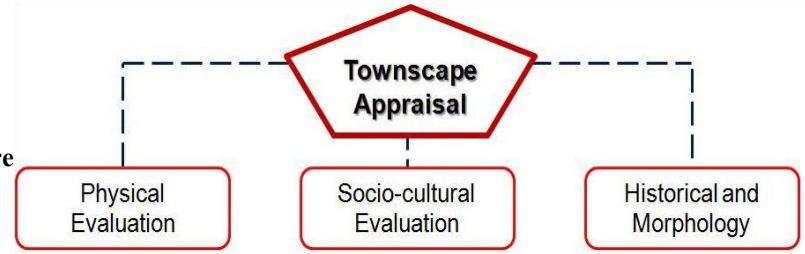


Figure 1: Townscape Appraisal Approach
Source: (Shamsuddin, 2011)

Said et al., (2014) explained that studies by Solomon and Johnston in the late 1960s emphasised the importance of townscape analysis to study the relationship of buildings and their occupants (Solomon, 1966). The authors explained that to understand the character of a townscape, a detailed analysis of the structures and their historical context could provide guidelines for the townscape characteristics. Townscape can be overviewed by using three approaches that involve physical evaluation, socio-cultural evaluation, and historical and morphology (Figure 1). These mixed-method approaches are carried out at the stage where field study and secondary data research were being conducted (Shamsuddin, 2011).

The assessment of these criteria is made through observation, structured interviews with the residents, and property managers. Nevertheless, cultural and religious values are often subjective, and thus, difficult to be quantified. However, a fractal analysis extended by Cooper et al., (2013) to include Taiwanese evidence suggested that culture has a deep-seated influence on the formation of a townscape attitude. The study on the layout of historical cities in Malaysia reflected the importance of religious and cultural aspects in the society. This supports the need for assessing both values to learn how regeneration can affect a diverse, multi-ethnic society, such as the one in Malaysia.

METHODOLOGY

This research adopted mixed methods that involve old documents and old map review, visual survey through direct observation of physical elements in the heritage of old town and questionnaire to obtain respondents' perception. Most parts of this paper are based on primary data that applied a qualitative descriptive method as the core. A quantitative method was also adopted, so the analysis would be sufficiently valid to support the findings from the qualitative method. Thus, this research conducted both data collection methods simultaneously to ensure the data interpretation was more reliable.

The main criteria that oversee the changes can be defined by the dependent variables, i.e. character changes. In contrast, the independent variables are physical features of the old town, activity patterns, and the urban morphology of the town. Hence, two (2) methods, i.e. using inventory and distributing questionnaires, were undertaken as tools to measure the variables in the data collection process (Table 1).

Table 1: Variables and Data Collection Process

Dependent Variables	Independent Variables	Data Collection Method	Data Collection Tools
Changes of the urban character	Physical features of the old town	Observation/ photography analysis	Inventory / photographic evidence / old photographs analysis
	Activity patterns	Observation / survey	Inventory / questionnaire
	Urban morphology	History analysis / sources review	Old maps / history reports

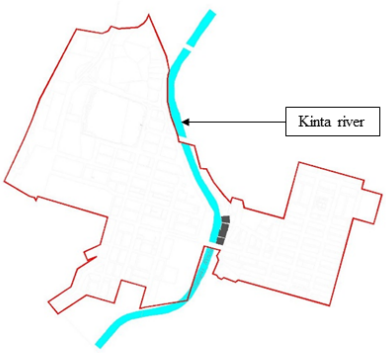
Source: Author,2019

Photographic analysis is essential to identify and compare the changes of the urban character based on physical features in the historical elements. It involves the collection of old photographs and current photographs. Additionally, inventory is prepared to record the outcome of the visual survey which based on intuitive feelings that describe how the researcher observed and experienced the place, in terms of the buildings' appearance, people's activities, public seating areas, public facilities, and street furniture within the old town area. A supporting medium, such as photographs, were attached to the observation inventory. This direct observation approach was applied to understand the relationship between physical features and its effects on the urban character. It was conducted at Jalan Dato Maharajalela – Tun Sambanthan, Jalan Dato Sagor, Jalan Sultan Yusuff, Jalan Bandar Timah, Jalan Market, Jalan Panglima, Tingkat Pasar, Hala Pasar Baru and Lintasan Pasar Baru.

Questionnaires are outlined into three (3) sections, which consist of the background profile to identify the characteristics of visitors that tend to be in the area, activities that were carried out in the study area to identify the purpose of visiting the area, and perceptions of respondents to acknowledge the opinions on the changes and current condition of the area. The respondents were randomly selected among the visitors within the study area, to ensure the validity and reliability of the analysed outcome for the research. As for the urban morphology analysis, it was carried out to understand how Ipoh Town had initially started and developed rapidly until the present. The scope of the analysis involves the year 1870 until the present day.

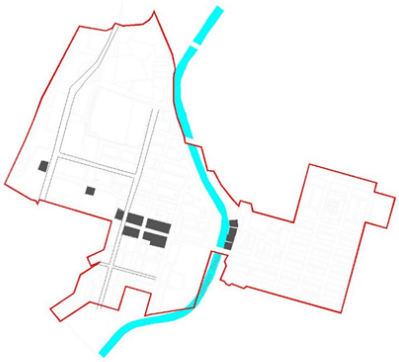
FINDINGS

Figure 2 shows the findings on the evolution of urban form based on the development of streets layout and building plot from the 1870 to 1991.



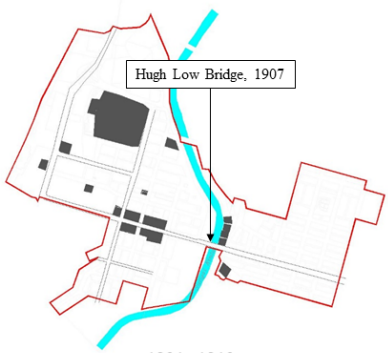
1870 - 1880

•According to the writing by McNair (1878), J.W.W Birch has stated on map, there were 2 neighbouring settlements at Ulu Kinta river bank, Epu and Palau. In 1879, Epu has been the main centre of the village in the district and a police post was built (Salleh, 2014).



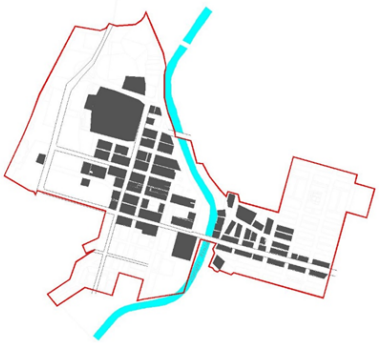
1881 - 1890

•Panglima Kinta has planned layout for Ipoh town in 1886 and Ipoh Court House has built. Several roads were built such as Club Road, Station Road, Belfield Street and Hill Street. A hospital was built between Railway Station and Central Police Station (Salleh, 2014).



1901 - 1910

•Standard Chartered Bank and Straits Trading Company were built at Station Road. In 1907, a bridge to cross Kinta River at Brewster Road was opened. Convent School was also opened in the same year. An Indian Muslim Mosque was built at Clayton Road. Ipoh New Town was opened in 1908 and 216 houses were built. The 9th resident has launched People's Park and Birch Memorial Tower in 1909 (Salleh, 2014).



1911 - 1930

•Ipoh Town Hall was built and completed in 1916. A year after, Ipoh Railway Station and a hotel was built to replace the first railway. Ipoh's third court house has completed (Salleh, 2014). . The town is structured and shop houses is increasing.

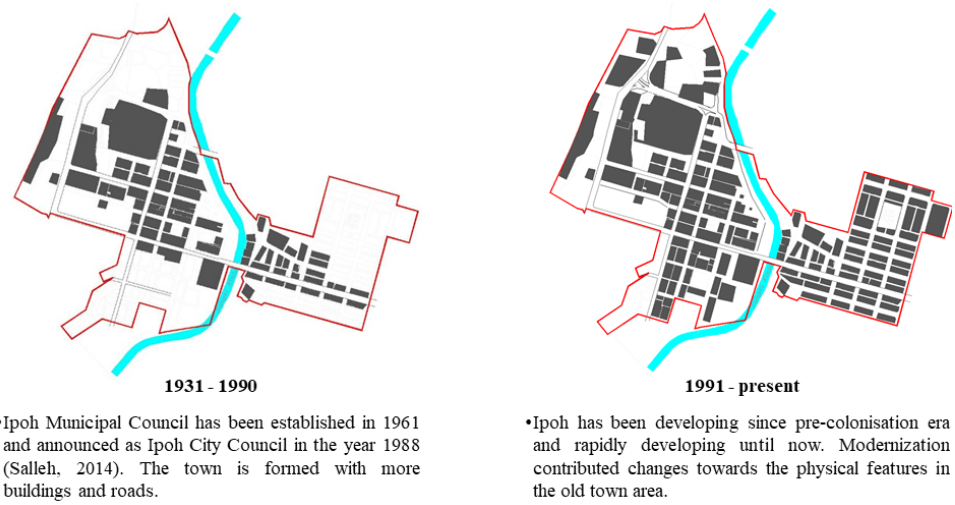


Figure 2: Urban Morphology of Ipoh Old Town
Source: Author, (2019)

The study has revealed that numbers of historical buildings play as the landmark and a typical historical urban element that shaped the character of Ipoh Old Town. Fortunately, in many cases much of the original form of the building has survived but the changes in uses and original character were continuously being changed. With changing of building and its surrounding physical conditions, the town is being adversely affected and losing some at least of its qualities (Rohayah et al., 2013). Despite the strength and architectural qualities possessed by these buildings, the buildings and their surrounding area are often subjected to threat and changes which resulted to placeless geography and possibly lead to the death of the main strength of the town as a historic place.

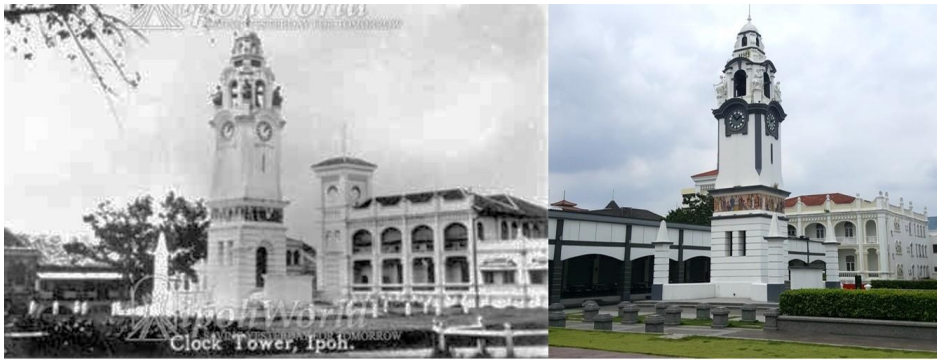


Figure 3: Memorial Clock Tower of J.W.W Birch Year 1920 (left) and Present (right)
Source: Anderson (2007) and Author, (2019)

The main elements that create the character of the place are streets, squares, buildings, and activities. In reference to Ipoh, users tend to walk around and involve in street activities, such as taking pictures, hanging out, retailing, and enjoying visual attractions featured by the old buildings. As for example, Concubine Lane, formerly known as Lorong Panglima, was an empty small lane of local houses. Now, the lane is occupied with retail activities and visitors (Figure 4). Moreover, questionnaire survey has found that most of the respondents are attracted to the physical features in the area, followed by visual and photography attractions, social activity at the area, and for self-enjoyment (Figure 5). This shows a current scenario that is influenced by surrounding elements has strengthen the ambience of the historic old town, which can be the pull factor to attract visitors.

Figure 4: Concubine Lane in 2010 (left) and in Present (right)
Source: Times of Malaya (2010) and Author, (2019)

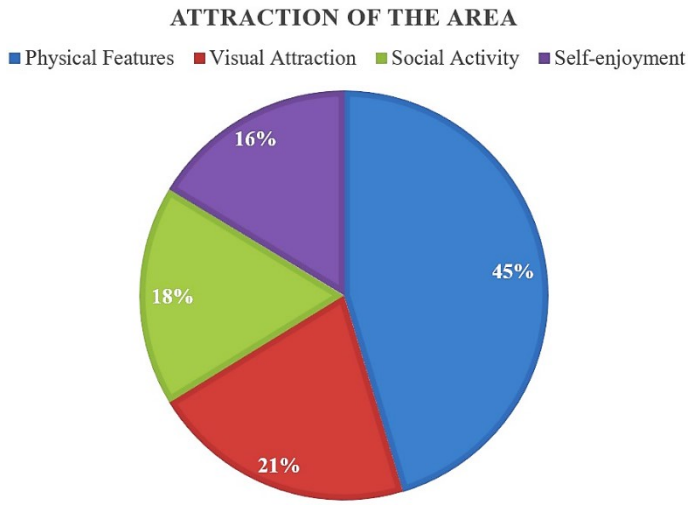


Figure 5: Responds on Questionnaire
Source: Author, (2019)

On the other hand, most of the remaining old features have been preserved to maintain their significant aesthetic values. Attention should be given to several old buildings because poor appearance can contribute to unpleasant feelings and unsightly visual impacts (Figure 6).

Figure 6: Decaying Old Shophouses at Jalan Market
Source: Author, (2019)

The study has revealed that typical historical urban form of Ipoh Old Town is the result of the evolution of buildings, landscape elements, and streets pattern around the cities. Result has confirmed that the attribution of these

physical features is intertwined between distinctiveness, diversity and heritage values which are of importance for their preservation.

CONCLUSION

Physical changes play a significant role in the morphology of a town, since the changes in townscape elements enrich the history of the place. Urban conservation is a way to maintain the character of a town. Nonetheless, additional modern development should complement the existing townscape. For Ipoh, the heritage buildings in the old town should be conserved and preserved as local assets and for the sake of the town's character. Successful old town preservation creates a diverse social activity among local users and visitors. This will ensure the socio-cultural value is not lost over time. Indeed, it is a norm for a town to undergo rapid changes as part of the urbanisation process. However, the aesthetic value of a town needs to be maintained, revitalised, preserved, and conserved as it will display diversity between old and new development.

ACKNOWLEDGEMENTS

This research is part of the study to understand the changes in townscapes, carried out for FRGS Research (IRMI-600-FRGS 5/3 (026/2017) funded by the Ministry of Education.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 109 – 120

ANALYSIS ON THE SOCIO-CULTURAL VALUES OF THE TRADITIONAL MALAY HOUSES COMPOUND

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Abstract

The Malay traditional environment is the interaction between human, natural environment, and culture, which is then translated into the spatial design of houses and their surroundings. However, rapid urbanisation has transformed many traditional villages by incorporating urban elements into the villages. This study focuses on understanding the existence of the socio-cultural values of a traditional Malay house compound in Kampung Paya Rumput Jaya, Melaka. The objective of this study is to identify the Malay socio-cultural values and the spatial arrangement of the traditional Malay house compound. Data were collected by means of a questionnaire survey, semi-structured interviews, a mapping analysis (site inventory), and a thematic/content analysis (interviews). The findings indicate that the community in the villages are still upholding the Malay traditional socio-cultural values. Future design of a house compound should incorporate the characterisation of a traditional Malay houses compound for maintaining at least part of the Malay traditional socio-cultural values.

Keywords: compound, Malay, socio-culture, traditional Malay houses

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INTRODUCTION

Malaysia is experiencing a rapid development of the urban and suburban areas. However, there is an increasing concern that such progress might have negatively affected the existing traditional Malay houses, which are considered as the cultural assets of the Malay community. Yuan (1991) defined *kampong* or village as a rural settlement sustained traditionally by subsistence activities like paddy-growing, fishing, and other agricultural practices. Villages are randomly distributed with an access road leading to the village and with trees that blend with the environment.

Socio-culture is considered as the law that lies within a society that dictates and forms the society's characters and way of living, either collectively or individually. An interrelation between socio-culture and the built environment can be seen when a change in a component brings a change to the other components. People's lives can be generally defined as social, while culture holds the meaning of creating the behaviour of the society (Muhammad, 2012). Therefore, an understanding of culture allows a society's action in the future to be predicted, particular their adoption of a particular culture in their life.

The study of a Malay house's socio-cultural values on a spatial organisation can explain the potential benefit of the implementation of urban form, which is influenced by the Malays on the society in the field of spatial planning. Thus, this paper will focus on the socio-cultural values of the spatial organisation of traditional Malay house, a case study of Kampung Paya Rumput Jaya, Melaka.

Traditional Malay House Compound

Ani et al. (2012) noted warm hospitality as one of the Malay socio-cultural values. The Malays enjoy entertaining guests during social or religious events, in which the segregation of male and female is apparent. This value can be understood as the compassionate treatment of strangers and the openness and generosity of Muslims families to others, as discussed in Othman, Aird, and Buys (2015). Hashim, Mohamad Ali, and Asnarulkhadi (2009) even elaborate about the communal intimacy of the Malay society as the Malay house is always considered as a unit of a larger community in a village. Spaces in a Malay house are designed to signify the warm hospitality of the Malays in maintaining amicable social interaction in their activities.

Ani et al. (2012) and Raja Bahrin (1988) have drawn attention to the value of boundary demarcation practised by the Malays. The demarcation is found to be imprecise whereby plants or other dominant features (such as streams, drains, shrubs, hedges, and rivers) are used as a boundary between lands. This pattern has been commonly identified in the Malay villages in Melaka according to the past researchers. In a study by Maliki, Abdullah, and Bahauddin (2015), the boundaries between the houses are also marked using a ditch or any marking

to indicate that a minimal use of visually and physically obstructive barriers is prevalent in the village areas.

According to the World Intellectual Property Organization (2016), customary law is defined as the belief or the way of conduct accepted as the rules of obligatory by indigenous groups as well as by the local communities. The customary law also dictates the socio-economic systems and the way of living of these people. Mohd Sahabuddin (2002) states that besides language and vernacular architecture, the customary laws as part of the original culture of the Malays had been expanded due to the migration of the community to a new area, which instigated the opening of a new traditional Malay settlement or *kampung*. Mokhtar Ismail (1992) mentioned that the customary laws practised by the Malays have become a part of their social-cultural values, yet these laws are not being documented or written. The Malays have inherited and are accustomed to these laws and therefore have incorporated them in their way of living.

Therefore, the arrangement of spaces in a traditional Malay house in Melaka serves to fulfil the socio-cultural needs of the society. One of the examples of a customary law practised by the Malays is the positioning of a house; it cannot be in front of the house belonging to an older relative. It is allowable for the house to be at the back or in line with the house of the elders. According to Raja Bahrin (1988), traditional Malay houses commonly face a transportation route, such as a river (mode of travelling).

The cultural analysis conducted by Talib et al. (2012) and Mokhtar Ismail (1992) found the functional spatial characteristics located outside a traditional Malay house; the compound of a typical Malay settlement is generally a fenceless open area. A fenceless compound allows constant interaction between the communities. The Malay community emphasises togetherness and community living. Another element is trees, which Mohd Sahabuddin (2002) denotes as having the functions of providing fruits for the residents and protecting pedestrians from the sun. In regard to housing orientation, the east-west direction facing Mecca is commonly found in traditional Malay houses, noted to be for religious reasons besides reducing exposed areas towards the solar radiation during the day. The boundary between one house and another is indicated by a drain or stream (Samsudin & Idid, 2016).

The exterior spatial characteristics of a traditional Malay house compound indicate similarities with the cultural analysis conducted by Talib et al. (2012). Mokhtar Ismail (1992) also found a house with an outdoor toilet separated from the bath, and a washing area beside a well—an arrangement noted to be for hygiene purposes. This area is located outside but is enclosed for privacy. The well area functions as a wet and drying compound for the inhabitants. Samsudin et al. (2016) explained that the cluster of traditional Malay houses has a natural and organic composition as a result of the fenceless concept of border. There are spaces in between the houses where collective activities are

conducted, such as wedding feasts or any celebration that involves community participation.

STUDY AREA

Kampung Paya Rumput Jaya was located in the district of Melaka Tengah covering the area of 1160 acres (Fig. 1). The overall population living in the village is 1557, which consists of 1527 Malay residents (98%) and 30 Chinese residents (2%). The village is one of the traditional villages in Melaka whose settlement began in 1705. The village was established by four friends from Kerinchi, Sumatera, known as Malim Panjang, Malim Sigai, Tuan Fakeh Ali and another one whose name is unknown. During their arrival, they encountered a *Kelinting* tree at a swamp forest. The size of the tree was four metres in circumference, and it was coated with wild grasses from top to bottom. Thus, the four friends named the village "Paya Rumput" after the name of the grass.

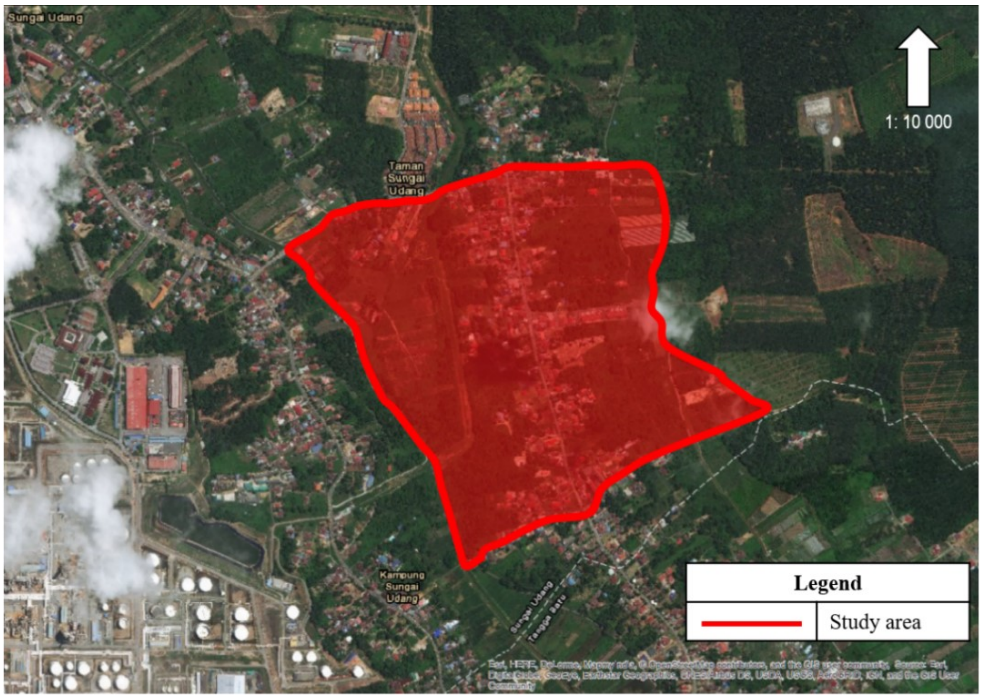

Figure 1: Boundary of Kampung Paya Rumput Jaya, Sungai Udang, Melaka
Source: *Google Map, 2019*

METHODOLOGY

This study area was selected for several reasons. Ninety-eight percent of the inhabitants of the village are Malays, and the village has existed for more than one-hundred years old. Eighty percent of the houses are still maintaining the

traditional Malay facade. The study involved the collection of primary and secondary data. The primary data were collected from a questionnaire survey, semi-structured interviews, a mapping analysis (site inventory). The interviews queried the experiences of the villagers living in the village and the hardscape observable at the site. A sequential explanatory method was adopted, and the reliability analysis rendered a value of 0.8, a value considered sufficient for the analysis. An aerial survey was also carried out using a fixed-wings drone to capture a high-resolution photograph of the study area. Permission to fly the drone over the village was given by the chief of the village. Five assistants were recruited to carry out the survey from 2nd June until 6th June 2019.

The secondary data derived from an analytical review of relevant literature and case studies. The conceptual framework of the study is illustrated in Figure 2. For each case study, two diagrams were prepared: (i) drone mapping, and (ii) diagram of features on each parcel.

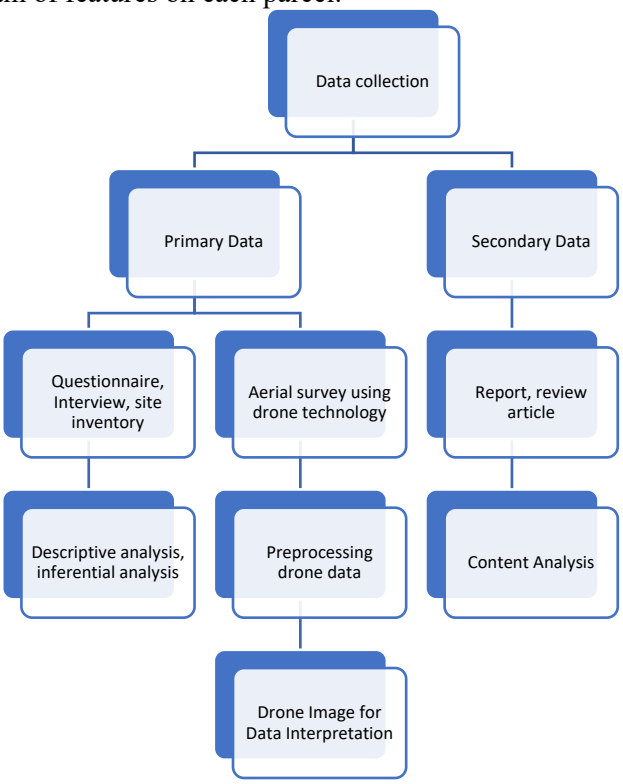

Figure 2: Conceptual framework of the study

ANALYSIS AND DISCUSSION

The analysis was performed to answer the first objective, which is to identify the existence of Malay socio-cultural values in the traditional Malay settlement. The descriptive analysis served to provide in-depth understanding of the study area. The subsequent spatial analysis focused on the respective parcels to understand the socio-cultural values of the Malay traditional houses' exterior.

Descriptive Analysis

This analysis concentrated on the existing relationship of the respondents with the original owner and to the man-made and natural features at the compound of their traditional Malay housing in the study area.

Table 1: Frequency analysis on family relationship

	Frequency	Percentage
Family relationship with original owner	38	95%
No relationship	2	5%

The descriptive analysis (Table 1) shows that 95% of the home owners do have a family relationship with the original owner, and 85% of the home owners have inherited their houses from family members. The rest of the respondents (5%) are renters, thus having no relationship with the original owner. According to the chief of the village, usually the youngest child will inherit the house from their parents.

Table 2: Frequency analysis on own courtyards

	Frequency	Percentage
Own courtyards	32	80%
Shared courtyard	8	20%

The above analysis (Table 2) shows that 80% of the respondents own their courtyards and 20% share their courtyards. The courtyards contain several man-made and natural elements, such as an outdoor toilet, a well, a garage, a well, trees, plants, and flowers. The relationship between these inhabitants is close as they share their courtyards, thus indicating the close relationship among the relatives.

Table 3: Frequency analysis on plant flowers and herbs

	Frequency	Percentage
Planted flower and herb	26	65%
No plant	14	35%

Table 3 indicates that 65% of the respondents have planted flowers at their compound, which serves as a multifunctional transitional space. According to the researchers' inventory, the flowers are arranged at the side of the house and along the fence. The flower arrangement is also seen as the boundary demarcation value practised by the community in the village.

Table 4: Frequency analysis on plant fruit trees

	Frequency	Percentage
Planted fruit trees	23	57.5%
None	17	42.5%

Table 4 shows that 57.5% of the respondents have planted fruit trees. Fruit trees also provides a boundary demarcation value in the village.

Table 5: Frequency analysis on fence

	Frequency	Percentage
Fence	31	77%
No fence	9	23%

Seventy-seven percent of the respondents do have a fence and the rest of the respondents (23%) do not have a fence. The analysis also shows that the most preferred material for fencing is wire (50%), probably due to the material's durability and safety. This finding also indicates that the villagers are aware of the safety of their dwelling.

Table 6: Frequency analysis on seating

	Frequency	Percentage
Seating	34	85%
No seating	6	23%

Table 6 shows that 85% of the seatings are available at the exterior area of the housing. This finding implies the villagers' socio-cultural value of being fond of having a meeting at a compound to enjoy the breeze from the surrounding areas. Many of them use trees to locate a seating in the compound to enjoy the ventilation of the windy air.

Malay Socio-Cultural Values in The Compound of Malay Traditional Housing

This study was conducted to answer the second objective, which is to analyse the spatial distribution of the compound of a traditional Malay house. The socio-cultural value is interpreted as a symbolic meaning of the house's compound. Several parcels were identified from the sketched plan and drone mapping. The

parcels identified enabled the researcher to understand the relationship among the residents in each parcel.

Fig. 3 shows the illustrations for Case Study 1. One of the respondents' houses is located in front of her relatives' houses, which are located within the same lot of the land. The kinsfolks prefer to stay close to each other to assist each other in daily activities if necessary, thus indicating a socio-culture value of a strong relationship, cooperation, and consensus. They are also comfortable living with a family. Such value also reflects the respect among the family members.

Figure 3: Case study 1

The boundary demarcation is the fence surrounding the area. The orientation of the houses to the main road indicates that the houses tend to be orientated to the transportation route. The distribution of several matured trees at this compound helps to cool down the air in the surrounding areas. The trees are also located at the same courtyard, which can be used for common activities.

Figure 4: Case study 2

Fig. 4 shows one parcel within the village in Case Study 2. The sketched plan of the house shows a parcel of the respondents' houses. The houses are all located within the same lot of land. The houses are orientated to the main road and just nearby to the relatives' houses. One respondent's family runs a stall in front of their house, which is strategically located by the main road. This finding also shows the value of a strong family relationship in the respective parcel. Many trees can be identified around the compound, particularly those at the back of the house. The material of the courtyard is asphalt. A shared courtyard can be used for collective activities of the family members. At the middle and side of the compound are palm trees, which provide a shaded and cool environment, hence a resting area for the villagers.

Figure 5: Case study 3

The sketched plan (Fig. 5) indicate that the respondents have been living close to their relative, which reflects the value of a strong family

relationship. The relative's house is located just next to his house within the same lot of land. Both houses share a driveway and a courtyard, and both have their own garage. The outdoor toilet is located just next to the house, and both clothes lines are located at the back of the house. The houses are orientated towards the main road. A drone image of the parcel shows clear trees and greenery at the compound. A dense of several matured trees contribute to a windy airflow hence improving the ventilation of the houses and cool the surrounding area. The observation shows that the arrangement of the houses in Melaka is organic in the respective parcel; however, all of them are orientated towards the road. The road appears to be the most efficient method of transporting both people and goods. Al-Ahmadi (2000) explained that orientation is the key element in considering the placement of things in the Malay environment, as referred to Tajul Muluk, whose findings were translated into the built environment perspectives.

Analysis of the interviews showed that 80% of the respondents share a parcel with their relatives. Twenty-percent of the respondents have one house in each parcel—a pattern that can be identified from the exterior spatial organisation of a traditional Malay house. Staying near relatives implies the socio-cultural values of a strong family relationship, cooperation, and consensus. Such socio-cultural values are mostly reflected through the positioning of the houses close to those of family members within the same lot of land. The findings indicate that the Malays tend to form a housing cluster that consists of family members.

A high percentage of fencing shows that the villagers are aware of the safety of their dwellings. However, all of the houses appear to have a fence at the parcel, an observation that contradicts the notion that the compound of a typical Malay settlement is generally a fenceless open area (Talib et al., 2012; and Mokhtar Ismail, 1992). Maliki et al. (2015) explain that women can have more freedom of spatial use by having family members as neighbours in their village setting. The open compound serves as a playground for children and as a venue for feast and gathering. The functions of the spaces in the courtyard can be depended on the inhabitants' needs. Cultural events can also be supported by the community, which includes relatives (Sufari, 2017).

Thus, the socio-cultural values of a strong family relationship and the practice with customary law have been demonstrated in the study area, similar to the observations by Raja Bahrin (1988), Mokhtar Ismail (1992) and Mohd Sahabuddin (2002). These elements can be adopted in a terrace-house settlement, but doing so in high-rise apartments requires a detailed design to preserve the socio-cultural values of the community. An apartment is characterised by privacy issue; the kitchen is located opposite to the walkway, and the people from the other buildings are able to see those in a different building. Another privacy issue of an apartment is the door, which is also located opposite to a neighbour's door.

Thus, a design that accommodates or imitates the compound of the traditional Malay houses should be considered for urban living. This study

implies several elements that can be considered, such as the sharing of courtyard between the houses and the variety of softscape elements at the courtyard areas. Privacy can also be well-taken care if a house's entrance is not opposite to another house. The corridors should include small trees or plants with benches to maintain the green areas as the after-work areas. Any land or spaces on a high-rise housing should be turned to a garden so that those who are passionate in gardening can contribute to beautifying the spaces.

CONCLUSION

Preserving the social-cultural values of the Malay traditional houses compound is crucial for future implementation by practitioners and national authorities. The characterisation of traditional Malay houses compound can be used for developing cultural heritage area. Thus, the functional space design for preserving culture values can be used as an influence on occupants' quality of life. The courtyard is the place (1) where the Malays prefer to have a feast, particularly by *gotong-royong* among family members, and (2) for children's activities. Landscaping with wide spaces and lined flowers and herbs are the setting for having a conversation with family members and neighbours on a *pangkin* (seating). The compound of a traditional Malay house has to fulfil the socio-cultural values mentioned. The design of the houses in an urban area needs to adopt the values mentioned. The arrangement of a private courtyard and landscaping is one of the design strategies that need to be incorporated in future design.

ACKNOWLEDGEMENTS

Thank you for the support of TRGS research grant "Trans-Disciplinary Research Grant Scheme" (TRGS16-03-002-00002). Special thanks go to International Islamic University of Malaysia and the Ministry of Higher Education (MOHE) for the research grant. Thank you also to Integrated Geoplanning Sdn. Bhd for the assistance in conducting drone data collection. The same also goes to all of the referees for the instructive comments to improve the manuscript.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 121 – 132

THE FORMATION OF SOCIAL CAPITAL IN MALAY TRADITIONAL SETTLEMENT

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Abstract

Good practices of traditional settlement's preservation allow all actors to engage and explore what makes a self-sustaining settlement by the locals. This study aims to identify the values of social capital that have influenced the social capital sustainability in Malay traditional settlement. For this purpose, semi-structured interview and non-participant observation were performed on Pulau Duyong, Terengganu as the selected Malay traditional settlement. The findings from this study revealed that the sustainability of social capital in the study area was achieved through a well-planned development with the involvement of the community, non-governmental organizations and authority as well as the integration and collective actions among the actors. The contribution of this study resides in the capacity to provide a useful guide for future social capital sustainability developments in a place with high heritage values.

Keywords: Sustainability; Social Capital; Heritage; Malay Traditional Settlement

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INTRODUCTION

The proliferation of research has been conducted and produced an impressive body of results confirming the importance of social capital in various domains of development. Coleman (1988) as one of the prominent scholars' in related study defined social capitals as "the component of human capital that allows members of a given society to trust one another and cooperate in the formation of new groups and associations". In the context of this study, social capital is viewed as an essential framework of the social fabrics that emphasizes on the obligations, reciprocity and the depth understanding of a community's social connectedness which resulting to sustainable living and people's well-being.

The concept is not only considered as an essential mechanism in the formation of a social community network in an ordinary settlement but the potential is also appropriate for the preservation of the local identity especially in the Malay traditional settlements. The notion is supported by Murzyn-Kupisz, (2013) and Moayedi & Kheiruddin, (2014) in which both kinds of research addressed the strength of social capital was heavily determined by the quality and density of social fabrics, connectedness, integration and involvement of the communities in a historic settlement. In fact, such propositions have been confirmed by the communities that they would preserve and protect the exclusivity of their local identity. Similarly, the study perceived the local identity reflected in the Malay traditional settlement plays a paramount role in society as it portrays the richness, diversity, cultural balance and living heritage of the community (Jeyaram, 2015). The study, therefore, argues that an attempt to create the globalised culture through modernisation and physical development will destroy the traditional settlement, which then results in the disappearance of the cultural norms and local identity. Therefore, this study aims to identify the values of social capital that have influenced the social capital sustainability in Malay traditional settlement so that Malaysia can achieve the aspirations of the sustainable developments for the traditional settlement in particular.

RESEARCH BACKGROUND

Among the latest contribution to a quantitative approach on sustainable development with due to social capital, Phillips & Pittman (2015) categorised the level of community social capital in two aspects identified as structural and cognitive. Structurally, the integration among the locals within the community generates a nexus of the social network. The scholar elaborates that this network fosters the community sustainable development by facilitating the flow of knowledge, ideas and services among the locals (Uphoff, 2000). Cognitively, the attachment of the community promotes mutual trust, shared the obligations and increases the norms of reciprocity betwixt the locals (Phillips & Pittman, 2015). Concerning the association between social capital and sustainable development, numbers of studies have finally summarised both constructs into three main

categories which are: 1) bonding social capital, 2) bridging social capital and 3) linking social capital (Murzyn-Kupisz & Dzialek, 2013; Claridge, 2018; Cofre Bravo et al. 2019).

The first, which is includes the strong relationship that evolves between individuals in a similar social group (network closure), is defined as a bonding social capital. The bonding social capital is intimately related to networks with a high density of relationships between the community members in traditional settlements (Claridge, 2018). Every member in the community network is closely interconnected as they always interact frequently and they are acquainted amongst each other. Each of the community members shares the values and has the common understandings which enable them to trust and work together. Usually, this type of social capital includes family, friends, and neighbours whom they can provide material as well as emotional support. The *rewang* activities which used to happen in a similar social group of Malay during the wedding ceremony are one of the examples of bonding social capital. The integration between the local communities will develop collective actions between the members and create a sense of willingness to sacrifice for others. As a result, the social capital among the local community becomes stronger, which tends to develop a sense of attachment and belonging.

While bridging social capital is defined as a heterogeneous relationship for collaboration and coordination which characterized by larger and looser networks system with weaker ties (Cofré-bravo et al. 2019). The word "weak" should not be elucidated negatively since the strength of bridging social capital is the weakness in the ties (Claridge 2018). This type of social capital literally means to "bridge" people across different social groups such as race, religion or class. The further explanation of bridging social capital according to Pelling and High (2005), is described as an exchange of social relationship between groups of people with the intention to share same interests and goals, however, they differ in social identity (Claridge 2018). The exchange of goals, ideas and innovations could lead in building the consensus among the groups which then representing the diverse interests. Concerning the preservation effort of Malay traditional settlement, the intentions and efforts to preserve tangible heritage would become the starting point for them to cooperate and collaborate through a variety of activities and programs. Through this collaboration, they are allowed to share knowledge and experiences towards their community development in which eventually strengthen the tolerance and acceptance of different kind of social groups.

Lastly, linking social capital is symbolised as a glue that holds the norms of respect and trusting relationship between individuals and institution which has institutionalised power or authority gradients in society (Cofré-bravo et al. 2019). In the context of Malay traditional settlement, it is acknowledged that preservation effort entails diverse sources of knowledge, financial resources,

material as well as mental support. This so-called open-network brings advantages to the actors in term of access to the pool of resources and new knowledge (Claridge 2018; Cofré-bravo et al. 2019) which can accommodate the process of preservation for traditional settlement. Through this social network, the actors are allowed for mutual learning on heritage preservation management and practices, which resulted in promoting tolerance and social cohesion among the actors.

Considering the execution of the social capital sustainability at the local level, the Municipality of Kuala Terengganu has implemented the Sustainability Assessment (SA) in their latest planning practice (refer to Kuala Terengganu Local Plan Report, 2010). Even though formal description and guidelines of sustaining the heritage development in Kuala Terengganu are profoundly found in the report, however, the report does not explicitly mention the action to be taken by the local authority on the preservation of the traditional settlement when dealing with the massive development. Therefore, this study intends to deliver a practical understanding of the roles and range of social capital in preserving the traditional settlement through the identification of the values embedded among the communities and their routines held in Kampung Pulau Duyong, Kuala Terengganu.

METHODS

The study adopted a qualitative method by applying a case study approach to identify the values of social capital that affect social capital sustainability in Malay traditional settlement. The data were gathered from non-participant observation and semi-structured interviews in a traditional settlement named Kampung Pulau Duyong, Kuala Terengganu. Semi-structured interviews were conducted among 24 local participants. The selection of the settlement was made based on three factors; i) the village has existed before or during the British colonial period, ii) the village is classified as an Unfederated Malay State whereby the village did not accept the interference of British in their development process and iii) the local community still exercise their traditional lifestyles and significantly has unique physical and cultural characteristics.

Semi-structured interviews were used to obtain responses from several representative members of the local communities to allow the locals to express their personal connections with their settlements (Alshenqeeti, 2014). Only the locals who stay more than 20 years in the traditional settlement to be selected as a participant for this study to associate and explore their sense towards social networks. Thus, the purposive sampling was employed to select the participants from each of the settlements. The questions of the interview were categorized based on five sections. However, the fourth section which is the participation of the locals in the preservation programs is the primary focus where it could serve as the supporting evidence for the observation method. The responses were

recorded in two mediums, which are writing word by word in the interview form and audio recording. Apart from that, the checklist was prepared to guide the non-participant observation method at the selected settlement. The checklists were structured into three parts: the activities, the types of tangible heritage and the types of social capital that local communities being practised which affect the social capital sustainability of the locals. The data collection process was conducted across four-time intervals (morning, afternoon, evening and night) to ensure the types of activities conducted by the locals can be observed accordingly. The field notes, videos and photographs were gathered to support the checklist of the non-participant observation.

The data were analysed using thematic analysis and categorized into two themes, namely: 1) types of activities, 2) types of social capital. Every data gathered from non-participant observation and semi-structured interview were likely to have inaccuracies. Therefore, the triangulation process was used to minimize the inaccuracy level and increase the validity of the results (Salkind, 2010).

FINDINGS

The Collaboration and Involvement of Actors

According to semi-structured interview and non-participant observation conducted at Pulau Duyong Village, it revealed that the local communities create different social networks for generating and implementing their social capital sustainability's practices. Regarding the preservation efforts, the study found that the local community is always looking for the opportunity to organize and execute the preservation practices in term of community activities that involved all actors. Regardless of the differences of actors, they are interacting and create social ties with each other. The local community develops different types of social capital networks to seek new information, knowledge as well as financial resources which then establish the values of social capital. This study describes the findings in three parts, whereby categorizing accordingly using the types of activities which are daily, seasonal and annual – presented in Table 1.

Table 1: Form of the collaboration of actors in several activities.

Activity	Actors	Types of Social Capital	Form of Collaboration/Involvement
Daily -Brisk walking & sight-seeing at the jetty -Breakfast at stall -Mingling at the compound house & other special spots	Family members and neighbours Friends & Peers	Bonding Social Capital	-Interaction in daily activities among the locals

Seasonal - The Prophet's Birthday - Nuzul Quran - Qurban - Circumcision ceremony	Family members and neighbours Friends & Peers	Bonding Social Capital	-Cooperate and support in the implementation of the activity -Financial support
Annual -Duyong Art Festival -Duyong: Kenangan Lalu Mengusik Jiwa -Poskad ke Duyong -Malam Jatuh di Pulau Duyong	Family members and neighbours Friends & Peers	Bonding Social Capital	-Emotional, motivation and financial support for undertaking new activities -Support in problem solving and adaptation
	Independent Support Group Individuals Institutions	Bridging Social Capital	-Cooperate and collaborate in the implementation of new activity -Motivation to create new activities in regards to the preservation of the settlement -Financial support
	Government Agencies	Linking Social Capital	-Support and engage in the implementation of activities. -Financial support

(Source: Author, 2019)

Daily Activity

The data from interview discovered the presence of two groups of actors that being connected through their daily activities. The first group are family members and neighbour, while the second group are friends and peers. The daily activity like having breakfast at the stalls (*warung*) is one of the vital platforms for local to interact with each other. While having their breakfast, they were chit-chat and discussed the important issues related to their settlement. During the interview session, one of the informants, who is 33 years old Malay resident, describes the stall as follows:

"As for me, I would like to describe the stall (warung) as a place of a covenant for the locals. The stall is not only portraying as a place to eat, but it is where we meet others as well as a place for us to have a good discussion and conversation on the current issues".

Another Malay man, who claimed as a regular customer of the stall *(warung)* said that:

"I come to this stall (warung) every morning not only to enjoy my breakfast but also to meet my friends".

Figure 1: The wooden benches at the house compound.
(Source: Author, 2019)

Furthermore, the layout of the houses in the traditional settlement is another factor to explain the social interaction of the locals in their daily lifestyle. The traditional settlement is formed by a clustered number of houses. Each of the houses was built near to each other in which explained the closeness of the local communities. The spaces between the houses such as house compound act as social spaces for the actors to mingle. According to the observation, most of the houses were provided with the wooden benches at the house compound to accommodate their activity. This space was utilized by housewives. They are socially engaged as they would spend their evening to have a chit-chat with their neighbours. The interaction and engagement of the actors through their daily activities develop their social ties which eventually establish the bonding social capital. Apart from that, there is another reason to explain their closeness, whereby the neighbours are their family members. The statement illustrated by one of the informants who are 60-year-old housewife, she said that:
"Most of my neighbours are my family members. This situation makes it easier for me as I could seek their help whenever I need".

Seasonal Activity

The result of the interview shows that the local communities were very active in organizing seasonal activities. One of the most significant is the Prophet's Birthday (*Maulidur Rasul*). This event was held on the month of Rabiul Awal of Islamic lunar calendar every year. The head of the village, which is 61 years old, stated that:
"Every year, this event got a good response from all ages of local communities as most of them give their support and cooperation throughout the event. Some of the generous people would give financial support to cover the entire budget for the whole event".

The event started early in the morning with the parade. Some of the locals were involved, and they wore traditional attire to make this event merrier. On the other hand, another group were busy preparing the food at the mosque to provide adequate food for everyone. The highlight of the event was the religious talk at the mosque. During this event, all ages of the local community interact and connected among themselves. The interaction during these activities increases and enhances the social connection among the locals.

Annual Activity

Meanwhile, the findings revealed that there are many activities were organized annually by the local community- summarised in Table 1. However, there is one event that gives the massive impact not only to the locals but to all people in Terengganu indirectly. The event is known as the Duyong Art Festival (DAF), whereby it was declared as the most successful event ever organized by the local community. The DAF was started in 2015, which is originally initiated by the local community. This cultural festival was instigated for the purpose to enliven the ambience of the traditional settlement as well as to promote Pulau Duyong Village as the Malay traditional settlement with the high heritage values. The festival lasts for a month with the highlight of the event taking place for three consecutive days. Throughout the festival, there are many cultural and traditional activities were conducted. The most significant activities are music and poem recital, photography competition, the boat decoration competition, shadow puppet show *(wayang kulit)* and sports. The main activities were organized at the central stage, which is known as *Pentas Kemboja* located at the riverside of the settlement. This cultural festival gets a positive response not only from the entire local community but gets huge support from people all around Malaysia. The local communities, including family members, friends and peers give motivation and emotional support throughout this festival *(bonding social capital)*. The interview with one of a member of the organizers, who is 33 years old Malay man, reflected the statement as follow:

"Majority, the local communities were very helpful and worked together to prepare the place for the festival. Before the festival being conducted, some of them volunteered to do gotong-royong all around the village including the jetty area to make sure the places are ready for the activities during the festival".

The festival also collaborates with the independent support group, institutions and individuals who come from all over Malaysia. Collaboration and involvement vary. For instance, the students from University of Sultan Zainal Abidin *(UniSZA)* and University Malaysia Terengganu *(UMT)* volunteered to become the committee for the festival as to help the organizer to run the festival smoothly. Apart from that, government agencies are another organization that involved and support DAF. For example, the Public Works Department (JKR) is

the one that involved in checking the structure of the wooden jetty to make sure the safety of the crowd throughout the festival.

For the past five years of the DAF organization, it creates huge positive impacts not only to the locals but to all people as a whole. The most successful achievements of DAF are: 1) it increases the awareness of the people towards the importance of the preservation of our cultural heritage, and 2) get the financial support from a government agency *(Jabatan Kesenian dan Kebudayaan Negeri Terengganu)*. This statement portrays in the respond of the informant as follows:
"The DAF has promoted the awareness of the people all over the places. As for Terengganu, it shows an influx of NGOs in the two districts, namely Kemaman and Dungun. These NGOs function as the advocators that have the same aspirations in promoting the importance of our cultural heritage to the local community…"
"…for the first two years of its organization, DAF was fully sponsored by the local community, non-governmental organization and individuals. Only in 2017, the DAF got the recognition from the government agency as they give us the financial support to organize this festival. The most interesting part is, the DAF was included in the activities' calendar of Visit Terengganu."

DISCUSSIONS

The results revealed that all categories in social capitals were featured in almost all types of interaction based on daily to seasonal events whereby crowds are found to cooperate and work hand in hand in ensuring the success of every activity and events. In addition, after analysing and comparing each activity based on different categories of social capital discovered, it can be suggested that the local communities have excellent practices in developing and establishing different social connection within various actors such as NGOs, government bodies and tourists. Not only that, but the youth is also seen as more explicit as an active participant with social interaction with the elderly is noticeably high. Such interaction shows strong community bonding and it is from this kind of social relationship that eventually produced the social capital values in Kampung Pulau Duyong. Clearly, Kampung Pulau Duyong carries distinctive roles as glue that bond all group of people in daily basis where the interaction from all walk of life can be found at the different spot of social spaces in the village. Public spaces such as a coffee shop, jetty, house compound, recreational field and mosque are the spaces that offer various social, ritual and recreational affordances. The social affordances gathered from such spaces were manifested in basic facilities like strategic location, variety of local products, excellent services by familiar faces and flexible operating hours. The social spaces, for instance, have vital function in sustaining social capital as these spaces plays a daily role in facilitating various activities for the actors to enhance and improve their social networks (Ujang et al. 2018). Evidently, it was based on these factors, bonding social capital was formulated. At the same time, the findings also reveal that bonding social capital are overloaded with good values perceived as cooperation, tolerance,

understanding, reciprocity, trust, respect, committed and enthusiastic. Such values reveal prominent principles that seem to fit McKnight and Block (2012) that good social capital development and sustainability can only be achieved in the surrounding of a well-connected community.

Although most residents experienced and felt the loss of qualities/attributes that make their settlement a unique and special place, however, the majority of the resident still can accept and live within the change. In accordance to study on place disruption by Steele (1981) and Inalhan and Finch (2004) who elicited that place attachment develops slowly but can be disrupted quickly and create the need for a long-term phase of dealing with the loss and repairing or recreating attachments to people and places. Therefore, this study found that fundamental to resident's experience and sadness due to sea reclamation projects was the point that leads to a growing awareness of how much their history and culture are both embedded in and enfolded with a strong sense of belongings toward their settlement and its original setting. Clearly, it is starting from this awareness that has further developed an essential attitude toward strong movement in cultural and heritage preservation. Consistent with these, this study shows how the bridging social capital grows through the formation of Duyong Art Gallery and actors' participation and collaboration during the Duyong Art Festival. The aspirations and efforts to preserve the cultural heritage become the determinant for the actors to share their knowledge, understanding and instil awareness among each other. This social connection was developed based on the values of social capital like understanding, tolerance, sharing and cooperation. The research suggests that the presence of these values would further enhance the social ties among the actors which resulted in the establishment of social capital sustainability in Malay traditional settlement.

The success of the biannual events organised by Duyong Art Gallery members perhaps can be the strong evidence in portraying linking social capital in the study area. The study has shown among the actors associated with linking social capital are mainly coming from a group of international tourist, artisans and government agencies that provide the pool of technical resources and funding for the Duyong Art Festival. Obviously, the linking social capital, in this case, play an important role to the communities as it can increase the resources (Claridge 2018; Cofré-bravo et al. 2019) which made the event reality. Apparently, this kind of social network brings advantages for both local communities as well as the government agency. Through this collaboration, the actors have developed the trust and transparency of any information in the social structure which resulted in promoting tolerance and social cohesion among the actors. It is the practices of these social capital values that shaped the social capital sustainability among actors. Therefore, it can be concluded that Kampung Pulau Duyong can be one of the examples set for sustainable settlement in Kuala Terengganu.

CONCLUSION

Principal findings of this study are that the local communities compose and generate various support network configurations for specific goals depending on their purposes. Each of the bonding, bridging and linking social capital emerged to have differed functions in contribution to the preservation effort for the Malay traditional settlement. The participation of all actors through a variety of activities is based on the establishment of social capital values. Thus, it is essential to emphasize the paramount importance of recognition for social capital values as it would generate broader participation and involvement of all actors in the preservation process of Malay traditional settlement. The study concludes that the success and sustainability of programs carried out by the community depend mainly on cooperation and awareness of the importance of the physical and cultural heritage around them. Finally, close cooperation and collaboration between the villagers and NGOs such as Duyong Art Gallery is a model of social capital development cooperation that can be referred to as best practice by many.

ACKNOWLEDGEMENTS

The research was funded by the Ministry of Higher Education (MOHE) under grant Trans-Disciplinary Research Grant Scheme TRGS/1/2016/UIAM/01/5/1. The author would like to sincerely thank the TRGS research team for an extensive discussion regarding the subject of this paper as well as to the Integrated Geoplanning Sdn.Bhd. for assistance in conducting drone data collection. The special thanks to Terengganu State Museum and Duyong Art Gallery for the cooperation throughout the data collection for this research.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 1 (2020), Page 133 – 144

STUDIES ON THE CULTURAL ECOSYSTEM SERVICES IN MALACCA CITY

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Abstract

The benefits from ecosystem services have the prospective and potential to improve the Malay urban design and increase the quality of life. However, rapid development and urbanization activities are increasingly causing a conversion from the original functions and changes that can affect the urban environment. This paper aims to update current understanding of the concept of Malay cultural ecosystem services in Malacca City. Quantitative research through the survey method to 150 Malay respondents have been carried out in order to identify the parameters describing the types and value of the Malay cultural ecosystem services in the city context. The result revealed aesthetic value, recreational, tourism, social relations, spiritual and educational as the most significance parameters of the Malay cultural ecosystem services. The paper concluded that only through good practices from all parties can reduce the incredible development effects as political, economic and social systems is inevitable and constantly generates new demand.

Keywords: Malay, urban design, ecosystem services, policies, Sustainable Development Goals, Environmental Management

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INTRODUCTION

The Malay city possesses a unique urban design and concept, as well as a unique architectural identity. Moreover, Malay urban is one of the oldest civilizations in the world. The urban design deals with both the aesthetic and functional aspects of the City's built environment. Aesthetics, being the traditional concern of the urban design can only be more meaningful when they are combined with other considerations to generate an environment that is visually pleasant, convenient, comfortable, which conveys a sense of place, pride and belonging (Dewan Bandaraya Kuala Lumpur, 2020). The Millennium Ecosystem Assessment (MEA) (2005) defines the ecosystem services as the advantages people obtain from the ecosystem and its surroundings. Ecosystem services are the goods given to humans throughout the conversions of environments such as water and vegetation into a flow of necessary services and goods such as food and clean air (Constanza et al. 1997). Therefore, it becomes important to understand the role of nature in maintaining human well-being including the Malay cities and Malay urban design.

Zhang et al. (2016) has categorized these direct and indirect ecosystem services into four categories to sustain human well-being and survival throughout the world. These are including the regulation (e.g., disease control and flood regulation, support (e.g., primary production and nutrient cycling), provisioning (e.g., freshwater and fiber) and cultural (e.g., recreational and spiritual reflection). The ecosystem service concept can be adapted to urban ecosystems because the services for various inhabitants are important and needed (Tratalos et al. 2007; Ahern, 2007). In this case, urban planning plus urbanization activities are often associated with the development potential of ecosystem services including in the Malay urban design. Therefore, its ecosystem services will also decrease. This is because an urban ecosystem will be worthless if it is unable to provide any basic benefit and human need.

The rising request and demand for space for new users in the associated residential and industrial areas have generated massive uncontrolled built-up areas that occur in many developing countries and developed cities (Gonzalez & De Lazaro, 2011). Human activities can dominate the changes in land use and unnecessary synergies and trade-offs in the context of the ecosystem service's provision (Zhang et al. 2016). Sometimes, some of the old buildings carry a lot of traditional and unique identities in terms of history, architectural and heritage value which later reflected towards the urban form aspect (Abdullah et al. 2018). Hence, the contributions of the ecosystem services to the human well-being and world's economy have been recognized in policy and also in the basic science and policy (Egoh et al. 2012; Corbera, 2012; Van Oudenhoven et al. 2012; Muller and Burkhard, 2012).

Development and urbanization activities are increasing rapidly in the country, causing the conversion from the original land uses to other uses such as

agricultural land to residential or industrial areas planning. Generally, this changes the physical environment consisting of either atmosphere, biosphere, lithosphere and even hydrosphere (Md Jahi, 1993). Changes that occur as a result of human activities can affect the human environment such as the impact on the well-being of people. Besides, measuring the quality and well-being of the population who received the impact of rapid development is too difficult for a community or individual. In this context, although there are no indicators or effective methods for measuring cultural service satisfaction and the well-being of the population, the rapid development activities in one area will certainly have a social impact on the population in particular.

Malay urban cities, such as Malacca City with the highest percentage of Malay population, consist of designated built that can accommodate urban ecosystem services in cultural categories. In this study's point of view, its only focused on the cultural categories of the Malay urban ecosystem services in the Malay city as concerned in recognizing the social quality and level, despite the fact that the Malay urban ecosystem services provided more than the services. The cultural services, which include the direct uses of non-material (Sarukhan and Whyte, 2003) also cause bad qualifications and consolidation in management terms (de Groot et. 2005). The study of ecosystems that researchers often deal with is related to cultural aspects such as social relations, recreation, tranquillity, culture, tourism and a host of other ecosystem services. Cultural-based ecosystem services are often included under the direct use values (Sarukhan & Whyte, 2003) and undergo reduction and integration in management plans (de Groot et al., 2005). However, in Malaysia, little research has been done on contemporary history and culture as conducted by researchers in other ASEAN countries, namely Singapore.

Accordingly, Table 1.0 shows a matrix of lists of authors or researchers who have carried out research related to most of the urban ecosystem services conducted overseas. Based on these matrices, it is found that most researchers carry out studies on the urban ecosystem services for cultural categories. Besides, based on these matrices, cultural categories such as aesthetic values, spiritual values, education, recreation, tourism and social relations can often be useful in the context of urban ecosystem services. In this regard, among the researchers who conducted studies on the six cultural and social dimensions derived from urban ecosystems are Riechers et al. (2016) and Milcu et al. (2013). The table also shows that many researchers focus on cultural aspects as the results of their research will be considered in the planning and decision-making process of particular parties (Eliasson et al., 2019). Therefore, researchers wanted to measure cultural studies through some aspects of the Malay culture in the city of Malacca especially the level of social satisfaction in rapid development activities.

Table 1: The matrix lists of authors

Category	Dimension	Richards & Tompson	Larson et	Zari	Dobbs et	Nedkov et	Rocha et	Riechers	Borysiak	Sieber &	Gómez-	Haase et	Kohsaka	Gómez-Baggethu et al	Milcu et
Cultural	Aesthetic value	x	X	x			x	x	x	x	x	x		x	x
	Spiritual			x			x	x	x			x			x
	Educational						x	x	x				x	x	x
	Recreational	x	X	x	x		x	x	x	x	x		x	x	x
	Tourism						x	x		x		x			x
	Social relation	x	X	x				x	x		x				x

Furthermore, it is also important to achieve the Sustainable Development Goals by 2030 for a better and more sustainable future for all, including environmental degradation, peace and justice in order to leave no one behind. In order to determine the Malay urban ecosystem services and cultural in Malacca City this study aims to measure the value of the urban ecosystem services that have been provided based on the perception of the Malay communities. In addition, the researcher hope that this study will complement existing policy and help to design better conservation plan for the Malay urban ecosystem services and cultural in the area. Then, the paper also discusses about the methodology and approach that been used and also the results based on the study, as well as the discussion and conclusions. Hence, the researcher concludes this study by a brief overview role to make sure that the Malay urban, especially in Malacca and other cities in Malaysia, to be sustainable and more liveable with the right guideline in the present and future.

METHODOLOGY

The study was conducted around the city of Malacca with an area of 114.7 square miles (303 km²). Malacca City is a famous tourism city and it is administered by the Malacca City Council (Majlis Bandaraya Melaka Bersejarah, MBMB). Furthermore, the Malaysian Census in 2010 reported that the population of Malacca City was 484,885, which Malays comprised the majority ethnics with 273,844. Therefore, the study was conducted in Malay residential areas around the city such as Taman Pahlawan, Kampung Padang Temu, Kampung Melayu, Taman Sungai Udang and Kampung Kubu. The selection of the study area also includes the placement of the special Malay urban design elements around the study area especially building design and historical heritage that have their aesthetic value with the highest percentage of Malay population.

The data of this study were obtained from various primary and secondary sources. Point of view, primary data was collected through a survey form as its instrument. This survey is also conducted as a pilot study that used a

purposive sampling method where the form was distributed only to 150 Malay respondents who live in and around Malacca City via door-to-door surveys. 150 respondents were sampled in the experimental group that focuses on the characteristics of the Malay respondents and it also withers away as a backup sample in these pilot studies. Furthermore, the survey forms were distributed to the respondents to measure their perception on the urban ecosystem services that are provided around them and also to measure the cultural level in their community's life. Besides, the secondary data are obtained from various sources including through the ministry's website and the Local Authority such as Majlis Bandaraya Melaka Bersejarah (MBMB).

RESULTS

Respondent's Background

Figure 1 shows the respondent's background in the sampling area around Malacca City.

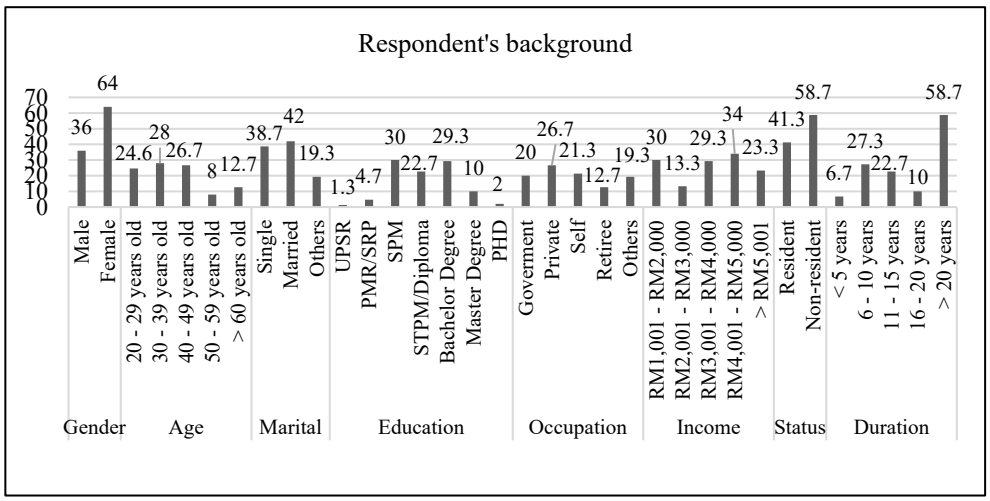

Figure 1: The respondent's background

Then, based on the survey that is distributed to 150 Malay respondents, 64% were females and 36% were males. In terms of age, it was divided into 6 age categories. The first category was under 19 years, that has no respondents, then 20-29 (24.6%), 30-39 (28%), 40-49 (26.7%), 50-59 (8%) and >60 years old (12.7%). Besides, most of the respondents have a bachelor's degree (29.3%), followed by SPM (30%), PMR (4.7%), PHD (2%) and UPSR (1.3%). For occupation background, most of the respondents work in the private sectors (26.7%), followed by self-employed sectors, the government sectors (20%), and the remaining were retirees (12.7%). Next, in terms of residency status, where the

original respondents from Malacca, or vice versa, most of them came from other areas or cities which were 58.7% and 41.3% were the original residence from Malacca. Most of the respondents have stayed in Malacca for more than 20 years and less than 5 years (6.7%). Overall, majority of the respondents have lived for a long time in the city and keep productive to enjoy the Malay cultural and urban ecosystem service cycle there.

Malay Urban Ecosystem Services Assessment

Table 2 shows the respondent's perception on the urban ecosystem services that are offered around them from the survey data in Malacca City. All the urban ecosystem services were measured based on a Likert scale with 3 scores: offered, neutral and none-offered. The classification of urban ecosystem services was referred to as Millennium of Ecosystem Assessment (2005) and The Economics of Ecosystems and Biodiversity (2011); five services belong to regulating services, single service from supporting services and six services from cultural services. However, there is no service from provisioning services because its services were rare and none was offered directly in the urban ecosystem services as shown in Table 2.

Table 2: Malay urban ecosystem services assessment in Malacca City

	Categories	Offered	Neutral	None-offered
Regulating	Climate regulation	80	10	10
	Flood regulation	80	10	10
	Disease control	73.3	16.7	10
	Carbon sequestration	50	46.7	3.3
	Noise pollution reduction	33.3	53.3	20
Supporting	Hydrology Cycle	90	10	0
Cultural	aesthetic value	92	8	0
	spiritual	94.7	5.3	0
	education	100	0	0
	recreation	100	0	0
	tourism	100	0	0
	social relations	100	0	0

Based on the table, the majority of the respondents have agreed that Malacca City offered most of the cultural classifications; there is a 100% score respectively on educational, recreation, tourism and social relations. The supporting classifications show a 90% score on the hydrology cycle. Then, in term of regulating classifications, most of the respondents (80%) agreed that Malacca City offered climate regulation and flood regulation category shows that 80% of the respondents agreed. Then, the disease control classification shows 73.3% of respondents agreed on the urban ecosystem services offered and the

remaining 10% disagreed. Besides, based on the table, it also shows that most of the respondents (50%) are neutral about the carbon sequestration that is offered at their areas and 46.7% of respondents agreed that the service is offered. In terms of noise pollution reduction, 53.3% of respondents are neutral that Malacca City has offered the services of noise pollution reduction, while the remaining 33.3% of them agreed and 20% disagreed. Overall, based on the result, the most significance of the urban ecosystem services provided by classified them, including cultural services (aesthetic value, recreational, tourism, social relations, spiritual and educational).

Assessment of Malay Urban Cultural in Malacca City

Based on Figure 2, the study found that the overall cultural components; educational, aesthetic value, recreational, tourism, spiritual and social relations were in a satisfactory condition, which means that these services were provided in the city.

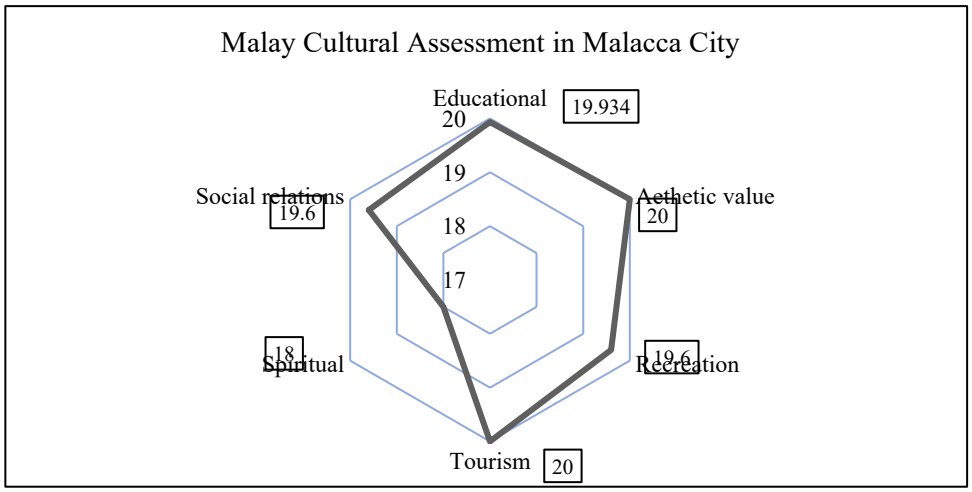

Figure 2: Malay cultural assessment in Malacca City

The level of respondents' cultural satisfaction was measured and analyzed from the survey data. Then, the figure shows that the highest level of satisfaction among the cultural services is in the aesthetic value and tourism services with a value of 20 respectively, followed by educational services with 19.93, both recreational and social relation services have the value of 19.6 and spiritual services have the value of 18. The cultural ecosystem services are defined in the report of the Millennium Ecosystem Assessment (MEA) as "nonmaterial benefits the people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences" (MEA, 2005a:40).

DISCUSSION

Overall, the paper gives a summary of all aspects that are related to this Malay urban studies including the concerns of current studies that are related to the Malay urban design and urban ecosystem services. There are several problems and challenges that need to be faced while carrying out this study. In the area of data collection in the field, namely the distribution of questionnaires, the problems and the main challenges are the difficulty to get the Malay respondents to complete the questionnaire. Besides, many respondents did not understand the term and key variables in this study of the urban ecosystem services and the Malay cultural services. Therefore, the researcher should take a considerable amount of time to inform the respondents before they complete the questionnaire form.

Based on the findings, Malacca City provided good Malay urban ecosystem services which were the regulating services i.e. climate regulation, flood regulation, disease control, carbon sequestration, noise pollution reduction, then supporting services i.e. hydrology cycle and cultural services i.e. spiritual, recreational, tourism, aesthetical value, educational and social relations. However, no service from provisioning services seems important because its services were rare, and none is offered directly in the urban ecosystem services. Based on this, the attempt to generate a liveable and sustainable city, including a Malay urban design that is complete with all the good infrastructures, social activities and interests, green landscapes, human security, social safety and protection, residents, public health, education and social work; shows the sustain process and usually needs enhancement (Khalid, 2016).

Based on the questionnaires that have been answered by the respondents, most of them were agreed that they got benefits in the educational services categories in Malacca City. For example, ‘’the residents are easy to access in education and a variety of facilities are available in channeling knowledge’’ questions which mostly got the highest score (85%) among the respondents. Education, that interest in the quality of living that connected to people living and allows people to make better decisions with their valued outcome (Ayoroa et al. 2010). Tourism's impact on the socio-cultural identity of the community such as introducing unique to foreign tourists also showed the highest score (90%) among the respondents. Based on this, Malacca City has ventured as an educational urban and tourism. It was supported by a studied that done by Samsir et al. (2016) and stated that tourism products in Malacca have valuable knowledge and experience for communities and tourists.

Next, in the categories of spiritual services, for example, the respondents feel free to go to a place of worship without hindrance and more facilities related to worship provided in the residential area also scored the highest percents (88%) among the respondents. For example, the mosque can be found anywhere in the city or village with the uniqueness of the architecture and

attraction design (Abdullah 2012). Furthermore, based on aesthetic value services in Malacca City, some landscapes have a high aesthetic value and quality in the vicinity (82% scores) and the historic building has a role in the cultural landscape also got the highest scores (79%) among the respondents. It connected with the studies that Malacca is a popular tourism terminus and destination that rich with cultural attraction and historical heritage which also offers knowledge and educational opportunities to various communities including Malays and visitors (Samsir et al. 2016).

As reported by Elmqvist et al. (2015), cities are a key nexus of the relationship between people and nature and are the huge centers of demand for ecosystem services and also generate extremely large environmental impacts. It can be seen based on the results that Malacca City was a convenient city and good in providing the urban ecosystem services, especially towards Malay's communities. While the city can provide many benefits and services to humans through the development and urban expansion activities, however, it remains an adverse impact on the environment. Thus, maintaining and increasing the providing of various ecosystem services, are relevant and significant in both perspectives of human living and the economic such as non-marketed and non-monetary services (Loinaz et al. 2015). This is important for the Malay urban dweller and communities who are surviving in the urban area in long duration and to make sure that their quality of life is in a good condition including in the cultural services. According to Ali et al. (2010), urban dweller's quality of life is very much depending on the livability of the city and people tend to leave the city when it has become less livable.

Based on the assessment of Malay cultural services in Malacca City, the study found that several aspects should be taken seriously by the authorities such as MBMB. For example, the authorities should play their roles in providing social infrastructures such as in maintaining the natural environment in the recreational area that can be used by the communities safely. Furthermore, the other cultural services in Malacca City that should be monitored from time to time, is to make sure that all the repairs, conservation and perhaps some improvement on the facilities aspect to be conducted immediately. It can be related with Riechers et al. (2016) who reported that the cultural ecosystem services could be one way to achieve awareness on the socio-ecological aspects, as the results show that there are linkages between cultural ecosystem services and urban social sustainability. Therefore, it is necessary to ensure that a Malay city is primarily a sustainable, liveable and securable, without having to sacrifice different and various natural resources and its UES. This is to make sure that the Malaysian policies should focus especially on the needs and class of Malay society, even within the same ethnicity. For example, the scholarships for overseas still need to be given as the majority of Malays parents are not able to cope with their child's learning and many education accesses needs to be

improved. Next, the SDG's goals as planned will be achieved as all the countries comply with the policies such as the Paris Agreements, and hence the standard of urban ecosystem services would be allowed to enhance in the future.

Studies on the urban ecosystem services and urban design have received increasing attention from researchers covering various aspects such as the study of culture and the benefits of its services, especially to humans and the environment. Therefore, there are several research proposals for future research. In this study, the researchers emphasize the cultural aspects of the Malay population in the city of Malacca. In the next study, the researcher intends to broaden the scope of the study area to include a broader range of aspects and scopes. In the context of data analysis, the researcher uses only a simple descriptive analysis, therefore in future research, the researcher intends to diversify the data analysis method so that various data inputs can be presented and discussed in detail. For example, a statistical analysis such as the Correlation Test and the Manova test can be utilized. So, the studies on aspects of urban ecosystem services and each category are relevant for implemented to ensure that urban areas with variety of ethnic groups including Malay communities will live safe, habitable and sustainable time by time.

CONCLUSION

The study has given an overview on Malay urban ecosystem services and Malay cultural in Malacca City that related to variety of benefits provided by the environment especially to the community and economy for maintaining human well-being. Overall, based on the result and the studies, the most significance of the urban ecosystem services provided by classified them, including cultural services (aesthetic value, recreational, tourism, social relations, spiritual and educational), regulating services (climate regulation, disease control, flood regulation, carbon sequestration and noise pollution reduction) then followed by supporting services (hydrological service). Finally, the paper concludes that the level of satisfaction among respondents toward the urban ecosystem services that have been offered in Malacca City is moderately good, but a few adjustments and improvements are in need immediately. So, all the parties should play an important role to make sure the cities especially Malacca City keep sustainable and more livable with the right policies and guidelines efficiently.

ACKNOWLEDGEMENTS

This study was supported and funded by Centre for Research and Instrumentation (CRIM), Universiti Kebangsaan Malaysia (UKM) from the Geran Universiti Penyelidikan (GUP) research grant (GUP-2018-032).

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 145 – 157

ENLIVENING THE MOSQUE AS A PUBLIC SPACE FOR SOCIAL SUSTAINABILITY OF TRADITIONAL MALAY SETTLEMENTS

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Abstract

Public spaces are vital elements of settlement fabrics that animate communities together in one place. Nevertheless, most public places are used for recreational purposes only without building on communal activities, especially in religious aspects. Therefore, to achieve robust social sustainability, this study aims to identify the key indicators for ensuring social sustainability of traditional settlements' public spaces. This study explores the typologies of public spaces found in traditional settlements that fill the needs of the local community. A mixed methodology was used to map and observe the public spaces and the communal activities held in two traditional Malay settlements in Kuala Terengganu. The bulk of the data were randomly collected from 400 residents by using a questionnaire survey to identify the most relevant factors that influence social sustainability. The results show that mosques have been listed as the highest preference of public space in the two sampled settlements. The study outlines three key qualities that lead the community to choose the mosque as the most important public space: 1) convenient access, 2) comfortable and clean, and 3) social aspects. This paper concludes on how these findings contribute to the improvement of quality of life, social interaction and social cohesion to achieve the Sustainable Development Goals (SDGs) globally.

Keywords: Mosque, Public Spaces, Third Place, Traditional Malay Settlement, Social Sustainability

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INTRODUCTION AND BACKGROUND OF RESEARCH

Traditional settlements are small-scale settlements with unique architectural features, different city forms and distinctive social and historical features, which vary according to local geographical conditions. Each of these elements has a specific physiognomy related to the uniqueness of their identity (Stefanou, 2000; Pozoukidou & Papageorgiou, 2013). The development and shape of such settlements are generally unplanned, spontaneous, and has an organic pattern (Setiawan, 2010; Ossen, Idid & Abidin, 2010).

Social sustainability can be broadly defined as the maintenance and enhancement of the well-being of present and future generations (Michael & Peacock, 2011). In the framework of the creation of a new community, the Youth Foundation defines social sustainability as "the process of creating a sustainable place and successfully promoting well-being by understanding what the community needs." Social sustainability combines physical design with social design, for example, providing infrastructure to support social and cultural life, providing a community-based system, and providing space for people and space to evolve (Woodcraft, Hackett & Caistor-Arendar, 2011).

Conservation and development efforts that focused on the physical landscape, especially public spaces, aim to enhance social well-being that is eroding under the threat of various social factors and unplanned developments. In the pursuit of quality social sustainability, the understanding of social spaces has been given minor attention in the scope of the study. The public space plays a crucial concern in shaping the prosperity of life and promoting social participation. In the urban context, influential academician Gehl (1971) in his book entitled "Life Between Buildings" provides a systematic approach to researching public spaces to encourage social inclusion in the community while aiming for social sustainability among the urban population. The social activities are essential to the community as they provide opportunities for everyone to participate in social relationships, passively by either watching and listening to activities or interacting with residents and friends (Kavanagh, 2010; Bahadure & Kotharkar, 2012).

However, uncontrolled revamps and new developments in many traditional settlements throughout Malaysia are threatening the social sustainability of settlements. The need for social space is also being neglected by the planning and development of new residential areas today. Ghoomi et al. (2015) corroborated this issue by explaining how the development of a modern city has eroded the quality of social relations as well as changed the physical pattern of the residential environment and is reshaping how people interact with one another. Counting on the issues above; this study provides insights and suggestions on preserving the quality of the public space as one of the essential physical landscapes while enhancing social sustainability among those who inhabit traditional Malay settlements.

Religious Institution as a third places

The word “third place” can refer to unique communal spaces for social interaction, offering a setting for companionability, freedom, community assembly, and expression of feelings (Jeffres et al., 2009). According to Oldenburg’s theory (2001), the third place is a space other than houses and workplaces, where the public wants to gather and interact voluntarily and informally without rules. The home is known as the "first place" with a "domestic environment" for relaxation, but its maintenance involves work and cost. The workplace is the “second place” that produces something productive (Woldoff, Lozzi & Dilks, 2013). Meanwhile, the “third place” is built as a space that can improve the quality of life among the local community and foster social connection (Alidoust, Bosman & Holden, 2015). Hence, to fulfil the community needs and desire, community spaces with multipurpose function are required to ensure a harmonious communal living environment.

The idea of a religious institution as a social bonding platform started from the concept of the mosque as a communal mosque or *jamek* type mosque which is close to the concept of a 'community mosque'. The idea of a community mosque grew since the early era of Islamic development, and the 'Prophet’s Mosque' is a noticeable case of the communal mosque in terms of sustainability and usage (Baharudin & Ismail, 2014; Omer, 2010). Hizan, Ismail & Ispawi (2017) also support that the mosque is the focal centre for Muslims to perform religious, political, social and educational activities under one roof. In designing a community mosque, among the criteria underlined by previous studies are spatial organisation and form such as the practice of native materials. This not only presents an original image but infuse the building with a local character that reacts to the culture, climate and environment (Hamid 2012). The mosque should be accessible and equipped with various entrances (Shojaee & Paeezeh, 2015). The appropriate setting will offer a sense of welcoming to the visitor, make it easy to reach, and ensure a fully utilised mosque at all times (Najafi, 2013; Ghahramanpouri et al., 2015). Hence, a religious institution should be a public space that is accessible to all, used by all without exception, and should last for one generation.

METHODOLOGY

This study adopts a mixed-method design. The qualitative approach is divided into a literature review and observation. The literature review is conducted to analyse the content of selected articles from journals, books, book chapters, reports, newspaper clippings, and official government portals. The site inventory focused on Kampung Pulau Duyong (KPD) and Kampung Losong (KL). This settlement is known as a settlement that retains most of the physical characteristics of the traditional Malay settlement. Observations were made to ascertain the physical factors contributing to social sustainability such as comfort,

activities, accessibility, availability of space and public facilities. Information from observational methods will guide how the socio-cultural activities of the local community enhance social sustainability in the area. Observation checklists was provided to assist researchers in recording phenomena to be observed in the field. The reliability of observation is higher by using checklists than using rating techniques because it involves observer judgment. Prior to getting down to the field, reviews were made through the google maps app as a basic overview of driving and facilitating fieldwork. In addition, it is supported by reliable and valid photographic data. Meanwhile, the survey questionnaire is used as a quantitative approach. The study involved 400 respondents from the local population aged 18-65 years. Recent reports on the population of Kampung Losong and Kampung Pulau Duyong are about 5,000 residents in each settlement. Therefore, at least 370 respondents were required based on the population with 95% confidence level and 5% of the margin of error according to Krejcie and Morgan's scheduled summary (Vaus, 2002). The questionnaire uses a Likert scale to range the preferences of the local residents. Respondents were asked to consider the most relevant factors that influence social sustainability on a 5 point Likert scale ("1" = strongly disagree and "5" = strongly agree). Cluster sampling was applied for this study as a method for data collection where the participants of the population selected at random.

Study Area

Kampung Pulau Duyong and Kampung Losong are located in the district of Kuala Terengganu, Malaysia. The strategic location of Terengganu is located 500 km northeast of Kuala Lumpur and facing the South China Sea.

Figure 1: Map of the study area
Source: Author, 2019

Kampung Pulau Duyong is one of several islands in the Terengganu River. This settlement is well known for its cultural and historical heritage, especially for the traditional boat making that still operates today. The locals maintain the Malay culture and way of life, with over 40% of the population working as fishermen. Meanwhile, Kampung Losong has 11 sub-villages located near the Kuala Terengganu River. Historically, the villagers of Losong are well-known for their knowledge of the marine sciences brought by the Bugis community. At the same time, the local people of Kuala Terengganu are skilled in carpentry. They combine these skills to produce high-quality boats. The socio-economic activities of the villagers also include the production of *Songket* textile, small-scale businesses and fishing. KPD and KL were chosen as two traditional settlements with similarities in terms of Malay culture and heritage values.

RESULTS AND DISCUSSION

Figure 2 shows the demographic data from the survey questionnaire which consisted of 400 respondents (n). Two hundred respondents participated in the survey for each settlement. In this study, KPD had 123 male and 77 female respondents, while KL was slightly more balanced with 98 male and 102 female respondents. The majority of the respondents are aged 18-66 years old, with Malays constituting the dominant ethnicity.

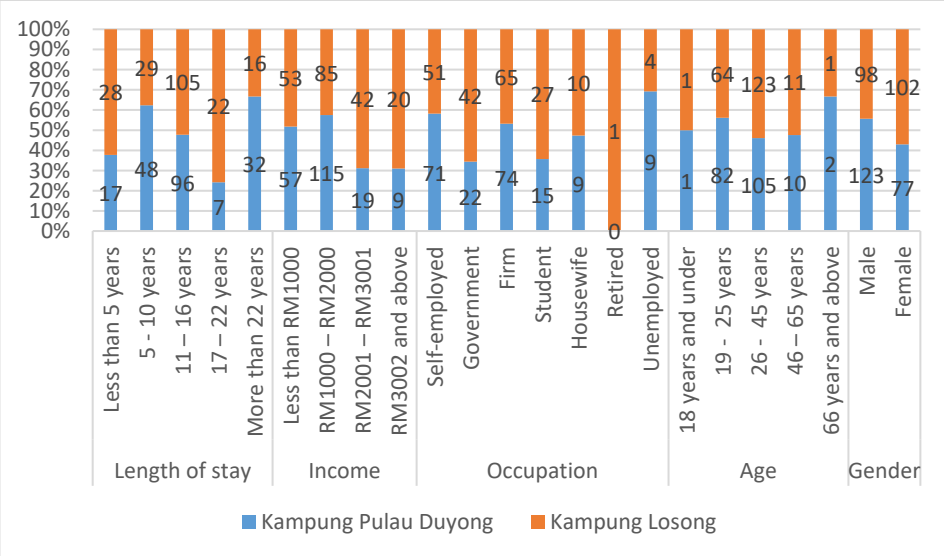

Figure 2: Demographics of respondents
Source: Author, 2019

The data presented in Table 1 indicates the choice of social spaces as the third space among KPD and KL respondents. The results show that the mosque is the highest choice for social interaction with a mean value of 4.52 for both settlements. Meanwhile, the areas with the lowest ratings were the fields (3.73), the jetty (3.36), the community hall (3.35), the civic hall (3.20) and the bridge (3.19).

Table 1: Typologies of the public spaces

Variables	**Elements**	**KPD**	**KL**	
		Average mean		**Mean value**
Place for social interaction	Mosque	4.74	4.31	4.52
	House	4.34	4.07	4.20
	Market	4.31	4.10	4.21
	Rivers and beaches	4.24	4.12	4.18
	Wakaf	4.12	4.01	4.06
	Warung	4.04	4.08	4.06
	Field	3.78	3.68	3.73
	Jetty	3.66	3.06	3.36
	Community hall	3.52	3.19	3.35
	The civic hall	3.27	3.12	3.20
	The bridge	3.26	3.13	3.19

Answer format: 1 = strongly disagree, 5 = strongly agree

Source: Author, 2019

As shown in Table 2, the mosque scores ranged according to its accessibility, comfort and cleanliness, frequency of activities, infrastructure and programmes. This suggests that residents identified sociability as one of the essential qualities that enhance the function of the mosque.

Table 2: Criteria mosque as public spaces

Variables	**Elements**	**KPD**	**KL**	
		Average mean		**Mean value**
Mosque	Accessibility	4.66	4.65	4.65
	Cleanliness and comfort	4.59	4.50	4.54
	Consistent programs and activities	4.56	4.48	4.52
	Ample sitting area	4.04	3.94	3.99
	Good learning centre	4.01	4.52	4.27
	Availability of recreational infrastructure	2.78	4.12	3.45

Answer format: 1 = strongly disagree, 5 = strongly agree

Hizan, Ismail & Ispawi (2017) supports that the mosque is the main centre for Muslims to carry out religious, political, social and educational

activities under one roof. It is considered a religious building where the Islamic civilisation was started. The role of the mosque is not only as a place of worship, but it has a multifaceted role in the spiritual, physical, and educational development of human beings and the community.

Good Accessibility for a Social Harmony

Accessibility refers to a person's ability to obtain the services, goods and activities they desire or the destination they want to reach. Among the factors contributing to the mosque's accessibility are proximity, convenience and social acceptability. The proxies include close travel distances, connecting roads and mixed-land use. Facilities such as a clear main entrance and directional signs also influence the villagers to gather at the mosque.

A safe road system will make it easier for people to move from one place to another. KL has a variety of alternatives to make it easier for people to move to the mosque, while the mosque in KPD is located near the residential area. The concept of centricity (Figure 3) found at KPD and KL places the mosque in the middle of the settlement to influence the number of people who visit the mosque easily with a minimum travel distance of about 10 meters. Thus, it is in line with the concept of sustainable settlement outlined by Shojaee & Paeezeh (2015) & Dave (2011) that combined the use of land to reduce the travel distance from the city to home, workplace and social space.

Figure 3: The walking distance between the mosque and settlement in Kampung Pulau Duyong is about 500 metres
Source: Author, 2019

Besides, the welcoming sense of the main entrance design encouraged people to visit the mosque. The signboard is also considered a convenient promotional and wayfinding point for users. It provides clear directions about the

location and increases the legibility of recognising the street environment. In agreement with the previous study by Setiawan (2010) and Ossen, Idid & Abidin (2010), the settlement pattern influences the character of people's movement. The organic pattern of the roads creates a sense of leisure and promotes a relaxing mood for the users.

Clean and Comfortable Environment Shaping the Productive Personality

Comfort and quality of the environment are factors that influence the well-being of the community (Ghahramanpouri et al., 2015). In the context of the mosque, it is influenced by various factors such as air quality, natural ventilation, colour schemes, the comfort of sound from outside, the clear sound inside the building, community space, facilities provided and parking spaces. These factors can be categorised into visual comfort, ventilation and space comfort.

The pleasure of the view is the quality associated with the tranquillity of the environment experienced through the sight of rivers and natural planting. For KL, the mosque has the elements of a picturesque setting, which are the Masjid Makmur surrounded by dense canopy plants, while Surau Losong Panglima Perang is located along the river and presents remarkable views of the river and the Masjid Kristal. Meanwhile, in KPD, the natural scenery of sloping trees is visible from Surau Putih. From the architectural aspect of the mosque, the wide entrance plays a role in creating a sense of welcoming and providing a sense of tranquillity from the hustle and bustle of the outdoor space. Respondents recognised this element as reflecting the identity of the mosque and symbolising Islam. However, the decoration is not a key element in making the mosque the main focus of the visitors, but the spirituality that exists within each individual motivates them to worship, gather and support one another.

Figure 4: Tranquil environment can help people feel calm and relaxed
Source: Author, 2019

Furthermore, a good building is one that has a good ventilation system. Inadequate air ventilation systems can adversely affect psychological and physiological health. All mosques have natural ventilation systems such as sloping windows and wide entrances. They also work to provide openings for daylight. Proper airflow is required for each building to divert cold air into the building and push hot air up and out. The opening of windows on the roof of the

mosque plays a significant role in the process of air-clearing. This cross-ventilation design managed to reduce energy costs by 40% compared to fully air-conditioned buildings. Overall, mosques in KPD and KL have ample window openings but differ in design.

Furthermore, the space comfort of the building also influenced the frequency of respondents to gather in mosques and *surau*s, as the area became wider, easier and more comfortable to accommodate large-scale religious and social activities. The main prayer hall is the essential requirement symbolising a sacred area where the residents will perform the congregational prayers such as the five daily prayers, the Eid prayers or the Friday prayer. Next, the porch is an extension of the basic shape of the building. In the context of the Malaysian climate, the porch is one of the crucial components of the building design as it acts as a transitional space between public and prayer spaces. It serves as a place for informal religious discussions, meeting place, waiting and relaxation area as well as an additional prayer area if needed. The comfort of the exterior includes the spacious surroundings of the mosque. Open spaces could be used for parking, ceremonies and *qurban* activities during the Eid Al-Adha festival. Overall, the layout of the mosque is fully well-designed to fulfil the basics of the users. The external spaces provided, e.g. the hallway, corridor and veranda, may also be used as a multifunctional space to maximise the mosque usage instead of solely serving as the air circulation space. Besides, the arrangement of interior and exterior spaces is well integrated with the existing landscape setting.

Moreover, sustainable practices are applied at KPD's mosque by using an automatic 'plug' innovation to toilet lamps. This practice is seen as a wise step in reducing electricity consumption. Further, reminder labels are placed next to the electric switches and water taps to remind users of sustainability practices.

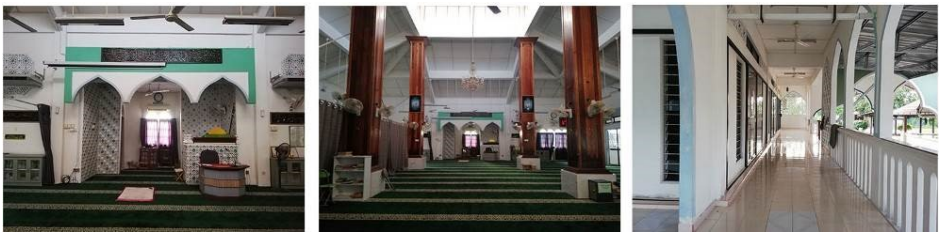

Figure 5: Spaces of mosques
Source: Author, 2019

Enhancement of Good Values through Programs and Communal Activities

The mosque serves as a centre of human focus that embodies the characteristics of the Muslim community. Among the purposes of the mosque are as a place of worship, the centre of knowledge and the centre of government and politics. Among the activities held are congregational prayers, morning and evening

discourses, Quranic readings, weddings, funeral management workshops, *qurban* activities, study programmes, talks in conjunction with the celebration of the Prophet's birthday and special discussions during the month of Ramadan.

Studies have found that social and religious activities are an essential factor in attracting people to enlivening the mosque. The activities create a sense of belonging to a place rather than relying solely on the physical design elements. Having said that, the physical spaces should be able to accommodate the activities. The results showed that 50% of the mosques in KL and KPD had a spacious yard to accommodate the needs of large-scale programmes.

Furthermore, the frequency of social activities in mosques and *suraus* was identified through the surveys. Most respondents in both settlements were involved every few months, with the percentage of respondents being 61% in KPD and 57% in KL. This is followed by "once a month" (17% in KPD and 21.5% in KL), and weekly (KPD 16% and KL 12%). Some individuals never participated in any mosque programme with the lowest percentage of 6% (KPD) and 9.5% (KL). This is due to time and mobility constraints due to age and health factors.

Table 3: Frequency of community involvement in mosques activities

Elements	**KPD**	**KL**	**KPD**	**KL**	**KPD**	**KL**
	Frequency		Percentage		N=200	N=200
Every week	32	24	16%	12%	200	200
Once a month	34	43	17%	21.5%		
Every few months	122	114	61%	57%		
Never	12	19	6%	9.5%		

Source: Author, 2019

Furthermore, the co-operation nature of the programmes also promotes the social sustainability of the mosques. In optimising the function of the mosque as a centre for social interaction, the collaboration between various organisations creates a good relationship between members of society. This finding is in line with the previous studies by Baharudin & Ismail (2014) which stated that the mosque is the node that becomes the prominent space for community socialising.

Hence, through observations, the mosques in KPD and KL have been seen to organise many programmes such as funeral management workshops, children camps and so on in collaboration with the Village Community Management Council and the Terengganu Islamic Religious Department. Such efforts coincide with the characteristics of a third place as a social space that serves as a focal point for people to create conversations in all areas of society including social interactions with outsiders and neighbours, and the opportunity to participate regardless of background (Omer, 2010; Oldenburg, 2001).

Finally, to ensure that mosques remain as a social space, the parties involved must provide a variety of activities, provide adequate spaces and

facilities and build a sense of community. The addition of open spaces around the mosque can also informally support social sustainability with the presence of social interaction among children who use the green space as a playground. In conclusion, a mosque should be multi-functional and be welcoming. Moreover, to meet the needs of today's community in keeping the mosque relevant, the mosque can also serve as a technology centre, leisure centre, healthcare centre, and the interpretive community centre.

CONCLUSION

In conclusion, it is suggested that religious institution should be planned according to sustainable factors in terms of form, spaces or activities. In representing the sustainable mosque, the mosque structure ought to have façades or walls that permit lighting and ventilation into the building to limit the use of energy and decrease cost for mechanical support. The location of the mosque should also be in harmony with the living landscape and within accessible walking distance. The mosque should also have a multifunctional space that can be wholly used. A great mosque functions as a focal point of human activity that successfully engages conversations in all social contexts, including social interactions with strangers, and where opportunities for participation are natural and available to all. The good public space is open for most of the day, without discrimination for new or permanent visitors; everyone is welcome to come together regardless of status and position. Mosque design gives a significant impact on enriching the quality of life. For the reason that the religious institution is faithfully related to the presence of a Muslim believer, natural surroundings are also the crucial factor that can bring humankind closer to their Creator. Thus, the mosque spatial organisation, accessibility and activities are among the factors that can lead to a better quality of life.

ACKNOWLEDGEMENT

The authors would like to thank the International Islamic University Malaysia and The National University of Malaysia to conduct this study. This research was funded by grant TRGS/1/2016/UIAM/01/5/1. Thank you also to Integrated Geoplanning Sdn. Bhd for the assistance in conducting drone data collection for this study.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 158 – 169

READAPTATION OF MALAY VERNACULAR ARCHITECTURE FOR INDOOR THERMAL COMFORT IN MODERN MASJIDS TOWARDS A SUSTAINABLE DESIGN.

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Abstract

The earlier masjid architectural styles were similar to Malay vernacular houses and evolved with the introduction of the modernist style. This resulted in increased energy consumption. Hence, a proper set of thermal comfort is important to provide a suitable environment for the masjid's occupants. The vernacular characteristics in the passive designs have caused designers to find solutions towards sustainable designs. Therefore, designing a good thermal performance building can be done by readapting the Malay vernacular architecture and passive design strategies for modern masjids. This paper is aimed to document the literature and potential case studies in identifying the relationship between the design of Malay vernacular and thermal comfort elements in a hot and humid climate. The outcome is to formularize requirements of thermal comfort in Malay vernacular masjids based on four major factors namely i) architectural qualities, ii) construction systems, iii) structural components and iv) non-structural components. The research is intended to change the approach of future designers to become more sustainable based on the application of passive designs that suit the climatic condition of Malaysia.

Keywords: Heritage, Façade design, Thermal performance, Ventilation

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INTRODUCTION

The main objective of this paper is to identify relationship between the design of Malay vernacular building components to the local climate condition. This process of identifying the relationship is important to understand the implementation of passive designs in a hot and humid climate as well as highlighting the significance of the thermal performance study in modern masjids that apply the Malay vernacular concept.

Baharudin (2016) revealed that during the 15th century, the masjid architectural style and its construction materials were similar to local traditional Malay houses. In the 19th century, masjid architecture in Malaya had changed and was influenced by the British colonial style. Moreover, in the early 20th century, the masjid architectural style was further diversified with the introduction of the modernist style. When the masjids modernize, nations and communities attempt its construction with modern materials resulting in a compromise to the passive impact of controlling climate. This can be seen from the function of the modern masjids, which do not portray the role of sustainability to facilitate the development of the surrounding community. Modern masjids are treated as iconic buildings, which much emphasis on aesthetics rather than functionality. Malay vernacular architecture formulated its character to the culture and environment. Nowadays, some designers adapt these components in the formation of contemporary architectural language. How does the vernacular and modern Malay masjids compare when it comes to the implementation of traditional Malay architecture in its design? Furthermore, modern designs of masjids rely more on the mechanical system for thermal comfort and thus, increasing the energy consumption. According to Chan (2004) and Singh (2006), 44.23%-64% of the annual electricity consumption in a building is allocated for the operations of air conditioners and other interior cooling mechanisms. This large consumption of energy for cooling stems from the problem of designing buildings that are ill adapted to the Malaysian local climate. This paper is aimed to identify which traditional vernacular architecture strategies are suitable to be adapted in modern masjids. The evidence compiled through observation in case studies captured an understanding of the effectiveness of environmental context in Malay vernacular architecture that can be adapted in contemporary quality of style.

RESEARCH BACKGROUND

Malay Vernacular Masjid

Malay vernacular architecture can be defined as a house designed to meet the thermal comfort of the occupant with consideration being given to climatic factors by using local materials and that reflect the social background of the occupant in the specific region. Abdul Ghaffar Ahmad (1999) mentioned that there are two types of architectural styles under the vernacular masjid category,

namely traditional and regional influences that can be differentiated by the design of the roof. The traditional masjid is generally a long shape gable roof while the two or three tiered roofs can distinguish the regional influence. Examples of the vernacular masjids with traditional influence are Kampung Laut Masjid, Nilam Puri, Kelantan (1730's), Langgar Masjid, Kota Bharu, Kelantan (1871), Paloh Masjid, Ipoh, Perak (1912) and Kampung Raja Masjid, Seremban, Negeri Sembilan (1924). Examples of the vernacular masjids with regional influence are Tengkera Masjid, Melaka (1728), Kampung Keling Masjid, Melaka (1748), Old Masjid of Kampung Masjid Tinggi, Bagan Serai, Perak (1929) and Tanjung Keling Masjid, Melaka (1930).

Sustainable Design in Built Environment

Understanding thermal comfort is important to architecture. It not only lays the foundation for building designs but also relatively affects the achievement of a sustainable design. Julia (1997) supported contemporary models of thermal comfort recommendation that a narrow temperature range to be applied equally across all building types, climatic zones and populations. This method casts the building occupants as passive recipients of thermal applications which lead to thermal comfort standards that require energy-intensive environmental control strategies. On the other hand, sustainability applies to actions/developments that preserve the global environment and its non-renewable resources for present and future generations. Besides that, the sustainable system adapts local climatic context into the building, accounting for both temperature and humidity. It is about making the most of local conditions to make the building comfortable, affordable and sustainable.

Thermal Comfort in the Malay Vernacular Masjid and Its Relationship to Climate

Before the development of mechanical air conditioning systems, societies used cooling methods such as shading, thermal mass and natural ventilation to achieve thermal comfort. For example, the local climate has a direct influence on the formation of Malay vernacular architecture resulting in the masjid appropriately responding to environmental factors. The openings such as windows, panels and grills are an important feature of ventilation, which give relief to thermal discomfort. Void versus mass with the ground and verticality of Malay vernacular architecture provides adequate cross horizontal and vertical ventilation (Yuan, 1987). The overhang reduces the sun's glare and the direct sunlight coming into the building. The roof geometry plane of a Malay vernacular masjid is observed to be another distinctive feature with the environmental factors. The slop gable roof pitched would runoff water so quickly and allowed the air ventilated through the space below (attic space). The roof construction is usually left exposed with

the lightweight thatch materials, which is tied to the wood spine to the roof construction members (Yuan, 1987). Overall, thermal comfort in Malay vernacular masjids is identified by comparing four major factors including architectural qualities, construction system, structural building components and non-structural building components.

Architectural Qualities

Among the architectural qualities, elements significantly considered are building shape/form, roof form, orientation, building envelope and surrounding context. The shape of the building plays a key role in the external surface area, which consequently determines its energy balance and hence, the cooling load. Examples of some building features, which were built in response to the warm and humid climatic conditions, are pitched roofs to enable rainwater to run off quickly and stilts to raise the masjids above ground level to avoid floods. Building orientation can also reduce cooling loads through minimizing solar heat gain through windows as well as minimizing or increasing solar heat gain through walls and roofs based on the climate. St. Clair (2009) mentioned that choosing an appropriate orientation relative to the wind direction can also help to maximize cross ventilation, which mostly suits buildings in hot and humid areas.

Construction System

The Malay vernacular architecture prefers to use materials that are easily available for a cost-saving approach. Nowadays, material such as concrete is considered easily available and not that costly compared to timber or steel. The Negeri Sembilan State masjid (refer Table 1) uses a series of intersecting reinforced concrete conoid to refer to the horn-like gable roofs of the Minangkabau traditional architecture. The reference to the 'bumbung gonjong' is uniquely expressed in the structural play of the conoids. The architect had not resorted to the simplistic revivalism alternative of the traditional roof but has reinterpreted it in an abstract but creative way. The gentle curve of the roof means that it does not require massive support, which allows for a completely free space below for the praying hall. Lace-like walls allow the hall to be freely cross ventilated by the natural breeze. This imitates the openness in the traditional vernacular masjid in maximizing airflow for thermal comfort. Furthermore, since the walls are not load bearing, they are perforated with carvings, similar to what can be seen in Malay traditional houses.

Structural Components

The Roof space in Malay vernacular houses is properly ventilated by the provision of ventilation joints and panels in the roof construction. Figure 1 below shows the roof's opening on both sides to allow air movement into the house (Hanafi, 1994). As one of the indigenous materials, the attap roof used in Malay houses has a low thermal capacity. This material does not retain heat and cools immediately.

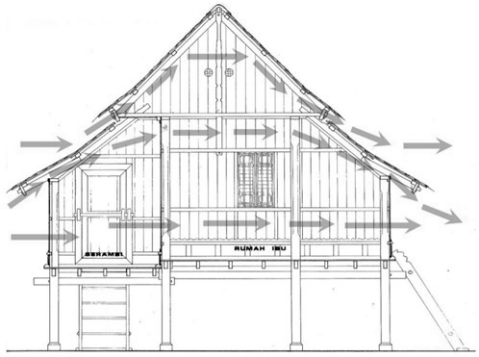


Figure 1: Ventilation Openings in the Roof of Traditional Malay House
Source: Center of Built in the Malay World (*KALAM), 1986.*

Vernacular Malay architecture also uses prefabricated construction methods where all the components are made and assembled on-site, which allows the house to be dismantled and reassembled elsewhere in different locations. This can be translated as a sustainable approach adopted by the previous builders involved in Malay vernacular building forms.

Non-Structural Components

Like the Malay houses, the vernacular masjids portray a high level of craftsmanship. This can be seen in the non-structural components such as louvered windows, fanlights, carving wall panels and fascia boards for the floors, walls, stairs, and roofs that are fitted between the frames to allow natural cross ventilation of air. Window components can be divided into three operable sections; the top, middle and bottom. The top section, called ornamentation, is the fixed ventilation panel that is usually well decorated and carved. A Malay vernacular masjid also allows ventilation by having many full-length windows and doors at body level. Hassan and Ramli (2010) concluded that a large number of windows and openings aided by ornamentation at the perimeter walls can contribute to the cross-ventilation process (Figure 2).

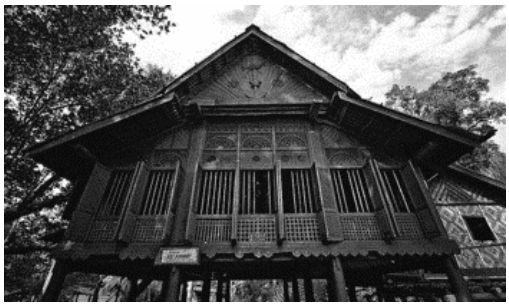


Figure 2: The Non-Structural Components of Traditional Malay House similar to Vernacular Masjid building facade
Source: Hassan and Ramli (2010)

ANALYSIS AND FINDINGS

Thermal Comfort in Modern Masjid Buildings and Energy Consumption

Seven case studies have been conducted for this research. Table 1 indicates comparison on traditional and modern masjids when it comes to the implementation of Malay vernacular architecture as their design concept. Four key aspects of these case studies are compared to establish common features and differences between selected traditional Malay vernacular masjids and modern masjids with the same design concept in Malaysia. Observations were recorded and placed into these four key aspects namely architectural qualities, construction system, structural building components and non-structural building components. Findings from observations conducted concludes that application of Malay vernacular architectural concept in modern masjid case studies have changed gradually in parallel with the development of structural advances and construction methods. In comparison with thermal comfort in the traditional Malay vernacular masjids, modern masjids architectural form, space, construction systems and building materials in these case studies have evolved and developed to a greater extent. The development in materials and environmental control systems (e.g. air conditioning) has greatly influenced the modern masjid architecture. Concrete, bricks, steel, stone and marble are commonly used in the construction of modern masjids.

Primary data collected from observation of case studies recorded in Table 1 shows Masjid Kampung Laut as one of traditional timber masjid in Malaysia that were built according to construction and structural technology of that period. Therefore, modern Malay vernacular masjids are built according to the construction technology present at this time. The State Masjid of Negeri Sembilan is the building that truly practiced the metaphor of traditional form and state of the art for Negeri Sembilan. The designer adapted the concept of Malay vernacular design by designing a cantilevered platform that reaches out to the

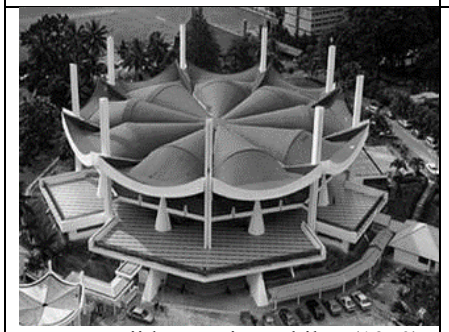
sun, bringing light into the interior space and allowing the hall to be naturally lit. Lace-like walls also allow the hall to be freely cross ventilated by natural breezes from the adjacent park and lake. At the same time, a series of intersecting reinforced concrete structures, the molded concrete underside the roof and pillars supporting a parasol roof made of a hyperbolic concave concrete shell seemed to be suitable building materials at that moment.

In an aspect of design context, Masjid Negara does not suggest any foreign influence but is uniquely suited within Malaysia's socio-cultural context. It also reflects a modern interpretation of Malay vernacular architecture and Islamic architecture. The use of a folded plate dome rejects any form of the colonial dome style. To provide sufficient daylight and passive cooling to the building, the architect designed an extensive set of serambi with light courts and air wells. It was also built on a raised platform on polotti with high ceilings and large fenestration for ventilation. Therefore, Masjid Negara is a good example of a modern masjid that is not only imbued with technological and spiritual qualities but is a modern masjid that preserves the spirit of true Malay vernacular architecture as well. It can also be concluded that the National Masjid has the closest criteria in terms of Malay vernacular architecture. The quantity of openness reflects the importance given to ventilation in the design of Malay vernacular architecture. The structure with minimal partitions in the interior will allow easy passage of air and cross ventilation. Its large roof and low windows tend to be under lighted. This gives a physiological effect of coolness as strong light is often mentally associated with heat. Indirect sources of light are the best forms of natural lighting for this climate as they minimize heat gain and glare. Direct sunlight should not be used for daylighting as it is accompanied by thermal radiation. These are the most effective means for climatic comfort in a building for the Malaysian climate and environment. This intelligent design of Malay vernacular architecture shows concern of thermal comfort for the occupants.

Based on the findings stated in Table 1, Tuanku Mizan Zainal Abidin Masjid is one of the early sustainable masjids in Malaysia. To become a sustainable building, the masjid should be providing a comfortable environment in the internal spaces. A unique cooling system was created by using a high-end technology system, which uses GKD's Escale stainless steel mesh that allows full natural air conditioning in the interior spaces. Furthermore, by using this high-end technology, it also allows good daylight and gives the effect of transparency to the masjid thus reducing and saving energy usage.

Table 1: Criteria of Malay Vernacular Masjids

CASE STUDIES	ARCHITECTURAL QUALITIES		CONSTRUCTION SYSTEM	STRUCTURAL	NON-STRUCTURAL	REMARKS
TRADITIONAL MASJIDS	SITE PLANNING	SPACE PLANNING	MATERIAL	BUILDING FORM	OPENINGS & LIGHTINGS	
 Kg Laut Masjid, Kelantan (1730)	-The praying area facing the qibla -Once disassembled at its original site and then restored to a new site due to flood	-Open square plan -Length 74ft -Width 71ft	-Lime mortar & clay roof tile -All structural component from timber	-On stilt 2.3m from ground -Minaret (1) -Three-tiered roof	-The long low windows for cross ventilation & views -Serambi/verandah -Perforated floors, perforated walls and ventilated panels at the tiered roofs.	-Optimally considered and make use of the natural air flow in this climate -Have suitable criteria for Malay vernacular masjid
 Langgar Masjid, Kelantan (1871)	-Location of the Royal cemetery	-Rectangle plan with indoor wall panel	-Lime mortar & clay roof tile	-Three-tiered roof -Topmost section is a gable roof sitting on a truncated double-tiered hipped roof	-No clerestory lighting -No ventilation grilles -Back verandas for shading devices -The full long low window for cross ventilation & views	-Fit criteria of Malay vernacular masjid -Thermally comfort with natural ventilation but assisted with artificial lighting
 Paloh Masjid, Perak (1912)	- Location of the founder's mausoleum	- Square plan - Prayer hall surrounded with colonnade	- Concrete wall - Wooden ceiling	- Minaret (1) - Two-tiered gabled roof - Solid wall and stand on foundation	-Roof-like wooden canopy	-Fit criteria of Malay vernacular masjid -Thermally comfort with natural ventilation but assisted with artificial lighting

MODERN MASJIDS						
 National Masjid Kuala Lumpur (1965)	-Reflecting pools and fountains spread throughout the compound to cool down the surrounding throughout the climate -Prayer hall facing Qibla	-Folded plates of the concrete main roof are a solution to achieving the larger spans required in the main gathering hall. -Relationship of pathway and spaces is "pass by spaces"	-Concrete dome with stained glass for sustainability & lighting control. -RC construction -Marble floor & walls -Column overlaid with unglazed black mosaic tiles at top and base. -Bottom of pillars at prayer hall are paved with terrazzo & concrete -Verandah floor are layered with black terrazzo tiles for low maintenance & sustainability	-Minaret (1) -The main roof is reminiscent of an open umbrella -Star dome represent the 13 states of Malaysia and five pillars of Islam. -Post and beam concrete structure -Built on raised platform with high ceilings	-Serambi and verandah with light courts & air wells for sufficient daylight & passive cooling -Contemporary expression calligraphy and ornamentation for aesthetic and ventilation -Natural lighting from roof onto column and floor -façade from plain white concrete to create light & shadow effect	-Optimally considered and make use of the natural air flow in this tropical climate -Have suitable criteria for vernacular architecture
 State Masjid Negeri Sembilan (1970)	Adjacent to park and lake.	-A nine-sided polygon with a large open polygonal prayer space. -The double-storey volume prayer hall has a ring of first floor terraces supported by nine conical buttresses rising from ground level.	-Glass and timber at façade building -Series of intersecting reinforced concrete -Pillar supporting a parasol roof made of a hyperbolic concave concrete shell. -Molded concrete underside the roof	-Minaret (1) -The horn-like gable roofs of the traditional Minangkabau. -Curves and lines of gently moving upward to a point underside of the roof -The non load-bearing wall are perforated with carvings	-The curve of the roof allowing a completely free space below for the praying hall. -Cantilevered platforms reach out to the sun, bringing light to the interior space, allowing the hall to be naturally lit. -Lace-like walls allow the hall to be freely cross-ventilated by breezes.	-Design consideration highlighted on the traditional Minangkabau architecture -Optimally considered and make use of the natural air flow and lighting in tropical climate

 Tuanku Mizan Zainal Abidin Masjid (2004)	-Adjacent to landscape and lake. -Adjacent to the main prayer room is surrounded by a pool to make guests enjoy a cool and airy atmosphere.	-The main prayer hall is surrounded by marshrabiyah screen consisting of lattice and architectural metallic wailing screen which serves as transparent light and wind	-70% steel & 30% concrete -The main entrance is strengthened with glass reinforced concrete to increase the integrity of the structure and uses fine glass to create an illusion of a white masjid from afar.	-characterise three design principles: simplicity, airiness and transparency. -The edges of the masjid's roof are able to shelter the people praying outside of the main prayer hall from rain	-Gas District Cooling" AC technology -Natural ventilated & fans stainless steel mesh for atmospheric quality. -Semi-transparent spiral mesh provides reliable protection from the sun and rain.	-Optimal use of the natural air flow and lighting -Suitable criteria of Malay vernacular architecture with modern technology -Sustainable masjid
 Raja Haji Fi Sabilillah Cyberjaya Masjid (2015)	Grasscrete paving system on the car park area	*Rainwater harvesting for landscaping and toilet use.*		Rooftop solar panels	-Variable Refrigerant Flow (VRF) AC system for energy saving. -Energy-efficient LED lights. -Low-E panel glass that reduces heat transfer. -Max natural air ventilation system.	-optimally considered and make use of the natural air flow and lighting in tropical climate -Green masjid

At the same time, the design of Raja Haji Fi Sabilillah Cyberjaya Masjid is an inspiration for more developments of green masjids in the future. It is the first masjid in Malaysia to be awarded a Platinum – Green Building Index. The main design intent of this masjid is to save energy through its design by having an average daytime temperature of 26°C to achieve a thermal comfort zone. Some of this green building features of the masjid include rainwater harvesting for landscaping and toilet use, Variable Refrigerant Flow (VRF) air conditioning system for energy saving, energy efficient light-emitting diodes (LED) lights, low e-panel glass that reduces heat transfer, grasscrete paving system for the car park area, rooftop solar panels and maximum natural air ventilation system.

CONCLUSION

Masjids represent a great place of importance and function for Muslims communities. The feeling of tranquility and peace is what worshippers are looking for in masjids but to attain this, they need to feel thermally comfortable and relaxed inside the masjids. In response to the seriousness of working toward a sustainable future and the identity of local masjids, the government, organizations, and agencies have been developing policies, laws, regulations and building codes. The goals of these initiatives are to improve the wellbeing of people and to value the natural environment. For architects to successfully apply the principles of sustainable design, there is a requirement to understand the laws and regulations related to the environment. Moreover, there is a need to be more proactive and take responsibility without solely relying on the legislative enforcement only. Designers need to question the impact of each decision they make when designing a building and adopt a long-term view by focusing on sustainability rather than the aesthetical building form. This paper recommends that new masjid designs should move towards adaptation and interpretation of vernacular architecture whilst being suited with the contemporary context and technology. Malay vernacular identity in any modern designed buildings especially masjids can be considered as a challenging task in architecture. However, referring to climatic characteristics and elements of thermal comfort in Malay vernacular masjid, modern building designs in Malaysia should be able to optimize thermal comfort by fulfilling all these major factors. This paper represents key aspects of the most suitable traditional vernacular architecture strategies to be adapted in modern masjids namely architectural qualities, construction system, structural building components and non-structural building components. If a modern masjid is designed and built by considering the above points, it can result in a very appropriate modern building form suited specifically to the vagaries of tropical climate in Malaysia.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 170 – 180

THE ORIENTATION SETTING OF BUILDINGS IN THE TRADITIONAL MALAY SETTLEMENT: A CASE STUDY OF KG SERI TANJUNG, SUNGAI UDANG, MELAKA

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Abstract

The orientation of buildings is one of the factors that define the characteristics and pattern of a settlement. The purpose of this paper is to analyse the orientation setting of the buildings in one of the gazetted traditional Malay settlements in Melaka, namely Kg Seri Tanjung, which has been listed as Heritage Village in Melaka State Structure Plan 2035. The objective of this research is to identify the orientation setting of the built-up areas and analyse the factors of the orientation of the built up. This research has used the drone technology to identify the orientation setting of each built up in the settlements, which is also supported by the ground survey to confirm the social interactions among the settlers. The findings indicate that the orientation of a building is influenced by the geographical factors and distribution of houses that depends on the family ties among the dwellers. It is identified that the geographical factors and relationship among the neighbours are highly related to the orientation of the buildings, which is also contributed by the factors of orientation of the buildings towards the natural environment, road, *qiblat* and its adjacent buildings. This analysis highlights and acknowledges some potential values in the traditional Malay settlement settings that can be used as a reference for the preservation of the characters of the future traditional settlement. The findings of this study are also a part of the urban design principles of the traditional Malay settlement that is important to preserve the identity of Malay in future development.

Keywords: Malay settlement, orientation pattern, traditional settlement

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INTRODUCTION

There are two types of traditional settlements in Malaysia. The first settlement is the unplanned settlements that include the Malay's traditional and fisherman village. The second settlement, on the other hand, is the well-planned settlement that include new and urban village. These settlements are formed due to various factors such as the physical and spatial elements (Funo, Yamamoto, & Silas, 2002; Samsudin, 2014). Those settlements mostly can be found in the rural area and some parts of the urban area. According to Rully & Florian (2016) and Solehin, Hakim, & Samsuddin (2014), the distribution of the physical elements in the traditional settlement usually looks chaotic with organic and unplanned arrangement. However, this has initiated a social interaction among the settlers, which is good for the community. The study on the orientation of the built up in a settlement will contribute to the pattern of the traditional Malay settlement. Hence, it requires a thorough understanding on the orientation settings of the built up, which might be one of the factors that influence the patterns of the settlement. Besides, this paper aims to adequately understand part of Malay urban design principles, which are the building orientation in the traditional Malay settlement and the social interaction of the community. Therefore, will contribute to the knowledge of the urban design principles of the traditional Malay settlement, which will indirectly preserve the identity of Malay in future development.

The Orientation Pattern of Settlement

There are three types of housing orientation arrangement in Malaysia, namely the cluster form, linear form and scattered form. In the cluster form orientation arrangement, the houses are built around the main facilities that are the focus of the community. The houses are usually oriented to some functional buildings, such as the community hall and local mosque, which can indirectly encourage the social interaction between the local residents. The linear form of orientation arrangement usually can be found in an agricultural area. The houses in this area are traditionally built along the main road or riverbank, front facing and parallel to each side. Meanwhile, in the scattered orientation arrangement, the houses are built organically because of the topographical factors. It has also been found that the houses mostly are oriented to the adjacent buildings, while some are oriented to nature. Figure 1 below shows the types of housing orientation arrangement in Malaysia.

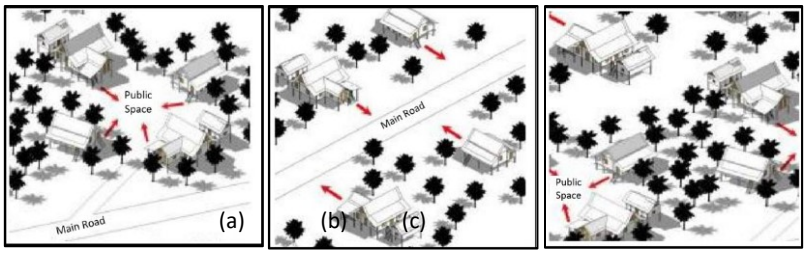

Figure 1: Types of housing orientation arrangement in Malaysia (a) cluster arrangement form, (b) linear arrangement form and (c) scattered orientation form.
(Source: Ministry of Housing and Local Government, 2010)

The arrangement of the houses in a settlement also reflects the conceptual divisions of space, which undoubtedly connects the community, while increasing the social interaction among the society. A published review by Ciolek & Forer (1980) explained that the orientation of a building in a city was impromptu and consciously created. This is due to various semantical of orientations in space, such as class, location, age, and familiarity with an area. Ciolek & Forer (1980) also argued that the orientation that is based on sectoral is irrelevant in a city. This is because it may appear to be lacking in overall but working effectively in its basic units. However, the function of an area is basically influenced by the social interaction of the community in the settlement. Sudarwanto, Hardiman, Suprapti, & Sarjono (2018) also agreed that the orientation of the buildings in the traditional settlements was formed spontaneously and organically along the coastal area and overlooking the river. This is because river was the main mode of transportation before.

In addition, the topological factors are often the leading factors that influence the orientation of a building. The house position in the Malay village in Bali was decided upon after carefully considering the wind direction (Marpaung, Dwira Nirfalini Aulia, Nawawiy Loebis, & Adhe Maulidina Harahap, 2019). According to Tao, Chen, & Xiao (2017), in China, most of the houses in the traditional settlement are typically found along the natural elements and commonly facing the sun. This is to ensure the occupants were healthier due to the poor hygiene conditions at that time. Hence, the direct sunlight was efficiently utilized to exterminate the bacteria (Tao et al., 2017). Besides, most of the houses were positioned to be facing the natural elements such as river, terrain, and agricultural resources. This distinctive pattern of settlement was also discovered in most of the traditional settlement in Malaysia. According to Ghaffarianhoseini, Berardi, Dahlan et al. (2014) and Abdullah (2007), the orientation of the Malay houses of the early settlers was properly oriented to the direction of *qiblat,* which is towards the sunset. Moreover, the gabled roof was adorned with a sunrise and sunset pattern to indicate precisely its proper direction (Mastor Surat, 2013).

Furthermore, Rahmitiasari, Antariksa, & Eka Sari (2014) have identified five key factors of the orientation of the building, which are the economic and infrastructure, social, occupancy, environment and culture. According to Solehin et al. (2014), the social and cultural characteristics of the Malay in their traditional settlements have influenced the distribution of the dwellings and the pattern of the traditional settlement in Malaysia. Besides, the economics of the Malay that has been more towards agricultural activities since the beginning of the formation of the Malay region is also one of the factors that influence the pattern of the settlement. It is also acknowledge that the lifestyle of the Malays concerning on the faith, culture and characters is influenced by Islam (Samsudin, 2014). As a consequence, the layout of a settlement was based on the social culture and the lifestyle of the community in the settlement. Samsudin (2014) also stated that the organic arrangement of the houses, surrounded by landscape and other physical elements of the settlement, has positively enhanced the social interaction among the settlers. Although most of the traditional settlements were formed in an organic and unplanned pattern, almost all of the settlements had an adequate provision and good accessibility of public facilities. A typical Malay traditional village has at least a prayer hall *(surau)* and community hall for the community to gather and celebrate events. Most of the houses also have an open space, which is the house compound. This open space is used for the children to play and the local elders to spend their time chatting with the neighbour.

STUDY AREA

This research focuses on the traditional Malay settlement in Melaka, where Kg Seri Tanjung is carefully selected as case study. The selection of the case study is based on the official lists of proposed traditional village and gazetted traditional Malay village from Melaka State Structure Plan 2035 (RSN Melaka 2035). Figure 2 below shows the location plan of Kg Seri Tanjung.

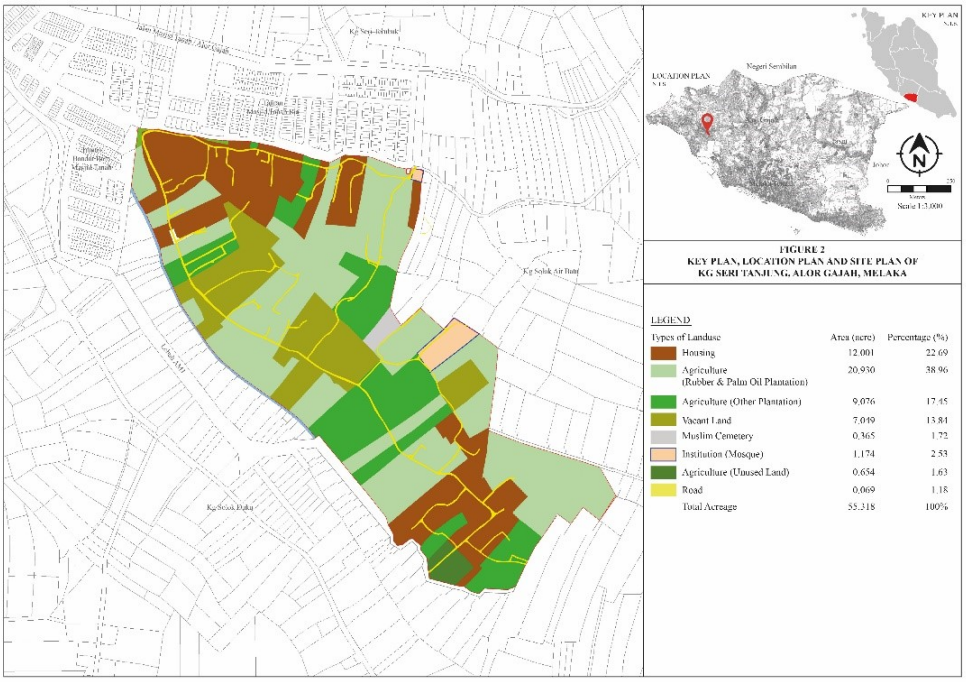

Figure 2: Location plan of Kg Seri Tanjung
Source: PLANMalaysia (2018), Redrawn by Author (2019)

Kg Seri Tanjung is one of the villages listed as a proposed heritage village in the draft of the RSN Melaka 2035. It is also included under the Inap Desa program. Under the Inap Desa program, the traditional house facade has to be properly preserved to maintain the Malay design identity and unique culture. Kg Seri Tanjung is precisely located in Alor Gajah, which is within one kilometre from Masjid Tanah, 27 km from Melaka city and about 13 km from Alor Gajah. The total area of Kg Seri Tanjung is 55.318 acres. The location of Kg Seri Tanjung is threatened by the mixed-use development that exists around the settlement, which consists of industrial, housing and commercial development. The development has slowly eliminated the identity of the traditional settlement of Kg Seri Tanjung.

METHODOLOGY

The spatial pattern of the settlement was identified through the analysis of the orientation of built up in the settlement. The data of the orientation of the built up were obtained through several data collection methods. The methods are the interview, inventory and ground survey, as well as through aerial image data. This study has also used the drone datasets to identify the orientation and spatial arrangement of the settlement. The official permission was granted by the

chairperson of *Majlis Pengurusan Komuniti Kampung* (MPKK), En. Khairuddin bin Mohd Ali, to conduct the drone data collection in the area. The exclusive interview that involves the *penghulu*, Tn. Iskandar bin Hj. Zainal, the chairperson of MPKK Kg Seri Tanjung, the members of MPKK and several random villagers are conducted. This was aimed to understand the current state of the village and identify the inhabitants' perception of the village. On top of that, the building footprint that was derived from the aerial image will show the interrelationship between the spaces. A preliminary observation was also conducted to carefully verify the necessary criteria of the study area. The factors of the orientation that were considered in this research are the orientation towards the road, direction of *qiblat*, adjacent building and nature.

ANALYSIS AND FINDINGS

The findings will adequately answer the first objective, which is to identify the orientation setting of built-up in the study area. The second objective that is to analyse the factors of the orientation of the built up will be answered in the analysis. The analysis will focus on several main functional areas in the study area. Besides, other physical and social culture characteristics are also considered to support the analysis.

Physical Characteristics of Settlement (Orientation Setting of Built Up)

The distribution of 265 houses in Kg Seri Tanjung are in clustered forms. Two key areas were selected as a sample of orientation arrangement in Kg Seri Tanjung. Area 1 is an administration area, where the community hall, chief office, kindergarten and several workshops were strategically located. Meanwhile, Area 2 locates the *surau* and several clusters of traditional houses. The percentage of orientation arrangements was calculated based on the orientation of built up towards the adjacent buildings, direction of *qiblat*, road and natural environment (river, sea, nature). Figure 3 below shows the building footprint of Kg Seri Tanjung that focuses on the orientation of built-up in the two key areas. The percentages of the orientation of built-up towards those elements are also presented. Meanwhile, Figure 4 illustrates the orientation pattern in Area 1 and Area 2 of Kg Seri Tanjung.

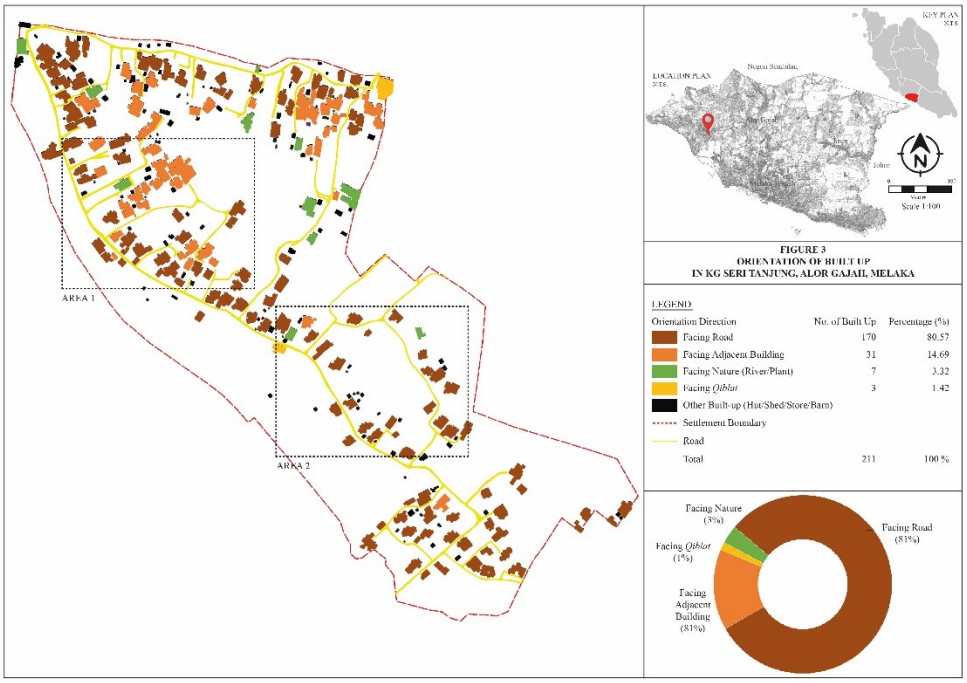

Figure 3: Orientation and percentage of built up in Kg Seri Tanjung
Source: Author (2019)

There are about 81% of the built-up which are built facing the road, followed by 15% are facing the adjacent building. The other 3% are facing nature and 1% are facing the direction of *qiblat*. The setting of the built up follows the organic pattern of the local road in Kg Seri Tanjung. As a result, most of the built-up are facing the road. The built-up that faces the adjacent building are mostly the houses of one's extended family. This means the houses are built on one lot that was inherited from their ancestors. Some of the built-up are oriented facing nature in Kg Seri Tanjung, which are facing towards the orchard, garden and the farm. Meanwhile, the built up that are facing the direction of *qiblat* are the *Surau* and the hut at the graveyard. Based on the figure and chart (Figure 3), it sufficiently shows that most of the built-up are built along the road and oriented towards the road. This contradicts Mastor Surat (2013) that asserted the early traditional houses were built facing the direction of *qiblat*. Moreover, an interview was conducted to 50 local residents of Kg Seri Tanjung including the *penghulu* and the chairperson of MPKK. The interview concluded that during the early formation of the settlement, the houses in Kg Seri Tanjung were facing towards the nature, which consists of the paddy field and plantation. However, as time passes by, the neighbouring land that surrounds the settlement boundary has

gone through development and it slowly threatens the environment of Kg Seri Tanjung.

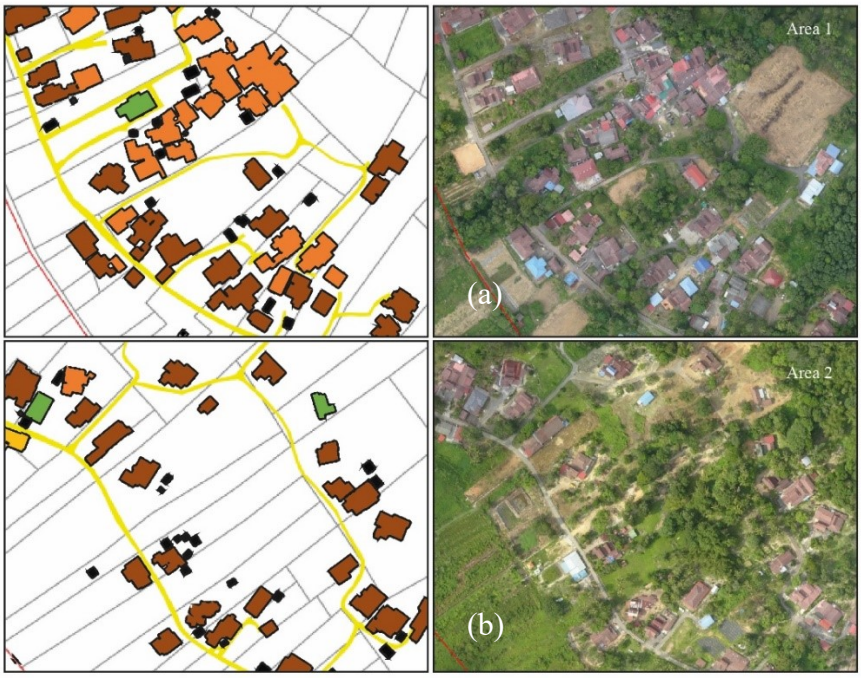

Figure 4: Close-up orientation pattern of (a) Area 1 and (b) Area 2

Area 1 highlighted in the Figure 4 above shows that the orientation of the built-up are mostly facing the road. Meanwhile, several groups of built-up are built facing the adjacent building. Based on the interview and ground survey, the orientation of houses that face the adjacent buildings are mostly because the houses are built for the extended family in one lot. It is similar with the characteristics in other traditional settlements (Mohd Hussain & Byrd, 2016; Rahmitiasari et al., 2014; Samsudin, 2014; Solehin et al., 2014) where there is an old house in a lot and as the time passes, at least two more houses are built on the side or behind the main house in the same lot to cater for the gradual expansion of the family members. Area 2 shows the same pattern of orientation of the built-up in Kg Seri Tanjung. Most of the built-up were facing the main road, while several houses that do not have direct access from the main road were oriented to the adjacent building. Other than that, the *surau* is facing the direction of *qiblat* and several houses are facing nature which is their plantation. Based on Figure 4 (b), it can be observed that there are only one to three houses that are built in one lot. Based on the survey, the settlers in Area 2 mentioned that this is because that

most of their other family members or siblings have decided to move out from the village. Some of them moved out of the village since their working place is too far, while some are following their husband. The land is then left to be cultivated by the existing heirs that stay in the settlement.

The setting of built-up in Kg Seri Tanjung shows that the built up follows the organic pattern of the road. Most of the built-up are built along the road and oriented towards the road. The dwellings that face the adjacent buildings are mostly built by the extended family in one lot, inherited from the ancestor. It is identified that the built-up that facing the *qiblat* are the *surau* and the hut at the graveyard area. Meanwhile, the built-up that are oriented towards nature are mainly possessed by the dwellers that own orchard, garden and farm. This makes it easier for them to vigilantly monitor their plantation and livestock. The literature review convincingly demonstrates a consistency with this finding as according to Roychansyah & Diwangkari (2009); Samsudin (2014); and Sudarwanto et al., 2018), the orientation of the house in a traditional settlement is influenced by the physical and spatial elements of the settlement. Meanwhile, it contradicts with Ghaffarianhoseini et al. (2014); Mastor Surat (2013); and Abdullah (2007) that mentioned that the rules of the house orientation should be facing towards the *qiblat* or the direction to Mecca. Several clusters of houses built close to each other have shared house compound, which naturally becomes a gathering place for activities such as '*rewang'* during weddings and festive season. The significance of the orientation of the built-up and the socio-cultural of the community is abundantly shown through the activities of the community, such as *'gotong-royong'* as well as sewing and woodcarving workshops.

CONCLUSION

The results of the findings and analysis have reasonably achieved all the key objectives of this research. The first objective was achieved where the setting of the built-up in Kg Seri Tanjung shows that most of the built-up are oriented facing towards the road and adjacent building. The dwellings are constructed by following the organic pattern of the road, while the extended houses exist due to the expansion of the number of households in the main house. This undoubtedly became the factors of the orientation setting of a built up that faces the adjacent building, which answers the second objective. The houses that were identified facing the adjacent buildings are mostly built by the extended family where there are several houses in a lot. The houses also share a house compound, which is a play area for the children, while for some others, the house compound is their plantation area.

Therefore, as a conclusion, the results of the study highlight and acknowledge some potential values in traditional Malay settlement settings. These values can be properly used as a reference for the preservation of the characters of the future traditional settlement. On top of that, the results can be

utilized in developing a proper planning guideline to assist the settlement development in the future. This paper also can be referred in the conscious effort to cater the issues of the modernisation of Melaka. This issue has undoubtedly affected the existence of the traditional settlements and threatened the uniqueness, values and sustainability of the built heritage of the settlements.

ACKNOWLEDGEMENTS

Thank you to the TRGS research group for an extensive discussion regarding the subject of this paper. Thank you also to Integrated Geoplanning Sdn. Bhd for the assistance in conducting drone data collection and the residence in Kg Seri Tanjung for giving cooperation throughout the data collection for this study. Thanks to the International Islamic University of Malaysia and the Ministry of Higher Education (MOHE) for the research grant Trans-Disciplinary Research Grant Scheme (TRGS/1/2016/UIAM/01/5/1). Authors also would like to sincerely thank all referees for their suggestions to improve the paper.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 181 – 192

THE ATTRIBUTES OF 'PAPAN MELEH' - ROOF EAVES DECORATION IN BAITUL RAHMAH (KUALA KANGSAR, PERAK, MALAYSIA) WITH THE HISTORIC BUILDING INFORMATION MODELLING (HBIM) APPLICATION

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Abstract

Malay building decoration components had been one of the essential elements in Traditional Malay Architecture. This study aims to look in-depth into the process of inputting the attributes data of "Papan Meleh" or roof eaves decoration in Baitul Rahmah building located in Kuala Kangsar using the HBIM application. The method of study for this paper involves three processes, which are the data collection, data process and data fusion. The findings in this study reveal that the data collection from Heritage study report is insufficient in describing the attributes of the roof eaves decoration. The data collection process involves the collection of primary data from the literature review, and secondary data from the heritage report. The secondary data have its limitation in describing the attributes of "Papan Meleh". Thus, the data process phase is done to correlate the primary and secondary data in finding its generic attributes and remodelling the 2-Dimensional (2D) into 3-Dimensional (3D) model using the HBIM software. The attributes are divided into tangible and intangible data of "Papan Meleh". After both 3D models of Papan Meleh and its generic attributes are done, both data are fused again through the HBIM software and a complete HBIM model is created.

Keywords: Papan Meleh or Roof eaves decoration, Baitul Rahmah, Malay traditional building, Historic Building Information Modelling (HBIM)

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INTRODUCTION

The use of Building Information Modelling (BIM) for cultural building heritage is known as Heritage Building Information Modelling (HBIM), where this new method of incorporating BIM and heritage studies is now a method to manage and document heritage building. The process covers the creation of parametric modelling, built by considering historical data and layered-in plug-in libraries that represent building components, which include both geometric and non-geometric attributes and relationship (Volk et al., 2014). This research aims to look into the processes involved in documenting heritage buildings, focusing on *Papan Meleh* or roof eaves decorative component in Baitul Rahmah using the HBIM application. To ease the research, the term *Papan Meleh* is defined as the Roof Eaves Decoration Component (REDC). The building and its specific component were chosen because the building itself was built by one of the royals of Perak, Raja Harun Ar Rashid. The components of the roof eaves are chosen as the main subject matter due to its unique design that can be seen in almost any Traditional Malay Buildings in different variations of design. By looking into the process of documenting the roof eaves decoration components, a generic framework of the process can be outlined as a reference for the other researchers and designers in producing possible design compositions and application to any future or existing buildings.

LITERATURE REVIEW

The literature review is divided into the review of the Malay roof eaves decoration, attributes of MTBD, HBIM and Heritage studies, HBIM modelling process, and heritage report on Baitul Rahmah. Firstly, an overview of the-roof eaves decoration was done on the variety of typologies of MTBD. Secondly, we carried out the overview of the attributes of MTBD as a whole. Lastly, the literature on the HBIM is also done to discuss its usage in the heritage study and the processes involved. Baitul Rahmah is the chosen case study for this paper.

Papan Meleh **or Malay roof eaves decoration**

The roof eaves decoration has many names, yet there is a slight difference between each of these different names. In Rashid et al., (2018), the roof eaves decoration component (REDC) is divided into three (3) types, which are ***Papan Meleh, Papan Layang*** and ***Kepala Cicak.*** This research is only focusing on the ***Papan Meleh*** component. ***Papan Meleh*** is the horizontal decorative timber roof eaves covering the timber rafters (Kayu kasau). Other names of ***Papan Meleh*** are ***Ande-ande, Papan Pator***, ***Papan Cucuran Atap, Papan Kaki Atap, Kening, Papan Tumpu Kasau, Papan Cantik*** and ***Papan Pator***. The difference in the term being used is due to the usage in different areas. For example, in Penang, the word ***Kening*** (eyebrow) is exclusively used, while other areas use other terms.

Figure 1 below shows an overview of typology for REDC. The blue annotation is the focus of this study.

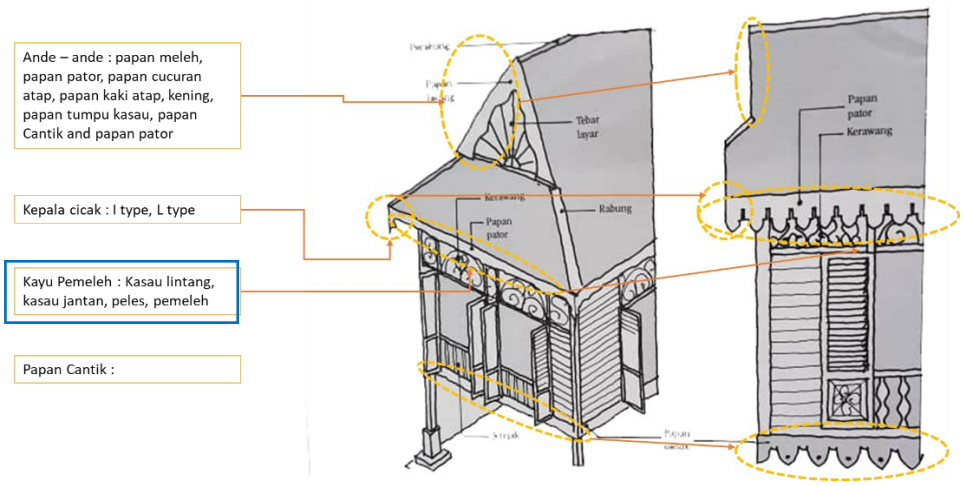


Figure 1: an overview of typology and placement of REDC
Source: (Hanafi, 2000)

The Attributes of Malay Traditional Building Decoration (MTBD)

To investigate the attributes of REDC, one must look into the general attributes for MTBD component, which are divided into two (2); tangible and intangible. Tangible data is the data that can be physically perceived, and intangible data is symbolically perceived. Both attributes are important in describing any component of the Malay buildings. The process of documenting each attribute is an important part of the heritage report and documentations. Past literature investigates the data in the form of the art of woodcarving. Thus, by reviewing the principles of MTBD, this could lead to a holistic and better understanding of the attributes of MTBD. A few works of literature that listed the principle of MTBD are reviewed. The review includes Ali's (1989) views on the Malay concept of beauty, while Othman (2005) looked into the principle of composition in creating a wood-carving design. Noor (2004), in his research, highlighted six principles of the Malay aesthetic by describing, analysing and evaluating the craft products produced by Malay artisans (refer Figure 2). Each researcher looked into a different perspective; Ali (1989) studied on the concept of beauty, Othman (2005) reviewed in the composition and Noor (2004) focused on the Malay aesthetic. However, the similarity in these three researches is that all of them concentrated on the Malay Art of Woodcarving. Wood carving is strongly related to MTBD. There is a recurring similarity between each listed principle. In Figure 2 below, the diagram shows the relationship between each researcher's principle. The first similarities are all the listed principles which can be distinguished into

intangible, tangible and both tangible and intangible (refer to Figure 2). The categorization of the tangible attributes can be quantitively distinguished, whilst the intangible components are the attributes that must be analysed through qualitative understanding. The second similarities look into the relationship between each listed principle. The diagram shows that the attributes from both tangible and intangible could be simplified into four categories, which are symbolism, nature, functional and composition (refer to Figure 3). These attributes can be used in different words, but for this research, this term is used to portray each attribute. For example, the word motif could be changed to "nature" or "vegetation". The different coding of colours in this diagram shows the different components of the relationship of the said attributes.

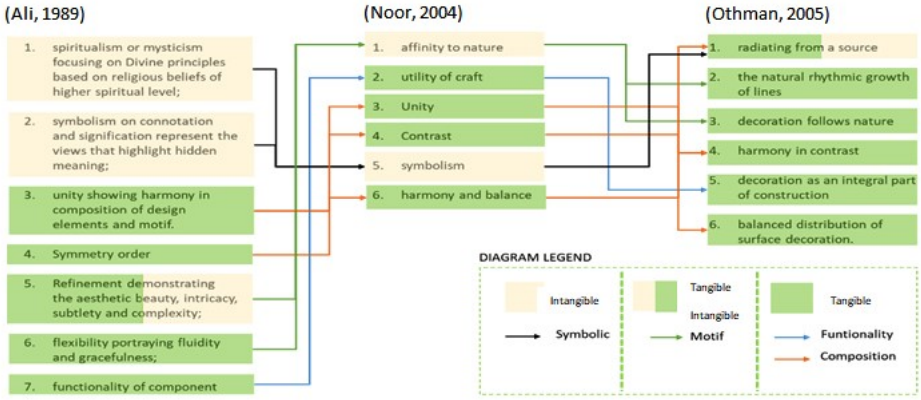


Figure 2: Malay architectural system presents the relationship of the different attributes in the decorative elements
Source: Author, 2020

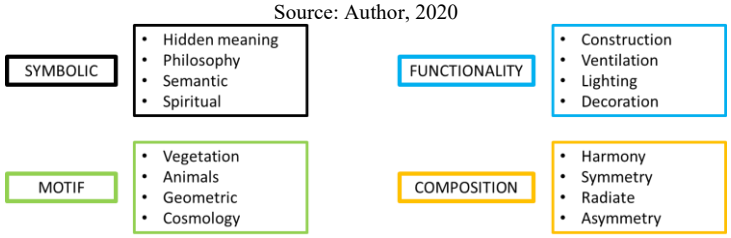


Figure 3: Attributes of MTBD
Source: Author, 2020

Detailed review on each of the four (4) attributes from Figure 3 shows a more diverse fraction of sub-attributes to be reviewed. Each main attribute (refer to diagram legend Figure 2 and Figure 3) will be further discussed in the next literature. These attributes are also supported by past research. These attributes are discussed with reference to REDC of Baitul Rahmah as a case study.

Heritage Building Information Modelling (HBIM), Heritage Studies and HBIM Modelling Process

The use of BIM for heritage studies is commonly known as the Historic Building Information Modelling (HBIM). The modelling process of HBIM from a building case study indicates the object of HBIM that comprises all building information, including tangible and intangible data. The process involves a reverse-engineering solution, whereby the finished as-built drawings of the heritage buildings are extracted from the survey (Cheng & Jin, 2006). According to Megahed (2015), the process of HBIM can be categorized into three (3) steps. The process of HBIM begins with a survey of historic buildings in order to capture data using both high-definition surveying and traditional methods. The next step involves processing the data into the construction and design of a parametric library of objects. Such models are then properly merged together, exploiting the editing capabilities to achieve a unique virtual representation of the historic building. The final step involves the fusion of data, where corresponding datasets using the BIM system define the historical object as a parametric object (Megahed, 2015). The tangible and intangible data include physical dimension, scale proportion, etc., while intangible data includes the historical facts, name of objects, symbolic meaning, etc. The tangible data helps in creating the physical 3-dimensional model whilst the intangible data provides the necessary information about the specific objects which are being modelled. The finalised HBIM models are in the form of completed engineering drawings which are comprehensive and suitable for historic conservation and management; the orthographic projections, 3-Dimensional documentation, sections, details, and schedules (Murphy, 2012).The researchers applied the same process to Baitul Rahmah as a building case study and its main subject are the REDC (***Papan Meleh***) of the buildings. This matter will be further discussed in the research methodology.

The Case Study: Baitul Rahmah, Kuala Kangsar, Perak, Malaysia

Baitul Rahmah is an aristocratic house, designed and built by Raja Harun Al-Rashid with the help of a skilled craftsman known as Tukang Sofian (Kassim et al., 2019) The house is a part of his legacy in Bukit Chandan where the building resides. Raja Harun was known to be very talented and had an eye for architecture; he was skilled with his hand, especially in the art of Malay woodcarving. Baitul Rahmah was said to be built in 1911; this is based on the handmade plaque which stated the year of 1911. The house design had an exciting fusion between the Traditional Malay architecture with British colonial style on some component areas. This study focuses on the use of REDC on Baitul Rahmah to be studied and remodelled into HBIM object as a means to record its physical looks and historical data that consist of intangible and tangible attributes.

RESEARCH METHODOLOGY

There are three (3) processes for this case study, Baitul Rahmah. The first process is the extraction of REDC from the KAED Heritage report on the Baitul Rahmah building. The second process involves modelling the decoration component from the 2-dimensional drawing into 3-dimensional modelling, based on the physical dimensions stated in the report. The extraction of the intangible data is also listed for the decoration components. The final process is fusing the 3-dimensional modelling with more intangible data of which show the attributes of each decoration component.

FINDINGS

The findings will be discussed in three (3) sequential processes: from data collection (Process 1), data process (Process 2) and data fusion (Process 3).

Process 1: Data Collection

The data collection process in this research is divided into two tasks, which focuses on the REDC of Baitul Rahmah. The first process is to collect the related data from the Heritage report of Baitul Rahmah (Heritage Lab KAED IIUM). The second process is by reviewing the current literature from books and journals. The literature is focused on the intangible and tangible data of MTBD. Both data from the heritage report and literature review are combined and correlated with the finalization of a semantic attribute to be inputted into the HBIM Data. Based on the previous literature, four main attributes are established as the Main attributes for MTBD. Table 1 shows the three (3) sides of tangible, intangible and both intangible tangible (In-Tangible) data that are taken from different literature reviews. This data is correlated with the heritage report data. The correlation process involves cross-referencing the incomplete data from the heritage report with literature review data.

Table 1: Semantic attributes from literature

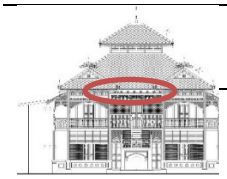
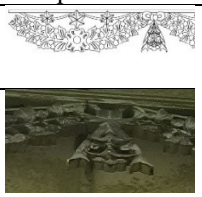
Intangible	Intangible Tangible	Tangible	
SYMBOLISM (Muhamed, 1956)	MOTIF (Shaffee et al, 2013)	COMPOSITION (Said, 2013)	FUNCTIONALITY (Denan et al., 2015)

Source: Author, 2020

The collection of data from the heritage report involves the collection of the textual and pictorial data from the heritage report in the Heritage Lab KAED IIUM on Baitul Rahmah. The data would include historical, pictorial, measured

drawing and textual information. The Table 2 below presents the data taken from the report.

Table 2: Heritage report

Placement	Component		
		**Name:** Fascia board -No Malay name was given **Material:** Timber **Influence:** Traditional Malay Architecture	**Details**: Tebuk tembus (direct piercing) technique **Description:** Carved with floral motif and figure of a hanging bat

Source: Heritage Lab KAED

In Table 2, some component names are incomplete in terms of the Malay and translated English names. The addition of "material", "details", "influence" and "description" attributes provide useful information for the tangible attributes. These attributes could be correlated with the data from the literature to enhance further attributes of the components which consists of tangible and intangible data. Step 2 is the Data Process, which involves the construction of components from the measured drawing in the Baitul Rahmah heritage report using the REVIT software, as well as the correlation of data between the information from a literature review with the heritage report data.

Process 2: 3D Modelling from REVIT

The measured drawing of the roof eaves decoration is directly taken from the AutoCAD software. From the 2D AutoCAD drawing, a 3D model is produced by exporting the drawing into the Revit software (BIM software). The process of the 3D modelling from the 2D measurement is straight forward; no problem is detected from this process. This can be seen in Figure 4 below.

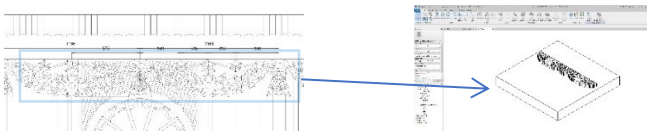


Figure 4: Detail measurement of 2D AutoCAD drawing (left), 3D modelled from 2D AutoCAD drawing (right)
Source: Heritage Lab KAED (left), Author (right)

Process 2: Correlation of Data from Literature and Heritage Report

Both data are combined into one complete data. The four main attributes that are being used as a portrayal of semantic for each component is compared with the data from the heritage report. Table 3 below shows the complete data merge from

the literature and heritage report. The heritage report is the secondary data for this research, while the literature is the primary data. Table 1 and 2 shows the attributes from the heritage report and literature review. The attributes on the material, description, details and influence portray a tangible description of the component, which is lacking from the attributes in the literature reviews except for the motif description. These attributes from the heritage report can be grouped under "descriptions" attributes, as all the attributes focus on describing the physical qualities of the component (refer to Table 3). The original description from the heritage report mentioned that the motif that was used can be merged with the motif attributes from the literature. The absence of some data such as the Malay name for the component can be inputted by looking into the available literature. For example, in the table above, fascia board is found in the heritage report only as "fascia board" which is in English terminologies. However, with reference to the other literature from the literature review, fascia board are called "Papan Meleh" in Malay, based on the work from (Hanafi, 2000). This would prove that both data are vital in giving a holistic view of the semantic attributes for each component. The table below is the finalized attributes that will be used for each component.

Table 3: finalize semantic attributes from correlate data

Measured drawing	**Attributes**
	**Name:** Papan Meleh (Hanafi, 2000)
	Symbolism: -
	Motif: Floral – unidentified plants Fauna - hanging bat
Site image	
	**Composition:** Symmetry composition from the hanging bat motif as the center
	Functional: To cover the Kasau Jantan (main rafter) from being directly exposed to sunlight and rain (Hanafi, 2000)
	Description: The component is in timber material carved using a direct piercing method and influenced by Traditional Malay architecture.

Source: Author, 2020

The process from Process 2 produces two data of a complete 3D model of the decorative components, and the finalized semantic attributes. Both data are still incomplete if they are separated. Thus, comes the next process, which is to fuse both data to get a complete HBIM data.

Process 3: Data Fusion

In Process 3, data fusion is implemented. This process involves the combination of the attributes data from Process 1 and 2 with the 3D model process data from Process 2. In order to input attributes, the first step is to open the 3D model on the component that has been created. Then, we select the "Properties Area" and click on "Family Type" (refer to Figure 5).

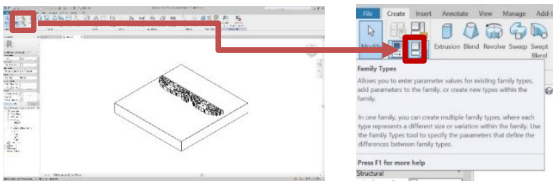


Figure 5: Properties Area to Family Type
Source: Author, 2020

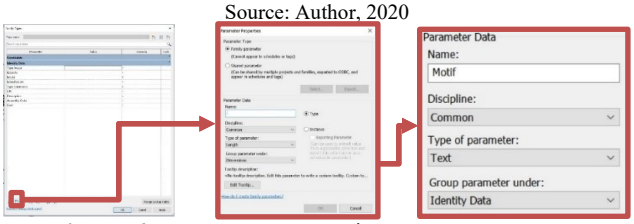


Figure 6: Parameter Properties to Parameter Data
Source: Author, 2020

From the "Family Type", we click on the Parameter Properties and the semantic data of REDC is then inputted into the Parameter Data's area. A total of 4 properties data, ranging from name, discipline, type of parameter and group parameter, are linked with the finalised attributes from Process 2. Figure 6 shows an example of some attributes that fuses into the Parameter Data of the REVIT software. The attributes consist of textual and pictorial data from the site. For textual data, the type parameter used is "text" and for group parameter, it would be placed under "identity data" (refer Figure 6). Figure 7 is an example of inputting "motif" attributes into the Parameter Data of the REVIT software. The figure below presents the completed data fusion process.

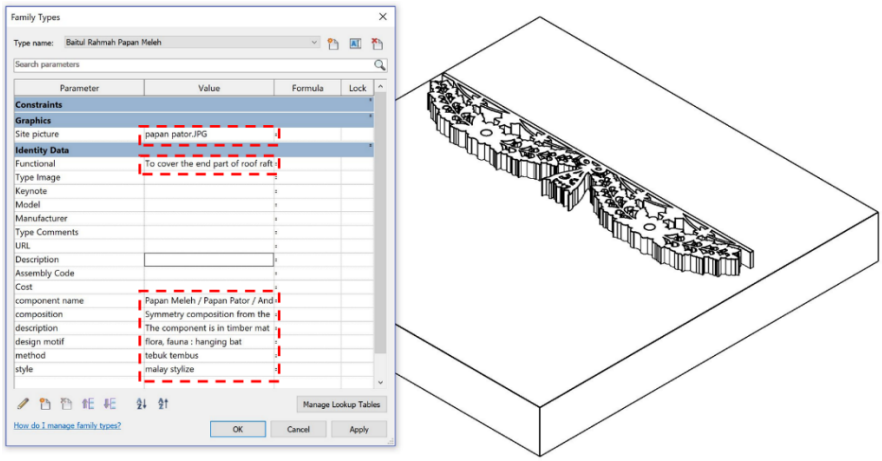


Figure 7: Inputted Parameter Data (red dotted box annotation)
Source: Author, 2020

The overall process of attribute enrichment of the Papan Meleh in Baitul Rahmah is further enriched in the 3D modelling. There are some limitations to this study. The first limitation is that the creation of the semantic attributes is limited to textual and pictorial data. Despite the fact that this data is enough to portray the semantic attributes of each component, there are still other attributes that could be explored, such as linking the component of the 3D model with a specific website by utilizing the Universal Resource Locator (URL) link function. The second limitation is in the ontological system for each 3D model, and each 3D component was modelled separately without a proper link to other 3D components. For future research, one could look closely on the ontological system of Malay Architecture. The third limitation is in the completion of the information. More data are needed to complete the full semantic attributes, especially on the name that is used to define the components. For example, from the heritage report, the name of fascia board is known to be only "fascia board" without its Malay name. Only after linking the data with the past literature that we get to know that "fascia board" is called "Papan Meleh" in Malay. To simply call it Papan Meleh is not enough, as the name is a general term or name that defines the type of decorative components that reside at the edge of the roof. Additional research is needed to find a suitable method in naming every decorative component in relation to its specific design attributes in the traditional Malay buildings, knowing this can help in understanding the application of decorative component not only for its general means but also its personal design attributes. Figure 8 presents the finalized framework of HBIM creation for MTBD.

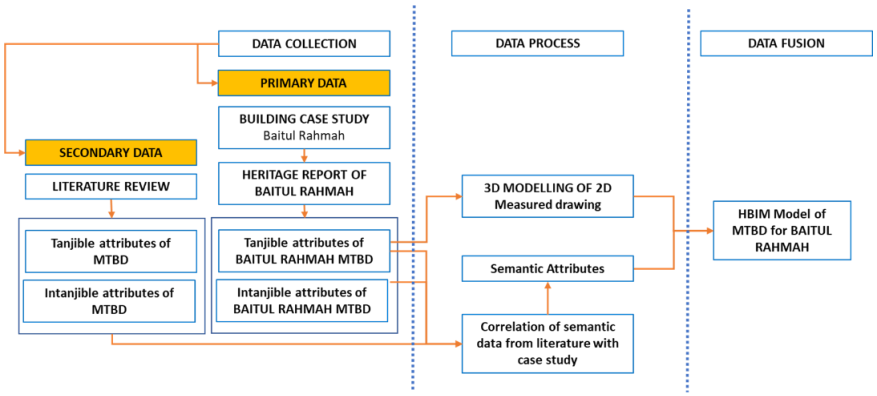


Figure 8: Proposed Framework to input attributes Data of REDC using HBIM application (REVIT)
Source: Author, 2020

CONCLUSION

The process of HBIM modelling for REDC in Baitul Rahmah is doable with a bit of limitation. The 3-step framework must be followed to get a proper HBIM model with rich information. The first step of the Data Collection is important in establishing the semantic attributes of each decorative component. This phase can be improved for future research as there can be additional attributes that could be added to this paper's semantic attributes. The second step of the Data Processing involves the process of textual data analysis and the building of a physical 3D model for each component. The finalized textual data create the primary attributes for a REDC and become the basic information that defines each decorative component in Baitul Rahmah. This data will be paired or fused with the completed 3D model of each decorative components from the same building. Fusing both data is the final process whereby it includes a specific step, as stated before. A complete HBIM data is created after the final step is done, yet there are still some limitations that are needed to be explored in the future research. This research establishes a framework that could be applied to other potential heritage building. Hopefully, this framework would be useful in the building heritage conservation industry in the field of HBIM application.

ACKNOWLEDGEMENTS

This research was supported by a grant TRGS/1/2016/UIAM/01/5/3 from the Ministry of Higher Education Malaysia (MOHE). This research is also supported by Kulliyyah of Architecture and Environmental Design (KAED) and Kulliyyah of Engineering of International Islamic University Malaysia

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 193 – 205

STREET NETWORK DESIGN, PATTERN AND CHARACTERISTICS FOR MALAYSIAN LOCAL TOWN

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Abstract
A large number of local towns with compare to another type of town in Malaysia notifying the variety which required further identification to highlight a standard in planning on this town category. Hence, this paper aims to define the basic criteria for street network of Malaysia's local town. Pasir Puteh, Baling, Rembau and Pontian were selected based on the diversity of the street network structure develop from beginning to the modern era. The towns were mapped using land use data. This study employed comparative analysis to assess similarity and differences on the principles and term of street network system. The finding suggests that local towns founded before independence retain the historical value of the street system built by the colonizer and new zone of local town is to serve the community rather than the administration. Thus, the research on how street network in local town influence vehicle or pedestrian movement is recommended.

Keywords: Local town, street network, zoning characteristics, urban patterns, design criteria

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INTRODUCTION

A local town describes as a place where people live and use it as a center for managing everyday needs (Ahmadi et al., 2009; Said and Wan Mohamad, 2017). In Malaysian history, settlement's center has been built by the leader of the state as an early colonization era. While, some urban street network used to collect natural resources, such as tin or rubber. For instance, street network in Taiping used to extract tin from the mining area to the town and then to Port Weld (Kuala Sepetang) by bus. After Independence, although the towns governed by the Malaysian state, the designs of the streets were still the same as the colonization period. This similarity is due to the structures of the towns affected by the colonizers. Before the 90s, in the era of colonization and after independence, towns thrive into a community center from a set of settlements and then become a town (Ramele et al., 2010; Harun and Jalil, 2012). At the start of the modernization period in the 1990s, the towns were built based on the National Physical Plan and established from a master plan such as Proton City, Perak (Salleh and Abdul Aziz, 2006). Thus, the history of urban development has explained the existence of a variety of street network structures in today's local towns.

Table 1: Types of towns in peninsular Malaysia

Types of Town/City	Population Size	Examples of Town/City	No. of Town/City
Global City	3.5 million and above	Kuala Lumpur, Putrajaya	2
Provincial City	1.5 to 3.5 million	Georgetown, Johor Bahru, Kuantan	3
State City	No Minimum Size	Kuala Terengganu, Kota Bahru, Alor Setar, Temerloh	8
Main City	More than 100,000	Sungai Petani, Kulim, Taiping, Shah Alam, Sepang	47
Local Town	10,001 to 100,000	Goping, Tapah, Kuala Kangsar, Banting, Kuala Pilah	223

Source: JPBD, 2016; Mansor, 2011; SPAD, 2012

Among other types of towns, local towns have the smallest population, ranging from 10,001 to 100,000. Table 1 shows that Malaysia has 223 local towns, meaning that local towns have the highest number of towns in Malaysia, more than global city, provincial city, state city, and main city. Thus, with Malaysia's large number of local towns, the demand for study on this type of town is higher because the impact represents majority of towns in Malaysia. Besides, some studies on cities in Malaysia concentrate on urban morphology and historical values of the historic site of Malaysia such as Malacca and Georgetown (Ramele

et al., 2010; Shamsuddin, 2011; Harun et al., 2013). Also, studies on the street network in cities are concentrated in major cities because of the rapid development of these types of towns (Moeinaddini et al., 2014). Thus, study on street network design, pattern, and characteristics is needed to understand local town as the dominant town for Malaysia. Therefore, this study aims to identify the street network criteria for Malaysia's local town consisting of zoning characteristics, street network design, and street network patterns. This study employed a depth study by Marshall (2005) in defining and understanding of the system and structure of street network in a town. The purpose of this study is to understand the characteristics as well as the structure of street network used to represent local town in Malaysia.

Zoning Characteristics

Towns in Malaysia were formed in the 1970s to the present in rapid development growth. Development experience shaped the physical of Malaysian local towns including the environment of the street network (Anwar et al., 2011; Mamat and Abdul Aziz, 2018; Mansor et al., 2012; Wan Mohamad & Said, 2014). Studies of urban morphology have explained the formation of the physical characteristics of local towns now formed by the ruler's ideology for the towns (Ahmadi et al., 2009). This formation clarified the zoning created based on their characteristics in Malaysian local towns (Wan Mohamad & Said, 2018). Harun and Jalil (2012) identified the three-stage development of towns in Malaysia during (i) the era of the Malay Sultanate, (ii) the era of colonialism, and (iii) the era of the Malaysian state. Accordingly, street network zoning characteristics in local towns are based on old zone physical identity (Malay Sultanate era and colonization era) and the new area (Malaysian government era).

Street Network Design

Street network design forms in the typology of ABCD pose the structure in complicated classification (Marshall, 2005). The design is used to characterize the street network type, involved street network patterns, design characters, and design history. For example, bilateral layout or B-type consists of two gridiron and parallel street network patterns. The design is developed when most people used to walk, carry (e.g. cattle car) and car (e.g. car, van, motorcycle and bus) to travel. Hermawan & Ismiyati (2009) used the concept of ABCD typology to understand the development of Semarang City's street network.

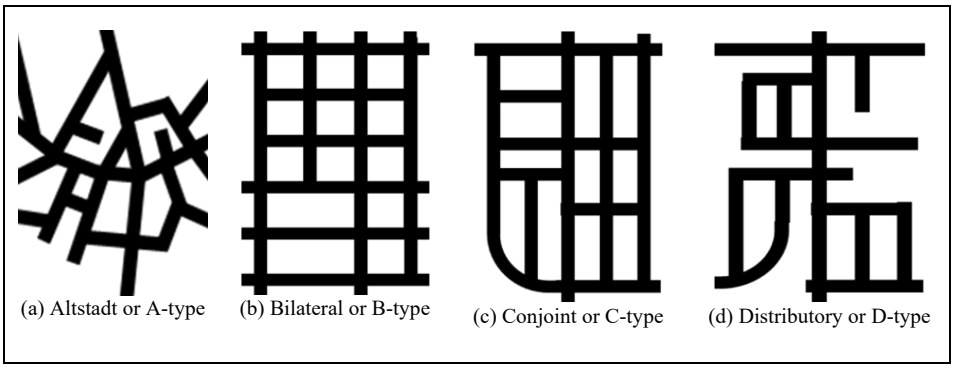

Figure 1: The form of street network design for ABCD typology principle

This study, therefore, used the typology of ABCD to be observed in defining the street network design in Malaysian local town. It involved A-type, B-type, C-type, and D-type street networks (Figure 1). This selection is because the intricate distinction in defining model types can help this study to explore the outcomes of street network structure in Malaysia.

Street Network Design

Street connections in town have created different patterns of street networks that influence street connectivity. There are 32 studies from 1920 to 2001, as recorded by Marshall (2005), that used different definitions of types of street network patterns in urban planning, transportation system and engineering management.

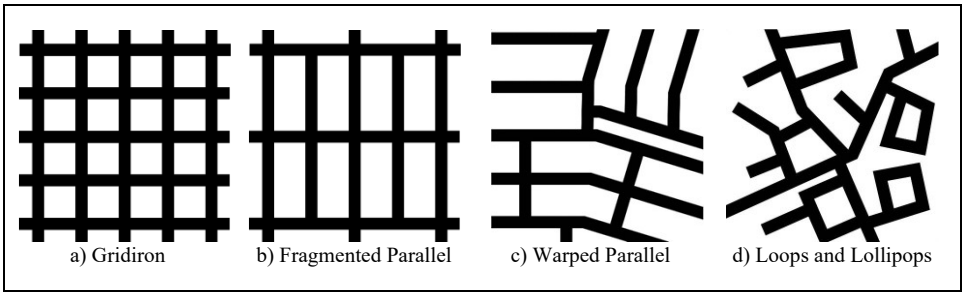

Figure 2: The types of street network pattern

Figure 2 trends such as gridiron, fragmented parallel, warped parallel, and loops and lollipops are correlated with affecting the frequency of walking, riding and transportation usage (Marshall and Garrick, 2011), death rates (Moeinaddini *et al*., 2014), and helping to define health care experiences (Marshall *et al*., 2014). Hence, this research used trends in defining the typology of street network patterns in local town as shown in Figure 2.

METHODOLOGY

There are 223 local towns in Malaysia, according to Table 2. There are two groups of urban centers, major and minor (Mansor, 2011). The former has 30,001 to 100,000 inhabitants. The minor, however, has a smaller population of between 10,001 and 30,000. Therefore, four towns were selected for discussion to understand the street network of local towns. To represent the major settlement center, Pontian and Baling were chosen. Pasir Puteh and Rembau were chosen for the minor middle. Towns are chosen similarly to have a fair decision towards the towns for both types of urban centers. The four towns were selected because they have different street network styles. Depending on the period the town began to exist, the establishment of their street network; the period is according to the colonization era, independent era, and modernization era. Besides, there are different types of street network design and street network patterns in the street network in those towns.

Table 2: Type of Urban Center in Malaysian Local Town

Urban Center	Population Size	Examples of Town	No. of Town
Major Settlement Center	30,001 to 100,000	Baling, Kuala Selangor, Kuala Pilah, and Jasin	30
Minor Settlement Center	10,001 to 30,000	Pasir Puteh, Rembau, Raub, Kuala Kangsar, and Kuala Perlis	193

Source: Mansor, 2011; SPAD, 2012

The land use data obtained from Jabatan Perancang Bandar dan Desa (JPBD) Semenanjung Malaysia was mapped to gather the information of town characteristics, structure of street network, and formation of streets. The data was categorized according to (a) zoning characteristics, (b) street network design, and (c) patterns of street network as variables for this study. From the mapping and categorization, the information of the selected towns was compared accordingly to define and identify the similarity and differences of the variables. Firstly, zoning characteristics of the towns was identified according to the physical character of the towns. Secondly, the street network design determined from mapping process based on the formation of the street network structure. Lastly, the patterns of street network were determined according to formation of streets connected with each other. This study employed comparative analysis to assess the similarities and differences of the variables identified in each town based on the principles suggested by Marshall (2005). The discussion is according to the interpretation of triangulations identified from the comparisons done for each

selected town. The findings from selected towns, therefore, have the potential to show the identity of street network for local towns in Malaysia.

RESULTS AND DISCUSSION

The findings of this study discussed according to the variables of the criteria, which consist of zoning characteristics, street network design, and street network patterns.

Zoning Characteristics of Malaysian Local Town

Figure 3 shows the zoning of the physical character identified in four towns, (a) Pasir Puteh, Kelantan, (b) Baling, Kedah, (c) Rembau, Negeri Sembilan, and (d) Pontian, Johor.

Figure 3: Town zoning of four selected local towns (2019)

The town with physical characteristics is categorized as an old area, particularly the street network that formed before Independence. The character of street network designs and patterns was influenced by the grid and radial European street network styles. Besides, the Malaysian government preserves the environment of the old zone under the National Urbanization Policy II (JPBD, 2016). For example, while travelling on the street network, people in Baling, Kedah, can still experience the old façade of shophouses with art decoration on windows. In Pontian, Johor, the trees with high and significant character show the characteristic of the ascent of the old zone. Baling, Kedah's colonial buildings demarcated the colonial era history. Similarly, the towns that preserved and maintained under the National Urbanization Policy II (JPBD, 2016) shows the old area possesses its unique heritage, such as history, architecture, identity, and environment that shaped the characteristics of the street network.

Colourful Shrubs | Modern Design of Shophouses

Figure 4: Environment of Pontian, Johor as the eco-tourism town in Malaysia (2017)

In the meantime, street network characteristics for the new zone are different. New zone is known as the town area that was established in 1957 after Malaysian Independence. Likewise, the town's development is focused on socio-economic growth, such as industrial growth, education, and leisure. Therefore, the layouts and patterns influenced the characteristics of the street network for the new zone. The spatial layout of street characteristics used to achieve the town development theme. For example, Pontian, Johor is designated as an eco-tourism town by National Urbanization Policy II, is developed from a mixture of parallel patterns and loops. This street network shows that the pattern mix used to distinguish ways of pedestrian and transportation. For instance, according to the observation in Pontian Town, the environment of new zone is decorated with colourful shrubs like *Eugenia oleina* (Kelat Paya) and *Ficus benjamina* (Weeping Fig) to attract tourists. Moreover, the shophouses façade is built without art decoration with basic geometry to highlight the new face of tow with modern styles (Figure 4). The local towns, therefore, reflected by the physical

characteristics of the old with different characteristics of the street network. During travel in Malaysian local towns, the variety of street network environment in old and new areas will optimize the representation of pedestrian actions.

Street Network Design of Malaysian Local Town

Table 3 shows three types of street network design identified from four selected towns, namely, bilateral (B-type), spousal (C-type) and distributor (D-type). The proposed street network for walking and carriage riding in Pasir Puteh also defines bilateral or B-type street network design. Walking in a grid shape, while walking on the streets, the layout provides four-way directions for the pedestrian. Whereas, street network design conjoint or C-type is a common type found at the town's expansion. This design is generally identified in new urban areas like Pontian and Rembau. The model was used in smoothing the traffic flow to support transport such as a car or bus. Finally, the layout of the street network with a hierarchical process is distributory or D-type. D-type design works in a hierarchy, collaborating with different types of streets, as opposed to B-type and C-type streets. In modern street networks, it is commonly found to differentiate the traffic flow depending on the particular area (Said and Wan Mohamad, 2017). Pontian Street, for example, is designed in Pontian as the main roads used to handle heavy traffic flow from other roads. Therefore, the model styles define the system in terms of travel mode, street hierarchy, and traffic flow to the street network in the towns. Therefore, in Table 3, the study of street network design for Pasir Puteh, Baling, Rembau and Pontian is provided in the identification of street network design for Malaysian town.

Table 3: Types of street network design in Malaysian local town

Street Network Design	**Pasir Puteh**	**Baling**	**Rembau**	**Pontian**
Bilateral or B-type	/			
Conjoint or C-type	/	/	/	/
Distributory or D-type	/	/	/	/

The street network design styles found in Pasir Puteh, Baling, Rembau and Pontian are shown in Table 3. In all four selected towns, namely C-type and D-type, there are two types of street network designs identified. This identification means that street network design in Malaysian local town was based on modern principles of urban planning that took into account the movement of pedestrians and the flow of transport which met the function of C-type and D-type design. Relatively, local towns in Malaysia were rapidly developed during the transportation era, which was through the Malaysian National Plan, specifically after Malaysian Independence in 1957. Meanwhile,

among the four selected towns, Pasir Puteh is the only town with B-type street network design. This B-type identification shows that there are local towns in Malaysia with B-type street network design where walking and carriage riding were built, which created four-way directions. B-type was only available in some local towns, particularly the towns that were established during the colonization period (1511 to 1957). The C-type and D-type are therefore required to represent Malaysia's street network. Meanwhile, in Malaysian local town, the town which includes B-type presents the distinctive design of the street network. The town with a B-type has the character of the old design that influences pedestrian preferences in finding a path in the town.

Street Network Patterns of Malaysian Local Town

The street network patterns identified in four selected local towns are shown in Table 4. In Pasir Puteh, Baling, Rembau, and Pontian, there are two types of street network patterns that are fragmented parallel patterns as well as patterns of loops and lollipops. This identification means that street network patterns are based on those patterns in Malaysian local town. However, from the trends, this shows that, while walking and automobiles were the fundamental transportation modes, Malaysian local towns were quickly developed after Malaysian Independence in 1957. This indication describes that the streets were arranged with hierarchy in Malaysian local towns where there are streets for vehicles, pedestrians, and a mix of pedestrians and vehicles. Pontian Street, for instance, is known in Pontian as the main road for movement of vehicles, while Pantai Street is defined as a local road for mixed-use of pedestrians and vehicles.

Table 4: Types of street network pattern in Malaysian local towns

Street Network Patterns	**Pasir Puteh**	**Baling**	**Rembau**	**Pontian**
Gridiron	/			
Fragmented Parallel	/	/	/	/
Warped Parallel		/		/
Loops and Lollipops	/	/	/	/

Table 4 shows that Baling and Pontian are two local towns with warped parallel patterns. This indication shows that the trend is present only in local towns planned to follow the form of land area and current main roads. In Baling, at Liku Road, the twisted parallel patterns are created to fit the main road line that is Badlishah Street. In Pontian, to protect the green area, the warped parallel patterns were created at Medan Koop Road. Besides, Table 4 also reveals that Pasir Puteh is a local town with a gridiron pattern. This identification shows that the town area with a gridiron pattern was developed during the period when the

primary mode of travel was walking and carriage. The street network is distinguished by the old area which formed during the colonial era. However, since the National Urbanization Policy II does not list Pasir Puteh as a historic town, the character of the old zone is not well preserved (JPBD, 2016). The characters of the old shophouses façade at Pasar Lama Road, for example, are unobtrusive because the state did not license the area. As a result, the towns protected by the National Urbanization Policy II as a historic town are required for the gridiron-like street network in order to maintain the character as unique (JPBD, 2016). Hence, fragmented parallel patterns, as well as loops and lollipops, are compulsory to represent Malaysian local towns ' street network. In the meantime, the town with twisted parallel and gridiron patterns is reflecting the street network that had the preferences to change as necessary and granting the opportunity to influence street connectivity.

CONCLUSION

The identity of a street network of a local town is defined according to the criteria from 223 local towns listed in Malaysian, including population, type of urban center, zoning characteristics, street network designs, and street network patterns. Therefore, the street network requirements representing local towns in Malaysia are listed in Table 5.

Table 5: The criteria for street network of Malaysian local towns

Criteria	**Components**	**Descriptions**
Population	30,001 to 100,000	More population than minor settlement center
	10,001 to 30,000	Less population than major settlement center
Types of Urban Center	Major Settlement Center	Consist of two sets of boundaries
	Minor Settlement Center	Consist of single set of boundary
Zoning Characteristics	Old Zone	Preserved area by NUP 2 2016 as historic town
	New Zone	Area in the town developed after Malaysian Independence in 1957
Street Network Designs	B-Type	Identified in local town
	C-Type	Identified in local town
	D-Type	Identified in local town
Street Network Patterns	Gridiron	Identified in local town
	Fragmented Parallel	Identified in local town
	Warped Parallel	Identified in local town

Loops and Lollipops	Identified in local town

Based on the criteria shown in Table 5, understanding the identity of a street network for the local towns in Malaysia is evaluated. Local town population includes categories (a) 10,001 to 30,000 and (b) 30,001 to 100,000 leading to categorization of urban center type as either major settlement center or large settlement center. The physical characteristics create a town classification that only refers to a community that has an old and new area or a new zone. In particular, the town's old neighbourhood is protected and preserved as heritage towns under the National Urbanization Policy II (JPBD, 2016). Though, after Malaysian Independence in 1957, the town included as a new area is rapidly developing. Street network of Malaysian local town has advantages on designs because it has B-type, C-type and D-type layout. The street network patterns identified which are gridiron, fragmented parallel, warped parallel, as well as loops and lollipops represent the local town developed in the era according to different types of transport mode.

The discrepancies between two zoning features that are old and new areas in a town suggest an interpretation of a street network's identity portrays the local town's streetscape. The variety of street network layouts and street network patterns means that eliciting street network communication leads to the street network architecture system of local town. This research, therefore, demonstrates the importance of street network parameters in the field of urban planning to the fields of urban landscape design, architecture science, social behaviour, and environmental psychology. Accordingly, this study contributes to future research on how human behaviour that reflected from the criteria of street network in Malaysian local town.

ACKNOWLEDGEMENTS

The Ministry of Education Malaysia funds this study under Fundamental Research Grant Scheme, FRGS (Research Code: FRGS/1/2018/SSI11/UMK/03/1, R/FRGS/A1200/01672A/002/2018/00552).

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 206 – 218

IMAGE AND IDENTITY OF MALAY ROYAL TOWN IN MALAYSIA

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Abstract

The Malay Royal towns in Malaysia are typically the location for the royal administrative district. The history for these royal town's ties back to the Malay Royal Institution. Unfortunately, some towns are slowly threatened. Therefore, this paper aims to investigate the town's unique character that shapes its image and identity intending to identify the attributes and how the people perceived them. The study adopts the case study research approach with the use of multiple sources of evidence which involved the convenience sampling method of the local people in the Royal Town of Kuala Kangsar, and Pekan. The finding shows that the royal town's preservation should include both tangible and intangible characters such as historical buildings, historical stories, and cultural events to support the identity of the place.

Keywords: Urban heritage, Malay Royal town, image and identity, preservation

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INTRODUCTION

Malay dynasties in the Peninsular inherited their status, directly or indirectly, from the Sultanate of Malacca, which was the dominant power in the Strait of Malacca in the 14th century. Members of the Malacca's ruling dynasty fled to Perak and Johor after and re-established themselves around the Peninsular and these results in the formation of Malay towns called the Royal towns. There are several royal towns exist in Malaysia, namely; Arau in Perlis, Klang in Selangor, Seri Menanti in Negeri Sembilan, Anak Bukit in Kedah and Muar in Johor (Harun et al., 2015). The Royal towns in Malaysia had significant influence from the early Malay Sultanate that sets the old establishment for the urban setting in Peninsular Malaysia. The development of civilization of a Malay Royal town and inhabitants can be seen from the physical form that still exists nowadays. The town is the ultimate destination and memory of the struggle and glory of human civilization (Heryanto, 2011).

Furthermore, the Royal town is an embodiment of culture, not only in the physical environment and morphological are rarely accommodates the diversity of structures socio-cultural that have been formed in the area (Harun et al., 2015). Each of these Royal towns has its own historical and cultural characteristics that help to distinguish between these towns through the alignment of minor or significant building fabrics, forming the area into valuable urban masterpieces (Vernières & Kluijver, 2012). These towns are known as Malaysia's heritage that needs to be preserved.

However, its identity is slowly eroding due to its characteristics are being threatened with improper planning and modernisation (Samsudin et al., 2018). The physical environment and characteristics often used to justify the formation of the Royal towns rather than the human activities, meanings and cultural. The overall aim of this paper is to investigate the unique character of the Malay royal town. The unique character will include tangible and intangible elements that form the town's image and identity. Hence, in this study, two (2) objectives have been set, which is the first (1) is to identify the attributes that form the image and identity of the Royal town. The second (2) objective is to understand how the local people perceive the current royal town. A questionnaire survey, semi-structured interview, site observation and archival research had been applied in this study to achieve the main aim and objectives. As the research focuses on two (2) case study areas of Royal town, an overall picture of the concept of Malay Royal town in Malaysia can be generalized. Ideally, the findings from this research can help to trigger significant interest in the knowledge and understanding of the Malay Royal towns in Malaysia, especially for the national heritage.

RESEARCH BACKGROUND

A royal town is defined as a town that has a high value in terms of historical and cultural significance and shows a strong relationship between the growth of the community and the development of the urban landscape, especially in terms of the built elements (Royal City Comprehensive Plan, 2009). Formally, it is believed that the concept of the Royal town was introduced in the late 18th century to segregate the authority between a local ruler and colonial dictatorship (Samsudin et al., 2018). Syed Zainol Abidin (1995) stated that a historical and old town or a city needs to integrate the existing intangible and tangible values in its local planning and development. The place must portray its outstanding local identities such as diversity of cultural and local activities, customs and local heritage and be able to highlight its distinctive urban form features. The Malay royal town is an excellent example of a Malay traditional town which is based on the presence of all eight components of a Malay traditional town (Fig.1), namely; the palaces, field, marketplace, mosque, village, river, gateway and fortress elements (Mohmad Shukri et al., 2018).

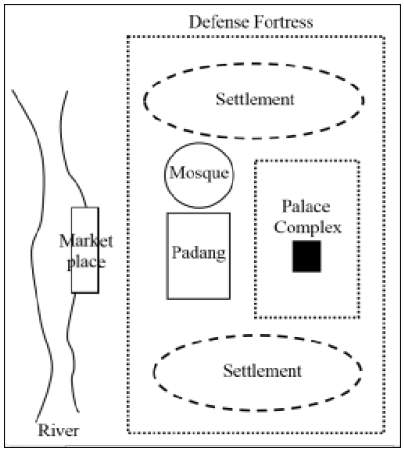

Figure 1: The physical components of Malay Royal Town
Source: Mohmad Shukri et al. (2018)

Image and identity attributes of an urban heritage area

Conservation of heritage values through identifying, recording, analysing and protecting heritage and cultural resources is critical because it provides a sense of identity and continuity of a place (The Importance of Heritage Conservation, 2020). The place identity theory, according to Twigger-Ross & Uzzel (1996), is guided by four (4) principles, namely; distinctiveness: the values that make a place one of a kind and unique, continuity: the values of historical and nostalgic, self-esteem: the values like pride, sense of belonging and attachment and self-

efficacy: the need to feel safe and comfortable. These four aspects of place identity must be equivalent to support place identity (Breakwell, 1993). Ginting (2016) had further developed the theory and came out with the attributes that help to shape the image and identity of an urban heritage district (Table 1). Hence, those attributes were adopted in this study based on the local context. Her findings also suggested that two (2) of the main characteristics that shape the identity of a heritage district are the nostalgia elements and historical buildings.

Table 1: Attributes of Place Identity in Urban Heritage Area

Distinctiveness	**Continuity**	**Self-Esteem**	**Self-Efficacy**
Accessibilities	Historic buildings	Historic buildings	Signage
Historic buildings	Historic stories		Public transport
Local product	Cultural activities		Parking
Cultural activity	Pedestrian		Pedestrian
	Nostalgia		Facilities

Source: Ginting (2016)

METHODOLOGY

The method for this study employed a case study approach to determine the local people's perception of the town's attributes that help to shape the town's place identity with the use of multi-sources of evidence. A case study approach is used to generate an understanding of a complicated issue in its real-life context (Robert, 1986). This research was conducted in the Royal Town of Kuala Kangsar, Perak and Pekan, Pahang where both royal families are the direct descendant from the old kingdom of Malacca Sultanate (Ahmad Fawzi et. Al., 2002). This factor gives an exciting idea to conduct a study on the town's identity to see if there are any similarities in the ideologies behind the unique character of both towns. The selection of participants for this study was based on the convenience sampling, and according to the sample size method by Miles & Shevlin (2015), the sample size derived for this research stands 120 per case study. Thus, two hundred forty respondents (240) which include adult local people were involved with the questionnaire survey. The survey questions were adopted from the previous study by Ginting (2016) where the author managed to come out with the attributes that shape the identity of a heritage district based on the four aspects of place identity (Table 1). The survey also had been conducted using 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Other than that, site observation, semi-structured interview and archival research method had been conducted to develop a deeper understanding of the town's current condition and the historical and cultural background.

FINDINGS AND DISCUSSION

The data were analyzed through descriptive statistical measurements using SPSS. A comparative data analyses later were undertaken to identify the similarities between two case study in a way to generalize the overall picture of the unique character of Malay royal town in Malaysia. The results of the analysis show that several tangible and intangible elements defined the image and identity of the royal towns. The physical component comprises the aspects of the natural landscape, the urban structure and architectural features (Harun et al., 2015). Meanwhile, the intangible includes the social background and cultural significance of human activities in the study area.

Malay traditional town components

According to Mohmad Shukri et al. (2018), the royal town is an example of a Malay traditional town based on the presence of its eight (8) components; palaces, field, the marketplace, mosque, village, river, gateway and fortress elements (Fig.1). From the findings, the data shows that both study areas are consisting of the Malay traditional town components as follows;

Table 2: Malay traditional town components in study areas

Component	Kuala Kangsar	Pekan
1. Royal Palace	Iskandariah palace	Abu Bakar palace
2. Mosque	Royal mosque Ubudiah	Sultan Ahmad Shah Mosque
3. Public open space	Pavilion Square (Polo field)	Pekan Square
4. Marketplace	Kuala Kangsar Market	Pekan Market
5. River	Perak River	Pahang River
6. Village	Kampung Bukit Chandan	Kampung Padang Polo
7. Fortress element (Sense of demarcation)	Situated on top of the hill and surrounded by settlements. River and forest act as a clear boundary of separation between the royal administrative district and other areas.	Settlements surround the palace complex. River and forest act as a clear boundary between the royal administrative district and other areas.
8. Gateway	Kuala Kangsar gateway	Pekan gateway

Source: Author (2019)

The place identity aspects in the royal town

Table 3 shows the overall analyses between the two study areas. The highest mean score collected is under the element 'self-esteem' with rating 4.15. Followed by 4.12 for the 'continuity' aspect, 3.97 for distinctiveness and 3.87 for self-efficacy. The results also indicate that the royal town characteristics are affecting the local people by elevating their values of self-esteem, continuity, distinctiveness and self-efficacy.

Table 3: Overall Comparative analyses between two studied areas

Place Identity Aspects	*K.Kangsar* Mean	*Pekan* Mean	*Total* Mean
Distinctiveness	3.83	4.10	3.97
Continuity	4.08	4.16	4.12
Self-Esteem	4.11	4.19	4.15
Self-Efficacy	3.72	4.02	3.87

Source: Author (2019)

Table 4 shows the respondents' perception of self-esteem aspect in research areas. Three research elements are involved, namely; evaluation, pride, and attachment which are labelled as EV, PR and AT respectively. The highest mean score is 4.38, and the lowest is 3.54, and both are under EV element for *Pekan* research area. The complete tabulations of mean scores are as follow;

Table 4: Respondents' perception of Self Esteem Aspect in Research Areas

	Statements	**K.Kangsar** Mean	**Pekan** Mean	**Total** Mean
EV	Good public amenities.	3.54	3.78	3.66
	Living cost is affordable.	3.73	3.68	3.70
	Enough public facilities.	3.99	4.38	4.18
PR	Ability to feel the Royal sovereignty when seeing Buildings with grandeur architectural.	4.10	4.19	4.15
	Malay traditional design, state's symbols, King's images & the use of yellow and golden colours.	3.88	4.12	4.00
	Formal landscape.	3.78	4.04	3.91
	The Royal customs ceremonies.	3.87	4.07	3.97
	Festive lighting arrangement.	3.78	3.88	3.83
AT	Feel part of this town & willing to contribute.	3.91	3.99	3.95
	Feel sad if this component demolished:			
	Palaces	4.56	4.34	4.45
	Royal Mosque	4.54	4.41	4.48
	Royal Mausoleum	4.48	4.37	4.43
	Historical buildings	4.46	4.43	4.45
	Jetty and River valley	4.31	4.35	4.33
	Public square/field	4.20	4.31	4.25
	Traditional Villages	4.43	4.40	4.42
	Market	4.11	4.28	4.19
	Royalty/Nobility Residence	4.37	4.34	4.35

EV = Evaluation PR = Pride AT = Attachment, Value Format: 1 = strongly disagree, 5 = strongly agree

Source: Author (2019)

Based on data in Table 4, majority of the respondents feel that the overall quality of public amenities, facilities and the living cost are quite good, and this was supporting the elements of overall evaluation that shapes the self-esteem aspect

of the town. Most of the respondents with mean score 4.15 agreed that they could feel the greatness of Malay royal institution when they saw buildings with grand architectural design with the use of state's symbols, flags and king's images on buildings and street decorations. Use of the colour yellow and gold have added to the feel of greatness towards the royal institution (4.00). These also followed by formal landscape design (3.91), witnessing royal ceremonies (3.97) and even the festive lighting during nighttime (3.83). This is in line with Shabak et al. (2015), who stated that symbols and history of culture increase feelings tied to a place. These characters help to enhance the elements of pride that crucial in shaping the self-esteem aspect of the town's identity. As functional and emotional ties are essential in forming place identity (Ujang, 2012) therefore, most respondents (3.95) feel that they are part of the study area and willing to contribute to the town. Also, place attachment is essential to make a place to be successful (Shabak et al., 2015). Respondents are unhappy if the characteristic of the study area is abandoned, especially the royal mosque (4.48), the palace (4.45), and the historical buildings (4.45). This is due to the firm and unique historical values that show high attachment to the town in which helps to shape the self-esteem aspect of the town's identity.

Table 5 shows the respondents' perception of the continuity aspect in research areas. Two research elements are involved, namely; nostalgia & familiarity and value, which are labelled as N/F and VA, respectively. The highest mean score is 4.41 under VA element for *Pekan* research area. The lowest mean score is 3.60 under N/F element for Kuala Kangsar research area. The complete tabulations of mean scores are as follow;

Table 5: Respondents' perception of Continuity Aspect in Research Area

	Statements	**K.Kangsar** Mean	**Pekan** Mean	**Total** Mean
	Feel interested & impressed with the following;			
N/F	History of Malay Sultanate.	4.30	4.13	4.21
	History of town opening by Malay Rulers.	4.13	4.14	4.13
	History of British Colonization.	4.20	4.02	4.11
	The town reminds me of childhood memories.	3.60	4.03	3.82
	Feel interested with the following views:			
	Majestic view of Palaces	4.34	4.36	4.35
	Picturesque view of Royal Mosque	4.40	4.41	4.40
VA	Panoramic view of the River Valley	4.06	4.11	4.08
	View of traditional Malay houses	4.12	4.17	4.14
	The scenery of Royal/cultural ceremonies	4.13	4.27	4.20
	The scenery of people various activities	3.80	4.03	3.92
	Historic buildings and areas are well preserved	3.83	4.12	3.97

N/F= Nostalgia & Familiarity VA = Value, Value Format: 1 = strongly disagree, 5 = strongly agree

Source: Author (2019)

The number of respondents who agreed on the continuity aspect of the study area was quite high (mean score 4.12) (see Table 3). Only local people will have a strong perception of their personal experiences in the past. Personal experience is mostly a memory when they visit the research area to involve in social gatherings or witnessing a royal ceremony that is still functioning or memory while taking a walk and enjoying the scenery along the riverside. One of the elements that support the aspect of continuity is nostalgia & familiarity. Majority of the respondents with mean score 3.82 agreed that the town areas reminded them of their childhood and many unforgettable experiences such as witnessing the royal parade along the roadside. Respondents also are very proud and eager to know more about historical stories. The heritage buildings configuration along the research area describes all two existing authorities during the early time of the form of the Royal towns, i.e. Malay Royals and British Colonial. Thus, it is perceived by the local people in maximum. Another element that supporting the continuity aspect of the royal town is an element of value. Respondents' perceptions of the preservations of the heritage buildings in both towns are quite good (3.97); however, some of the respondents complained about the abandonment of some heritage buildings during the interview. A site visit has shown that some of the heritage building privately belongs to the royal families, and some are administrative buildings such as schools, religious buildings and offices.

Table 6 shows the respondents' perception of distinctiveness aspect in research areas. Two research elements are involved namely; landmark and uniqueness & local character, which are labelled as LA and UN respectively. The highest mean score is 4.54 under UN element for *Pekan* research area. The lowest mean score is 3.10 under UN element for Kuala Kangsar research area. The complete tabulations of mean scores are as follow;

Table 6: Respondents' perception of Distinctiveness Aspect in Research Area

	Statement	**K.Kangsar** Mean	**Pekan** Mean	**Total** Mean
	This component act as an essential landmark:			
	The grand Palaces	4.10	4.43	4.26
	Royal Mosque	4.18	4.41	4.30
	River Valley	3.92	4.08	4.00
	Market	3.34	3.95	3.65
LA	Villages	3.42	3.83	3.63
	Public Square/Field	3.55	4.28	3.92
	Royal Mausoleum	3.79	4.30	4.05
	Old shophouses	3.62	4.06	3.83
	Historical buildings	4.00	4.51	4.25

	Royalty residence	3.88	4.08	3.98
	Bridges	3.93	4.24	4.09
	The presence of the King.	4.47	4.54	4.50
	The place for the Royal ceremonies:			
	Palaces compounds	4.23	4.38	4.31
	Royal Mosque	4.06	4.17	4.11
	Royal Mausoleum	3.70	4.13	3.91
	Jetty & River valley	3.68	3.67	3.67
	Public square/ field	3.43	4.13	3.78
	Main roads	3.50	3.98	3.74
UN	Located nearby the palace:			
	Royal Mosque	4.10	3.88	3.99
	River Valley	3.83	3.83	3.83
	Royalty residence	4.05	3.93	3.99
	Public square/ field	3.31	3.95	3.63
	Royal Mausoleum	3.87	3.94	3.90
	Market	3.10	3.69	3.40
	Educational institution	3.52	3.65	3.59
	The town consists of various districts.	4.29	4.31	4.30
	Unique and attractive local products.	4.41	4.38	4.40

LA= Landmark UN = Uniqueness & Local Character, Value Format: 1 = strongly disagree, 5 = strongly agree
Source: Author (2019)

As per demonstrated in Table 6, most respondents could effortlessly portray the place with the help of the royal town's components, namely; palace, mosque, field, or historical buildings, bridges and old shophouses as the landmark. It helps them in imagining and accessing the areas in the town. Lynch (1960) suggested that the study area is relatively different from other places because one of the characteristics of the distinct area is 'imaginable'. According to the respondents (mean score 4.50), the presence of the king in the town acts as the symbol of sovereignty and become a significant factor for the town's uniqueness. Some areas in the royal towns are known to be the locations for the royal or cultural ceremonies. These events often held at the palace's compound, riverside and even along the main roadside near the palace area. It shows that the main roads in the royal towns are open for cultural activities during royal ceremonies. It has attracted not only local people but also the tourist to stand along the roadside and witness royal ceremonies. This is to agree with the statement; events tend to attract most tourists to experience a culture and distinguish it with another culture suggested by Ujang (2012).

Most of the respondents (with mean score 4.30) agreed that the royal town areas could be categorized into various districts. The components of the royal town were located near to the palace area. However, most of them think that the location of the current market building was not situated near the palace area.

It is also expressed by the respondent, the original site of a marketplace in the royal town was located along the riverside, where the unique place of trading activities used to happen. Based on the field visit, both studied areas are consisting of 2 central districts which known as the royal administrative district that includes the palace, royal mosque, mausoleum, royal residence, and the other is the typical district which contains the different parts of the town. These districts can be recognized by the separations of using gateways, the design and architecture of its building and even the landscape design. The respondents (with mean score 4.40) also agreed that the royal town consists of unique and attractive local products.

Furthermore, both towns have a craft complex that becomes a place to showcase local products such as souvenirs. The local product shows the distinct characteristics of a place (Kastenholz et al., 2016). It enhances the aspects of overall distinctiveness of the royal town itself by supporting the elements of uniqueness.

Table 7 shows the respondents' perception of self-efficacy aspect in research areas. Two research elements are involved, namely; confidence & comfort and safety & accessibility, which are labelled as CON and SA, respectively. The highest mean score is 4.31 under SA element for *Pekan* research area. The lowest mean score is 3.15 under SA element for Kuala Kangsar research area. The complete tabulations of mean scores are as follow;

Table 7: Respondents' perception of Self-Efficacy Aspect in Research Area

	Statement	K.Kangsar Mean	Pekan Mean	Total Mean
CON	Feel comfortable and calm in this town.	4.13	4.19	4.16
	The cleanliness well maintained.	3.68	3.83	3.76
SA	Feel safe in the town during:			
	Daytime	3.76	4.03	3.90
	Night-time	3.15	3.52	3.33
	The town is easily access via:			
	Car & Motorcycle	4.21	4.28	4.24
	Public transport	3.28	4.05	3.66
	Walking	3.49	3.92	3.70
	Bicycle	4.10	4.31	3.67

CON= Confidence & Comfort, SA = Safety & Accessibility, Value Format: 1 = strongly disagree, 5 = strongly agree

Source: Author (2019)

Based on Table 7, the respondents feel very comfortable and calm when they are in the area with mean score 4.16, and the overall cleanliness of the royal town is also quite good (mean score 3.76). The feeling of comfortable and clean in the area supports the confidence and comfort elements that shaped the self-efficacy aspect. In terms of safety, most of the respondents feel secured during daytime

(3.90); however, some local people feel less safe during nighttime (3.33). Unfortunately, according to the interview with some respondents and the field visit, it shows that the lighting at night is still inadequate, especially for the pedestrian. Enough light gives a feeling of safety to someone (Mohaved et al., 2012). Most respondents with mean score 4.24, thought that the place is easily accessible by car and motorcycle, and is also easy to access the town areas by walking (3.70). It shows that the pedestrian walkway linkages are quite good but with some improvement needed. Even though most of the respondents feel that the public transport services are quite good (3.66) some of the respondent's complaint about the absence of public buses services in the central area of Bukit Chandan, Kuala Kangsar. Besides, the interview with the local people in Kuala Kangsar had shown that there are no public bus services in the area of the palace's compound. Most of the people who live near to that compound will move around using their motorised vehicle, bicycle, taxi and even by walking.

The unique character of the royal town

A set of unique character that helps to shape the image and identity of the town has been put in place as a recommendation for future conservation efforts. From the study, the result shows that the unique character that was supporting the aspects of self-esteem, continuity, distinctiveness and self-efficacy among the local people is consist of tangible and intangible characteristic as listed in Table 8 below;

Table 8: Unique character of the Royal town of Malaysia

Place Identity Aspects	Unique Character (s)
Self- Esteem	*The royal town eight components, town's legibility, the king presence, unique local products, town's various districts, royal ceremonies and historical buildings.*
Continuity	The nostalgia of witnessing royal cultural events, town's historical stories, historical buildings, the people's activity, traditional houses, the river, the royal mosque and palaces.
Distinctiveness	Excellent public facilities, grand architecture, royal ceremonies, unique streetscape, symbols and colours, formal landscaping, festive lightings, the royal town eight components and historical buildings.
Self-Efficacy	Excellent cleanliness & maintenance, peaceful environment and good accessibility.

Source: Author (2019)

CONCLUSION

In conclusion, the study had discovered the unique characters that shape the image and identity of the royal town in Malaysia. The attributes are consisting of tangible and intangible elements that support the aspects of distinctiveness, continuity, self-esteem and self-efficacy among the local people. Thus, in a way

to ensure the town's sustainability in the future, these unique characters must be preserved and protected. Therefore, the researcher is urging the local government and related parties to work together and come out with the strategies to improve and protect the royal towns in Malaysia as a national heritage. Also, clear guidelines need to be structured to preserve historical values in them. Lastly, it is highly recommended to explore more on the policy and guidelines on how to protect the royal town's identity in the future.

ACKNOWLEDGEMENTS

The authors would like to thank all parties who directly and indirectly contributed to the research, especially in the collection of data.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 219 – 230

THE VARIANTS AND MEANINGS OF MALAY MOTIF ORNAMENTATION IN THE URBAN CONTEXT: A CASE STUDY OF PUTRAJAYA

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Abstract

As Malaysia's new satellite city, types of Malay motif and meanings in Putrajaya have been abstracted and used as design motifs and ornamentation for the quest of local identity. However, it is uncertain whether the placement of such components, which is sometimes difficult to comprehend, gives the premises a sense of identity. Therefore, this study aims to identify the variants, meanings and applications of these motifs in the ornamentation of public buildings in the urban context leading to its character and identity formation. The researchers had conducted on-site surveys and photographic documentation, and semi-structured interviews for data collection. Using Putrajaya as a case study, a visual descriptive and interpretative analyses was undertaken to analyse the underlying basis in terms of various plants from natural surrounding and transformations into the new depiction of motifs. The analyses revealed two distinctive types of Malay motifs depictions found in the building components with the tangible and intangible qualities that articulate their compositional order. The Malay urban character involves the depictions of abstract motifs incorporating local Malay cultural elements. Plant-based motifs dominate the ornamentation, which have its meaning and characteristics. The physical and practical nomenclatures of the motifs are indicators of continuity of tradition in the urban buildings. Further research is necessary to investigate the people's perception of these abstracted motifs as ornamentation in the interior and exterior spaces of the public buildings.

Keywords: Ornamentation, Malay motif, public building, Putrajaya

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INTRODUCTION

Many urban public buildings, including educational, administrative, civic institutional, and commercial buildings in Peninsular Malaysia, showcase the ornamentation of abstract motifs to serve multiple purposes. The purposes of the embellishment depend upon the character of occupancy or the type of use. The understanding of such adornment and their meanings, especially by present-day designers, would inaugurate innovative possibilities for contemporary buildings and facilitate the design of buildings with local character to achieve a sense of authenticity while being aesthetically appealing. In recent years, considerable efforts have been invested in sustaining the revitalisation of cultural values, especially regarding architectural ornamentation. The focus of this quest for revival has predominantly centred on public buildings. However, it is uncertain whether the placement of such components, which is sometimes difficult to comprehend, gives the premises a sense of identity. McNaughton (2001) posits that the term 'ornamentation' specifically refers to its tangible and intangible roles that lead to building character and its identity formation. This paper discusses the integration of the decorative components in selected urban public buildings in Putrajaya with an emphasis on the manifestation of abstract Malay motifs in various forms of patterns and techniques. Many designers interpret the beauty of floral elements from natural surroundings into the innovated forms of motif and design. Thakkar (2004) postulates that a person develops his idea of ornament to beautify his surroundings. Nature and the socio-cultural environment have been the pivotal stimulus for beautification. Therefore, the objectives of this research are to analyse the types of abstract Malay motif and determine the meanings behind the design principles of the motifs as ornamentation reflecting local characteristics on public buildings in Putrajaya.

LITERATURE REVIEW

This section reviews the meaning of ornamentation, focusing on its purposes in the architecture. The discussions focus on the abstract motif and principles of the Malay motif. The discussions also focus on the fundamental theories and concepts underlying the Malay motif. It includes related research and a conceptual framework relevant to the subject area and unit of analysis for this study. At the same time, the review highlights the gap in the current understanding of this field of research.

Defining Ornamentation and its Various Meanings

There is no universally-approved definition of ornamentation. The term has been defined in many ways. Likewise, many scholars have given their views on the meaning of ornamentation and its different purposes. As a working definition, especially in architecture, ornamentation is defined as something that beautifies or adorns a building or monument that becomes its essence. However, its presence is secondary to the architecture (Jones, 2001) while furnishing visual order to the thing with which it is associated (Grabar, 1992). Embellishment serves as an intermediary between art and structure. Its presence is to improve the appearance of functionally complete objects hence giving visual pleasure (Trilling, 2001). Baer (1998) posits that one of the primary functions of ornaments fitted on buildings or applied on portable objects of art is to embellish their surface. It expresses and communicates contemporary ideas of beauty and aesthetic concepts using forms, materials, and techniques fashionable at a specific time.

Ornamentation serves as a specific term embodying its intangible role that leads to building character and its identity formation. Ornaments, as addressed by McNaughton (2001), provide a way of incorporating added meaning into buildings, which supports the purpose for which it was built and further conveys the beliefs of the surrounding community. Their co-existence should be in harmony with the structural features of the architecture. Ornament is distinguished from decoration in that its primary purpose is to enhance its carrier by supplying visual order (Schafter, 2003). The decoration involves embellishing things by adding ornaments. Salama (2007) postulates that decoration is related to space beautification, which means to bring out the ability to spread the inner beauty so that the surrounding also becomes beautiful. Beauty is not only understood as aesthetical meaning; it is also associated with intangible purposes, including calmness, peacefulness, and pleasantness. Furthermore, the idea of ornamentation grew from the basic urge of an individual to embellish his surroundings wherein nature and the socio-cultural environment play a significant role (Thakkar, 2004; Spahic Omer, 2009). Three factors influence the mode of embellishment, namely the practical consideration, the need of display and the symbolic aspect of ornamentation.

The meanings of ornamentation and ornament, as seen here, are congruent to each other, and its presence in architecture is peacefully co-existent. In the presence of these compelling circumstances, the different purposes of ornamentation have been engaged in never-ceasing harmony, whether in its tangible or intangible roles. The meaning of the ornament relates to the various functional aspects, including building decoration, communication of design ideas or symbolic meaning, and enhancement of physical appearance. The perspectives of the ornamentation in architecture are useful references for this study. The study looks into the placement of ornaments in the fabrics of urban public buildings. In

the context of this study, the word embellishment is used to represent practices and ideas of building ornament, specifically those with abstract motifs.

Idiom of Compositional Principles and Visual Order in the Malay Motif

The motif is used visually as part and parcel of various forms in arts and crafts. Therefore, multiple definitions for the word motif are found in the literature related to art and design. A motif means repeated shapes or thematic elements in a design or pattern (Wallschlaeger & Busic-Snyder, 1992). The most prominent and frequent decorative patterns found in arts and crafts are from floral elements. Motifs and patterns are interconnected and considered essential ingredients of aesthetic design. Motifs and patterns interact and become complementary elements in decoration, reflecting the skills and preferences of the maker and the taste of the intended viewer (Trilling, 2001). The visual attributes of the decorative components are an amalgam of tangible qualities and intangible traditions that enunciate its compositional order. The essence of the Malay motif, such as in woodcarvings, for example, illustrates its link with the natural elements like a growing plant. This element emerges from a source or a seed, which serves as its origin. Thus, a growing plant has been an important source for design patterns employed in the Malay wood carving (Farish & Eddin, 2003). The *awan larat* (moving cloud), for example, represents the continual growth and movement of life in a natural plant. The name *awan larat* originates from a moving cloud (Syed Ahmad Jamal, 1994). It represents the form of a spiral which is continuous but emanates from a core root, flower or seed with the outward flow in a progressive movement, as shown in Fig 1.

Figure 1: *Awan larat* with its associated elements

Awan larat consists of combined elements forming one complete carving that usually gives more emphasis to plant aspects because of its gentle character and are suitable for a variety of compositions (Abdul Halim Nasir, 1987). Thus, the formation of *awan larat* is a visual form with unbroken relationships through the repetition of one or more aspects of the motif in a distinctive arrangement and composition. This principle comprises of an interrelationship between parts, including leaves, tendrils, flower buds, flowers, and shoots, within a complete composition. A carved panel with a complete profile customarily depicts *awan*

larat that consists of these elements that are depicted as the theme of the composition. Meanwhile, Rosnawati Othman (2005) suggests that two poles determine the visual order of the *awan larat*: (1) the sense of rhythm innate in the natural order, and (2) the genius of composition. Rhythm and movement are interrelated, which determine good carvings. Apart from being complete in composition, *awan larat* also represents a philosophical meaning that pertains to the natural growth of real plants (Sulaiman Esa, 2001; Rosnawati Othman, 2005). The flows of plant elements in intertwining, interlacing, and overlapping characters represent the growth of a plant in a complete composition, as shown in Figure 1. In the intertwining composition, the overlapped form of linking lines between plant elements shows crosses above or below each other in a three-dimensional arrangement.

In short, the reviews of related researches and literatures yield to the interrelationship between principles of aesthetic, principles of *awan larat,* factors of ornamentation and its meaning.

METHODS OF RESEARCH

This study involves exploratory research, and a significant amount of primary data came from the on-site surveys and photographic documentation, and semi-structured interviews. The purpose of the on-site survey was to identify and determine the buildings that have ornamentation with Malay abstract motif and their visual attributes, including (1) types of Malay motif, 2) placement and orientation of ornamentation, and (3) components of the building ornamentation. The selected area of research was Putrajaya, the administrative capital and administration centre of the government. Putrajaya houses many late twentieth and early twenty-first-century prominent architecture including Putra Mosque and Perdana Putra. In this area, the researcher identified a total of seven buildings for the investigation, and they are as an amalgam of various styles of architecture. These buildings are the Palace of Justice (PoJ), Pullman Hotel and Resort (PHR), Mahkamah Putrajaya (MP), Putra Mosque (PM), Bangunan Hal Ehwal Undang-Undang (legal affairs building) (BHEU), Ministry of Tourism and Culture (MoTC) and Ministry of Higher Education (MoHE). Most of the buildings were constructed in the late 1990s and early 2000s.

This study used pictorial analysis to identify the types of Malay motif, ornamentation, and compositional principles. This research also employed semi-structured interviews with prominent architects to obtain their opinions and personal views on the research inquiries. They provided information on the Malay concept in modern buildings and its philosophical meaning, especially about the building embellishment. Their knowledge and opinions are useful for the verification of data obtained from the survey. The authors interviewed the architect-conservators, and visited the selected buildings, as recommended by the expert architects. A survey checklist was used to identify and observe the

placement, orientation and physical attributes of the building ornamentations. Visual data on the motifs and building components discovered during the survey are worth for pictorial analysis and documentation.

RESULTS, FINDINGS, AND DISCUSSION

Types of Abstract Malay Motif Used in the Urban Public Buildings

Two types of Malay motifs were identified from the on-site survey: 1) abstract floral design, and 2) plant-based motif. They are further categorised into two types of ornamental modes, namely integrated element and surface beautification. The survey of the buildings reveals that the two types of motifs are the archetype of the Malay motif. This motif archetype is prevalent in the different components of the buildings, namely, wall decorative components, perforated screen panels, gateway panels, window screen panels. Their presences are either for surface beautification or integrated elements for the different types of buildings. 6 out of 7 buildings, namely, Palace of Justice (PoJ), Pullman Hotel and Resort (PHR), Mahkamah Putrajaya (MP), Putra Mosque (PM), Bangunan Hal Ehwal Undang-Undang (BHEU), and Ministry of Tourism and Culture (MoTC) are adorned with wall decorative components for surface beautification. The results suggest that surface beautification becomes central mode of ornamentation for the buildings. In the context of the abstract Malay motif, the craftsmen's understanding of the Malay philosophy of *awan larat* determines the distinctive physical form of ornamentation. The beauty in the arrangement of the ornaments does not happen arbitrarily, but the specific idiom of compositional principles regulate its existence as evidence in the ornamentation of the buildings. There are many examples of ornamental motifs with the stylised pattern and semi-naturalistic style of *awan larat,* which dominate the exterior façades of the buildings as apparent in Palace of Justice (PoJ), Pullman Hotel and Resort (PHR), Mahkamah Putrajaya (MP), Bangunan Hal Ehwal Undang-Undang (BHEU), and Ministry of Tourism and Culture (MoTC). Many integrated elements in forms of perforated screen panels, decorative gateway panels and window screen panel with plant-based motifs dominate the facades of these buildings. Table 1 summarises the archetypes of the motifs found in the ornamental components of the buildings with regards to the types of motif, placement and orientation of ornamentation, and components of the building ornamentation.

Table 1: Archetypes of motifs in the ornamental components of the buildings

Source	Ornamental modes and components	Types of motif	Depiction style and placement

PoJ	✓ Surface beautification (decorative components on wall facade)	✓ Abstract floral design ✓ Plant-based motif	Stylised pattern in repetitive placement
PHR	✓ Surface beautification (decorative components on wall façade) ✓ Integrated element (screen panel, window panel, gateway panels)	✓ Abstract floral design ✓ Plant-based motif	Stylised pattern and semi-naturalistic in repetitive placement
MP	✓ Surface beautification (decorative components on wall facade)	✓ Abstract floral design ✓ Plant-based motif	Stylised pattern and semi-naturalistic in repetitive placement
PM	✓ Surface beautification (decorative components on wall facade)	✓ Abstract floral design	Stylised pattern in repetitive placement of interior spaces
BHEU	✓ Surface beautification (decorative components on wall façade) ✓ Integrated element (perforated screen panel, gateway panels)	✓ Abstract floral design ✓ Plant-based motif	Stylised pattern and semi-naturalistic in repetitive placement
MoTC	✓ Surface beautification (decorative components on wall façade) ✓ Integrated element (perforated window screen panel, gateway panel)	✓ Abstract floral design ✓ Plant-based motif	Stylised pattern and semi-naturalistic in repetitive placement of exterior spaces
MoHE	✓ Integrated element (perforated window screen panel)	✓ Abstract floral design	Stylised pattern in repetitive placement

Ornamentation in the Pullman Hotel and Resort (PHR) in Precinct 5 and their visual composition and attributes suggest the *awan larat* archetype is used in its unifying pattern with other components, as shown in Fig 2A and Fig 2B. A range of integral elements gave attention to the front wall and windows and at the entrance gateway of the building. The decorative panels depicting the *awan larat* design with plant-based motifs was inspired by *Pokok Bunga Tanjung* (*Mimusops elengi*). This luxury hotel, located in Precinct 5, demonstrates repeated decorative panels with the integral Malay concept as part of the embellishment. The hotel has given Malaysian identity to Putrajaya and notably recognised as the first 'Malaysian Icon Hotel'.

A B

Figure 2: The architectural ornamentation of Pullman Hotel and Resort, Putrajaya

Bangunan Hal Ehwal Undang-Undang (BHEU) (legal affairs building), also known as the Legal Affairs Division, located in Precinct 3, showcases a wealth of perforated screens within its unique architecture. In these integral components, the concept of *ibu* (source) is visible within a composition of arches (Fig 3). Depiction of a*wan larat* design with a plant-based motif is very dominant, consisting of combined plant elements in gentle character.

Figure 3: The architectural components of Bangunan Hal Ehwal Undang-Undang

The building artistically blends traditional design, modern form, and the use of the local concept of motif inspired by Ulam Raja (*Cosmos caudatus*), also known as King's salad. In harmony with its architectural style, the building feature is suitable for Precinct 3, the core island, which is also known as the civic and cultural precinct of Putrajaya. The specific idiom of visual order regulates the beauty of ornamentation and is in parallel with the building's function. The design of the building reflects the Neo-Raj palace in Jaipur Rajasthan, India, which shows clear Mughal influences on its Rajput architecture. As such, colonnades, porticos, archways, and screens of window openings with faced brick façades become dominant features. The multitude of fenestrations and ornate wall decorations found are suggestive of local Malaysian identity.

Most decorations are plant-based inspirations employed as the innovative method for the depiction of local cultural themes rather than through

pure imagination or conception. Three approaches, influenced by Islamic principles of composition, namely unity in design, the contrast in characters, and the repetition of elements that appear in the arrangement of the components represent the aesthetic principle through visual beauty. This concept is further classified into two different aspects: micro composition (in the individual component) and macro composition (in the whole structure). The impacts of cultural constructs, such as the notions of "*ibu*" as "identity" influence the designs of the ornament. *Awan larat* has been the most pervasive design pattern in the decorative components, which are visible in many decorative components as seen in BHEU and the Pullman hotel. These qualities contribute to the meaning of beauty in their ornamentations. Therefore, beauty is one of the attributes that connote to the importance of ornamentation in both buildings.

Modes of Ornamentation and Principles in the Adornments of the Buildings

The analysis of the buildings suggests five principles of building ornamentation: 1) integral part of construction, (2) surface beautification, 3) functionality, 4) unity, and 5) meaningfulness. These principles are visible in the embellishment of wall components. In the façades of Ministry of Higher Education (MoHE), Precinct 5 and Mahkamah Putrajaya (MP), Precinct 3, as in Figure 4A and Figure 4B, respectively, incorporated fundamentals are normally used by Malay craftsmen as structural guidelines.

Figure 4: The decorative components at the front façades of Ministry of Higher Education (MoHE) and Mahkamah Putrajaya (MP)

The 5 principles of building ornamentation are necessary for orderly treatments of visual elements such as in woodcarvings. The decorative components are not apparently designed only for specific decoration but also are fixed as an integral part of the buildings as apparent at the front façade of the Ministry of Higher Education. All of the components are integral parts of the building framework with structural order, resulting in unity in diversity. Respecting the principle of meaningfulness and the set of rules that govern the Malay concept of defining beauty has been the aim of the ornamentation in the building, as evident in the administrative building, Mahkamah Putrajaya (MP).

The study shows that the public buildings and their ornamentations are the collective manifestations of the craftsmen's skilful interpretations that include tangible and intangible aspects behind the principles and meaning of each type of motif. Also, this achievement relates to their attitudes of making the embellishments visually comforting for the public in contemporary living. The study suggests how they respond to the local people's visual reference, but balancing the visual principles and unity of design of the ornamentation to suit the contemporary living. Based on their visual attributes, the decorative components are excellent indicators of both continuity and innovation of traditional decoration in the modern based buildings designed by local architects, for example, the Pullman Hotel and Resort (PHR), designed by Raja Kamarul Bahrin Shah Raja Ahmad. Local Malay architects like him have set an example by documenting their perception of traditional worldviews on inorganic materials such as glass fibre reinforced concrete (GFRC), which enhance the sense of sustainability of local identity while simultaneously sustaining the old traditions. The inherent beauty also reflects their knowledge in the application of design principles for visual composition. The beauty in the arrangement of compositional elements in the embellishment does not happen arbitrarily. The specific idiom of compositional principles dictates and regulates its existence. The art of ornamentation has integrated meanings and contents that is aware of the ethnic environment. The floral motifs are derived from the inexhaustible nature of its surroundings. Other than Arabic calligraphy or geometry, the floral motif is the possible form of content that could express the spiritual ideal of Islam, as found in many Putrajaya's buildings.

Visibility of the heritage identity of the Malay motif in the embellishment of the present architecture reflects the sustainability of traditional idiom of compositional principles and visual order in the Malay theme. Owing to these, the reinterpretation of the heritage identity of the Malay motifs in the present modern buildings reflects several changes in its architectural features. The mode of embellishment gives a major impact on the buildings' character, which synergises physical, philosophical, and innovative applications. These applications derive from emerging technological advances in the materials but controlled by the local taste in ornamental design. Consequently, the ubiquity of the Malay motif in urban fabrics is an attribution to the profusion of embellishment mode with unambiguous style for which it is the right medium to proliferate regional identity. This scenario is interesting because it may indicate that the local and geographical sense of artistic identity would be subsumed either into a generic Malay style or a genuinely local style. This scenario suggests that the form of the abstract Malay motif is versatile not only in the past architecture but also in the present public buildings. The use of modern materials did not cause the variety of design schemes of the old era boiled down to a few and limited collection of design expression. Instead, the conversion of this

decorative form, primarily via the use of floral design, helped it grow considerably more innovative and creative abstract decoration. This marks the rebirth of the abstract-based cultural items with converging values in the present architectural ornamental scheme. Both values deal basically with tradition and beauty.

CONCLUSION AND RECOMMENDATION

In this paper, the focus is on the integration of Malay motifs in the selected public buildings situated in Putrajaya. The results of the study show that abstract floral and plant-based design are the two types of motifs ornamenting public buildings. The study found two categories of ornamental modes, namely integrated element and surface beautification. The *awan larat* pattern becomes a dominant feature for the ornamentation. They form different placements for different types of buildings, namely administrative, commercial, and religious. The structures were heterogeneous in form, but most of the ornaments were in synchronised order, according to the building forms. One interesting finding was that plant-based motifs, although found in different shapes, are more common for various buildings. The use of abstraction is considered an effective approach in increasing the versatility of motifs for multiple typologies of architecture. Yet, underlying this heterogeneity is an underpinning of philosophical ethos of *awan larat* as an abstract motif in the building ornamentation, which promotes regional identity. These still resonate in modern buildings that eschew sentimental attachment to old ornaments and traditional values yet which are in favour of technological and architectural progress and change. The challenge is to continue encouraging interest in the production of local ornament while attempting to maintain its perception of authenticity among both locals and visitors. As such, there is a need for future research to investigate the perception of the application of abstract motifs as an embellishment in public buildings. Findings from this research would fill in the gap of knowledge regarding the existence of traditional Malay design in the architectural ornamentation of contemporary buildings, especially in discovering its meanings of placement concerning the visual forms and contents of the *awan larat*. Also, an introduction of a new motif from local plants into different types of ornaments would be part of the effort to promote traditional Malay design and ensure its sustainability.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude and acknowledge for the Transdisciplinary Research Grant Scheme (TRGS/1/2016/UIAM/01/5/1) from the MOHE for the support of this research. Appreciation is also due to the architects who provided insightful information for this study.

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 231 – 242

ANALYSING COMMUNITY PERCEPTIONS ON INCENTIVE STRATEGIES IN SAFEGUARDING A MALAY HERITAGE VILLAGE: THE CASE OF KAMPUNG MORTEN, MELAKA

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Abstract

Over-commercialism and the threats posed by uncontrolled development have slowly been eroding the cultural heritage stock, especially in the case of the traditional settlements. This paper reveals the community perceptions and feedbacks on the incentives given in safeguarding the uniqueness of a Malay heritage village known as Kampung Morten in Melaka. This study set out to determine the overarching question, which was, whether the incentive programmes formulated for the community have been found to be suitable to the aspirations and 'real' needs of the local communities. Mixed method approaches were used in this study which included document reviews, observations, structured interviews and a questionnaire survey; and involved the residents living in the village. This study evaluates the findings concerning the present policy framework, for understanding and managing the cultural heritage incentives programme in safeguarding the heritage village to establish a sustainable community. This paper has been able to reveal several issues on the conservation incentives policy, most notably of which is the incompatibility of the local communities' needs with the programme outcomes.

Keywords: heritage village, Malay, incentive strategy, sustainable communities, community engagement, community perception.

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INTRODUCTION

Effective incentives are essential in order to achieve the preservation principle for the present and the future generations. According to Meng (2015), incentivisation is generally recognized as a strategy of addressing programme performance; and thus, is a key aspect of the economics of any historic heritage. Incentives can be regulatory or non-regulatory, and may include a wide range of policies and methods. Incentive policies are tools to motivate the historic property owners or investors to retain their buildings or sites, and their delivery mechanisms vary from country to country.

It is crucial to understand the full potential of heritage village as valuable resources and contribute to sustainable development in a dynamic way. Given the complexity of the concept of heritage village, this research investigates the challenges and conflict between conservation and urbanization in the scope of living heritage. This paper presents an analysis on community perceptions, and how the incentives strategy works in safeguarding the uniqueness of a Malay heritage village known as Kampung Morten in Melaka.

LITERATURE REVIEW

A good amount of literature has discussed the dilemma and survival of the heritage villages across the Asian region (see Yeoh and Huang (1996); Sharifah Mariam Alhabshi (2010); Lih (2005) and Norsidah (2020). Over-commercialism and the threats posed by uncontrolled development have slowly been eroding the cultural heritage stock, especially in the case of the traditional settlements. The development and modernization processes in these regions in the 1980s have especially resulted in changes to the lifestyles as well as the social and moral values of the populations (Jones, 1997).

What Are Incentives?

Many works of literature have encompassed the incentives provision in diverse disciplines such as researches in finance by Read (2005), wildlife conservation by Hadlock and Beckwith (2002), forest management by Kumar (2007) and business by Goetz (2010). However, very few researchers have touched on heritage areas. As observed, there has been little or no research into the nature and impact of these incentives and how they might be integrated into heritage management strategies. However, only a few studies have been found in literature that have dealt with the incentives provision strategy from the perspective of cultural heritage preservation. Roddewig (1987) has been one of the few commentators who has written explicitly about the use of incentives in the preservation of historic areas. He pointed out how some of the ways in which incentives can assist the conservation of historical areas. In his view, incentives have two specific roles in the conservation process: (1) to generate more

rehabilitation of historic structures than would be possible, presumably, through other forms of government action, and (2) to provide a reasonable economic return to owners of buildings protected and restricted by laws.

Heritage Village and A Living Heritage

The term 'heritage village', which is the subject of this study, is defined as a traditional neighbourhood community or a specific district with historic significance, where both, the physical characteristics and its inhabitants, carry on with the living traditions, skills and other cultural practices. Heritage villages are different from single monuments, ensembles of historic buildings or pure natural heritage sites, where fewer social activities are involved.

According to Orbasli (2002), only in the second half of the twentieth century has there been a growing appreciation and understanding of living heritage, its recognition as being 'heritage', and a desire for area-based conservation. This has coincided with the birth of the Venice Charter that came into effect in 1964 and contained principles governing architectural conservation and restoration. Even though the human dimension of the value of heritage has been clearly recognized in the Charter, no direct reference has been made to living heritage.

Therefore, the United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage, which came into effect in 1972, made direct reference to community life. Article 5 suggested that each state which had signed up for this convention should 'adopt a general policy which aims to give cultural and natural heritage a function in community life, and to integrate heritage protection into comprehensive planning programmes' (Miura, 2005). Malaysia ratified the convention on 7 December 1988. Nonetheless, since 1992, the World Heritage programme increasingly focused on traditional knowledge, and the role of local communities in protecting and managing mechanisms. Additionally, the programme has fostered synergies between modern science and local knowledge, which are relevant to both cultural and natural heritage (Netherlands National Commission for UNESCO, 2014). Since then, further emphasis has been placed on the intrinsic relationship between culture and nature, people and places, and cultural diversity. Considering all of this evidence, it seems that the incentives provision is an important tool in safeguarding the living heritage as well as in creating a community's sense of place in accomplishing the sustainable community approach.

BACKGROUND OF KAMPUNG MORTEN

Kampung Morten is a traditional Malay village situated in the middle of Melaka city, just outside the designated UNESCO's World Heritage Site. The village, with a population of over 600, is considered one of the most outstanding Malay

enclaves, with the meandering Melaka river flowing besides it (**Figure 1**). The Melaka State Government in 1988 gazettement had declared the village as a traditional Malay heritage village. This recognition was under the Melaka state's Preservation and Conservation of Cultural Heritage Enactment of 1988 (Abdul Aziz, 2017). It is a fine example of a typical Malay village which is locked in the midst of modern development but is still lingering on with its own past history. The demographic profiles of Kampung Morten are shown in **Table 1** below.

Figure 1: Kampung Morten still retains its traditional Malay kampung charm even though it is locked in the midst of modern development
Source: Murali (2018)

Table 1: Demographic profile of Kampung Morten

Demographic Profile	Numerical Data
Population	630
Number of households	98
Total area	12 acre
Number of incentive recipients	80
Number of samples	45

Source: Author (2016)

METHODOLOGY

A mixed methods approach of concurrent triangulation design was used in this study, which included the usage of document reviews, observations, structured interviews and a questionnaire survey, involving the residents living in the respective site. Stratified sampling was used in the questionnaire survey to classify the specific residents, based on the residents who received the heritage

incentives from the authorities. The survey and interview data were collected in March 2014 and October 2016

.

Incentives Provision

Since the year 2000, about RM2 million has been allocated by the Federal Government, via the Ministry of Culture, Arts and Tourism (recently known as the Ministry of Tourism, Arts and Culture), to standardise the roofings of more than 80 houses in Kampung Morten. Besides that, beautification programmes have also been carried out to enhance its aesthetic appeal. The most significant aid has been for house renovations, where selected old Malay houses have undergone renovation mainly to their main structure, walls, windows, roofs and stairs (**Figure 3**).

As part of revitalizing the landscape efforts by the Melaka Historic City Council (MBMB), steel railings with attractive designs were erected along the facade facing the Melaka River, for the safety of the villagers and visitors. Technical assistance for the restoration of houses involved the maintenance and repair of their structures and facades. This was administered by the Melaka Museums Corporation using the funding allocated by the Conservation and Restoration Trust Fund from 2001 to 2010. The restoration project benefitted the recipient house owners. A majority of them received financial support, which was approximately about RM10,000.00 each, in the year 2001. The highest sums were distributed in 2010 and 2008, which had amounted to RM64,550.00 and RM46,500.00 respectively.

Figure 3: Most houses in Kampung Morten have undergone major renovations for the main structure, walls, windows, roofs and stairs since the year 2000
Source: Author (2018)

Additionally, in 2008, the Melaka Historic City Council, through their Engineering Department, granted the Morten Village more supporting funds for the repair and beautification programmes. Funds amounting to about RM3

million were allocated for house repairs in the Morten Village, involving 80 units of properties along the Melaka river. The assistance was provided largely in the form of exterior repairs, roof maintenance and structural defects. Moreover, the beautification programme has also involved the installation of "light-emitting diode (LED) rope lights" on the roof-tops of the 80 units of houses, with a total allocation of RM248,500.00, which was done in order to showcase an outstanding view of the Malay *kampung* during the night time. In 2009, an incentive with a total allocation cost of RM990,761.00 was provided to upgrade the drainage, landscape and pedestrian walkways by installing decorative streetlamps.

DATA ANALYSIS AND MAJOR FINDINGS

To measure the effectiveness of the incentives programme, this research employed the Bennett's programme evaluation method (Bennett, 1975). According to the model, the hierarchy of evidence for programme evaluation can be classified into seven levels, namely, the programmes' resources, activities, participation, reactions, learning, actions and impacts (**Figure 3**).

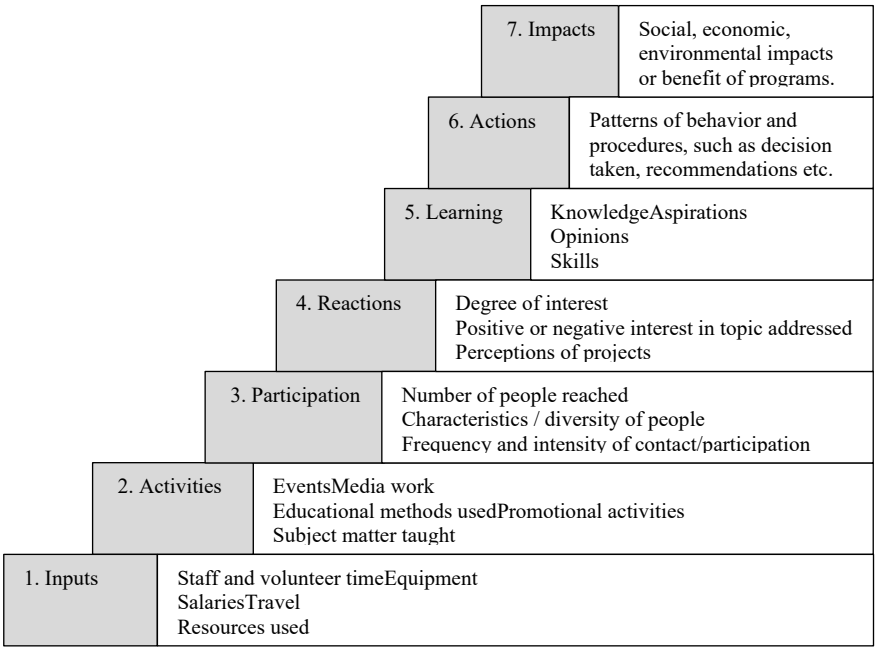

Figure 3: Hierarchy of programme evaluations
Source: Bennett and Rockwell (2004)

According to Roberts (2007), in order to measure incremental change during the programme implementation, Bennett had come up with a hierarchy that could show the causal links between the steps from inputs to outcomes; and could also show where along the continuum of change, had an extension programme reached

its delivery. This study set out to determine the overarching question, which was, whether the incentive programmes formulated for the community have been found to be suitable to the aspirations and 'real' needs of the local communities. Data was analysed using the Statistical Package for Social Sciences (SPSS) software and descriptive statistics. It evaluated the findings concerning the present policy framework, for understanding and managing the cultural heritage incentives programme in safeguarding the heritage village to establish a sustainable community.

In order to facilitate an average estimation of the satisfaction level, the values were grouped according to three equal categories (Mastor & Ibrahim, 2012). The cut-off point was calculated from the difference between the mean highest value and the minimum value on three degrees that represent the number of levels, using the formulae - ((5-1)/3=1.33). Thus, the degree values of the incentives programme evaluation are shown in **Table 2**.

Table 2: Degrees of the incentives programme evaluation and residents' needs for the tangible and intangible heritage

Evaluation	Degree	Level
Incentives programme (5-point Lickert scale)	1.00 - 2.33	Low (Level of incentives programmes evaluation is at low level)
	2.34 - 3.67	Moderate (Level of incentives programmes evaluation is at moderate level)
	3.68 – 5.00	High (Level of incentives programmes evaluation is at high level)
Needs for tangible and intangible heritage (3-point Lickert scale)	1.00 - 1.66	Low (Level of needs are at low level)
	1.67 - 2.33	Moderate (Level of needs are at moderate level)
	2.34 – 3.00	High (Level of needs are at high level)

Source: Mastor & Ibrahim (2012)

Using the five-point Likert scale, respondents were asked whether they agreed or disagreed with the statements pertaining to their satisfaction towards the incentives programme's inputs (how participants perceive the resources of the programme), programme activities (how participants react to the events or activities conducted), programme participation (the extent of the participants involvement), programme reactions (how participants react to the programme's interest), programme learning (to what extent participants acquired knowledge), programme actions (how participants react to the decisions taken) and programme impacts (the overall benefits). **Table 3** shows a summary of the mean score and standard deviation of the incentives programme evaluation by the Kampung Morten residents. The mean score ranged from 2.73 to 3.95, with an overall mean of 3.53.

Table 3: Mean and level for the incentives programme's evaluation

Incentives Programmes Evaluation	Kampung Morten		
	Mean	Standard Deviation	Level
Programme's Inputs	3.889	1.017	High
Programme's Activities	3.436	1.121	Moderate
Programme's Participation	3.948	0.794	High
Programme's Reactions	3.511	1.203	Moderate
Programme's Learning	3.496	1.216	Moderate
Programme's Actions	3.659	1.133	Moderate
Programme's Impacts	2.733	1.260	Moderate
Total Mean	3.525	0.926	Moderate

Among the seven factors of the incentives programme's evaluations, programme's participation and programme's inputs had the highest mean score with a value of 3.95 and 3.89 respectively, followed by the programme's actions (3.66) the programme's reactions (3.51), the programme's learning (3.50), the programme's activities (3.44), and the programme's impact (2.73). The findings have provided evidence that respondents in Kampung Morten have evaluated the incentives programme's participation, and the inputs recorded were the highest as compared to evaluation indicators from other programmes.

RESULTS AND DISCUSSION

This study evaluates how the incentives programme has worked, and identifies the impacts and challenges faced by the concerned community in the current scenario. The researcher recorded the following evidence after conducting a series of interviews in Kampung Morten. In this section, a thematic style of reporting was applied, where four broad themes emerged as shown below.

Views on Urbanization and Tourism Impacts

The respondents were asked on the impacts of urbanisation towards their daily lifestyle. One respondent from the village stated that: *"We really miss the 'kampung' environment that we had over the last 40 years. The 'ugly big giant' (the skyscraper) across the river has made our lives uneasy and inconvenient. It has really spoilt the scenery of our 'kampung' which was really pleasant before urbanisation came"* (Personal communication, March 12, 2014). The present study raises the fact that urbanisation has somehow disrupted their traditional lifestyle.

When asked whether the tourism activities had benefited the residents, one respondent reported: *"We have benefited from the tourism impacts; however, the community is not happy due to the surrounding economic pressures which do*

not benefit us that much" (Personal communication, March 13, 2014). Despite the negative views, one respondent expressed his positive opinion: *"There are pros and cons due to the surrounding economic pressures that we currently face. For me it was fine having this kind of development; however, the development should be harmonized with the existing traditional village. I have benefited a lot from this development, especially when people visit and stay at some of our homestays operated in this village. The youngsters can work in the city and I think this is good for our economy too"* (Personal communication, October 29, 2016). Interestingly, there was a significant difference between the positive and negative impacts of the tourism activities held in this heritage village.

Views on Public Participation

When the participants were asked *"What kind of participation did the community members have in drawing up the incentives programme for their village?"*, the majority commented that the initial discussion for the conservation project was made among the leaders and majority of them were not involved. One respondent had highlighted: *"The government promised to allocate a sum of money to improve our houses as part of the conservation programme for this village. However, the dishonest contractors have benefited a lot while nothing much has been done in real practice"* (Personal communication, October 29, 2016). Another respondent expressed her disappointment and stated: *"The contractors working on the project were not competent enough and did not fully understand the principle of conservation. They just did the work for the sake of money, and I still have to use my own money to fix the broken crafted windows"* (Personal communication, October 29, 2016). These evidences indicate that there were negative comments about how the financial support for house restoration was manipulated by appointed contractors.

Views on Conservation Works and Monitoring System

The respondents were also asked on the quality of the conservation works done by the appointed contractors for conservation work at their premises. One respondent commented, *"The quality of the workmanship was found to be poor. For instance, after they had finished the renovation, we again faced other problems, where some roofs were leaking; there were gaps in between the timber wall arrangement, and the windows they installed did not fit and could not be closed easily. The poor workmanship is really unacceptable and we are not truly satisfied because they did everything in a hurry. The contractors ignored our feedback on their workmanship"* (Personal communication, March 17, 2014).

One respondent pointed out: *"We were not given any chance to suggest preferred incentives to the local authority. They had set the policy for us. When the project started, the engineers from the local authority had somehow failed to monitor the work done by the contractors* (Personal communication, October 29,

2016). Some of the respondents interviewed had stated that the implementation phase was found lacking. It was mentioned that: *"When we complained about the quality of the workmanship, nothing was done, and so we could not expect anything from them. When we asked the engineer to sit for discussion, he was absent and sent over his representative. So the situation was truly hopeless for any feedback"* (Personal communication, October 29, 2016). These results are likely to be related to the residents' concerns on the lack of monitoring systems led by the authorities in the implementation phase.

Views on Intangible Heritage Educational Needs

Moreover, when the participants were asked on the intangible heritage educational training focus that they needed the most, the majority commented that: *"We need to reintroduce our folk songs such as 'dondang-sayang' and 'joget lambak' and also performing arts like 'silat' back to young generations. However, we have a lack of skilled people to educate the youngsters and we need the heritage-related body to help us in providing the training and support"* (Personal communication, March 13, 2014). However, talking about the same issue, one government officer reported that: *"We have been facing the death of heirs for inherited intangible cultural heritage in Melaka. The government has been quite active in organizing seminars and workshops (for instance the craftsmanship and several improvement of the heritage-related act). However, the response and participation among the communities has been quite disappointing"* (Personal communication, March 21, 2014). However, when we asked the communities *"Why did they not participate?"*. The majority of those who responded to this question felt that*: "The younger generations in this village are no longer interested to learn the traditional skills. It takes years to learn those inherited skills. While the majority of us nowadays are exposed to the modern lifestyle"* (Personal communication, October 29, 2016). This is the real dilemma facing the residents of the heritage village of the Kampung Morten in Melaka, who are trying their best to preserve their tangible and intangible heritage.

CONCLUSION

This paper has been able to reveal several issues on the conservation incentives policy, most notably the incompatibility of the local communities needs with the programme's outcomes. The incentives as a driver of sustainability have not been satisfactory enough to provide the strongest effect to the awareness on preserving the cultural heritage values by the local communities. The involvement of the local community has become even more relevant in this regard. The findings of this investigation could be used to determine the success of the community engagement principle applied in the respective case study.

ACKNOWLEDGEMENTS
The authors would like to thank the Ministry of Education Malaysia for supporting this research under Fundamental Research Grant Scheme for Research Acculturation of Early Career Researchers (FRGS-RACER) Vot No. RACER/1/2019/WAB03/UTHM/1 which is partially sponsored by Universiti Tun Hussein Onn Malaysia and University of Malaya (Project No. PV110-2012A).

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Received: January 2020. Accepted: 1st April 2020

PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 18 ISSUE 2 (2020), Page 243 – 254

THE DERIVATION OF URBAN DESIGN PRINCIPLES IN MALAY-ISLAMIC TOWN OF KUALA TERENGGANU

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Abstract

Islam took root in the Malay Sultanate kingdom when trade flourished through the Straits of Malacca and the South China Sea. Islamic teaching was accepted by the locals and Islam became the country's official religion. Islam has been assimilated in the way of life of the Malays, including the physical built environment of its cities. However, after colonisation, many of the Malay town structure had changed tremendously following the western planning. Remnants of the Malay-Islamic state footprint can still be traced in the town of Kuala Terengganu. This paper aims to establish the urban design principles influenced by the Islamic values which are embedded in and characterised in Kuala Terengganu. Employing a qualitative method, secondary and primary data (observation using photography) were collected. Content analysis were conducted on the observation data, archival documents, historical literatures and morphological study on Kuala Terengganu Town and triangulated with the literature on principles gathered from the characteristic of Islamic cities. The findings revealed that Kuala Terengganu has similar characteristics to other Islamic cities however it is translated in the local context. The comparison revealed fifteen Urban Design principles related to the Malay-Islamic Town of Kuala Terengganu that are well-assimilated and embedded within the local culture, geography and climate for the reference of future city planners.

Keywords: Urban design principles, Malay-Islamic town, Kuala Terengganu

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INTRODUCTION

Islam reached the Nusantara region as early as 9th century, as determined by the traces of artefacts found in Tanah Melayu. The trade route was instrumental in the spreading of Islam to local lands. Across water, the route spanned from Jeddah through the Red Sea to Aden, south of the Arab peninsular than to Gujerat (India) directly to Nusantara. Across land, it started in Syria or Iraq to Khurasan, north of Parsi to Afghanistan, then to China and later to Nusantara (Muhammad Hasan al-Aydrus, 1996). It brought Muslim traders from the Middle East and Muslim Chinese traders to Nusantara, including port cities such as Melaka, Aceh and in the east, port cities such as Kuala Terengganu. Islam took root and assimilated in the existing local culture. There was clear evidence that Islamic Law was legitimized as the official law in Terengganu in the 1300s based on the evidence in the Inscription Stone found dated 702H (1303M). The aim of this paper is to study how Islam has influenced urban design principles in the Malay town of Kuala Terengganu.

BACKGROUND

The arrival of Islam and its practice

Islam is a way of life. The direct translation on the meaning of Islam is 'peace'. Islam is actually a peaceful religion for a person/ community/ environment when the system guided by Allah through the Quran and conveyed by the Prophet Muhammad S.A.W is implemented, practiced and focused towards submission to Allah in the development of human kind. This includes development of cities as mentioned in Surah Al-Naml 27:91-92:

[Say, O Muhammad], "I have only been commanded to worship the Lord of this city, who made it sacred and to whom [belongs] all things. And I am commanded to be of the Muslims [those who submit to Allah]. And to recite the Qur'an." And whoever is guided is only guided for [the benefit of] himself; and whoever strays - say, "I am only [one] of the warners."

In the Quran, Allah mentioned fourteen (14) times about cities, their features and populations. Based on the theory by Besim Hakim (1986) of Arab-Islamic cities (Figure 1), there were two type of cities established. One type includes those built with Shariah, and the other was assimilated into Shariah, moulded into the existing physical structure (Figure 1). The latter was particularly so when Islam arrived and took root in established cities. Islamic culture 'peacefully' developed, assimilated and embraced the regional cultural characteristics which did not contradict Shariah. This is highlighted in verse 5, Surah Al-Maidah, as Allah allows people to consume or use all good things, and accepts practices of good behaviour and implementation.

Surah Al-Maidah 5 verses 5:
"This day [all] good foods have been made lawful, and the food of those who were given the Scripture is lawful for you and your food is lawful for them…."

Based on Figure 1, the physical changes that happen in a city with the macro setting of the urban area are decided by the rulers, while the micro setting of the dwellings and neighbourhoods are determined by citizens. These decisions were made very much depending on the site, environmental and geographical condition of the place so and does not contradict with the natural law. The importance of responding to the natural law is mentioned by Allah in Surah As-Syuara 26:7-9.

'Did they not look at the earth - how much We have produced therein from every noble kind?''Verily, in this is a Sign: but most of them do not believe'. And verily, thy Lord is He, the Exalted in Might, Most Merciful.

These verses have guided decision makers to look at the earth, study the geographical and climate conditions of a place before decisions are made to fulfil the needs of the people. Based on Imam Abu Hanifa (80 A.H-150 A.H) and Imam Malik (93 A.H-179 A.H), the founder of a predominant school of law, the nucleus of a *medina*/city should be in the interconnection of these three aspects: governance (*kadi*), the masjid, and the market (*suq*) market and its surroundings (Figure 2). The interrelationships between these components make up a strong Islamic city (Shojaee, 2015). A great sample of the nucleus is the development of the first Islamic City, Madinah, by Prophet Muhammad S.A.W. All the three components were very closely related physically through linkages. The governor, the Prophet S.A.W himself, had his house next to the Masjid Nabawi, which was then the centre of learning, recreation, community and health. Surrounding the mosques were the *suq* and the residences. Their close proximity allows the people to contact the leader/ governor for any problems. The linkages were also well-shaded and well-ventilated with clear air space in response to the climate. through the enclosures created by the proximity of the buildings and organic urban patterns. Furthermore, within the residences were the district rules, which were comparatively different to those of contemporary cities.

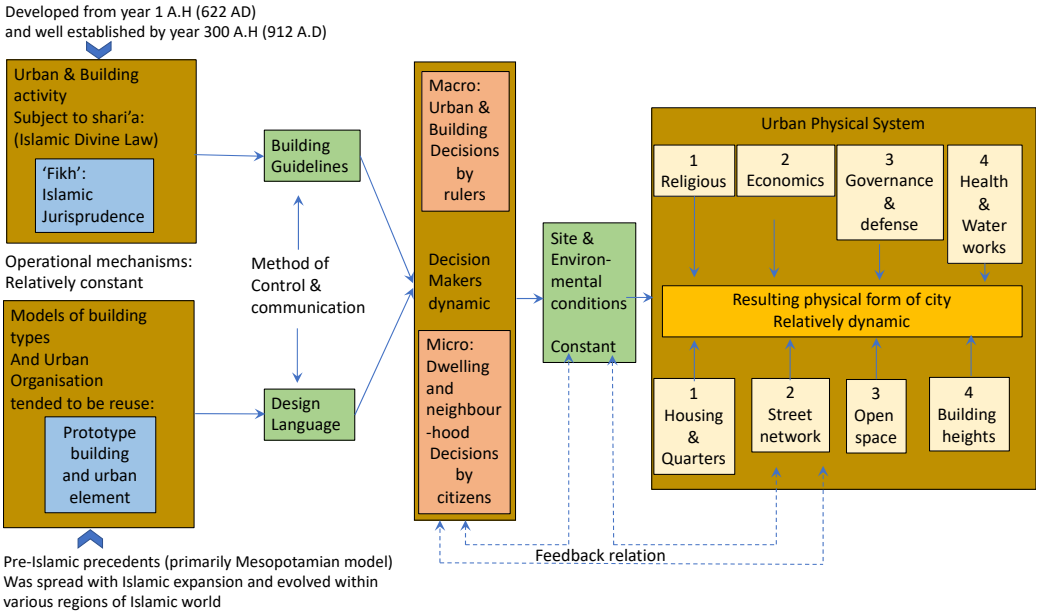

Figure 1. Conceptual Model of Selected Factors that shaped the traditional Arab-Islamic City *(Source: Besim Hakim, 1986: Redrawn by Author)*

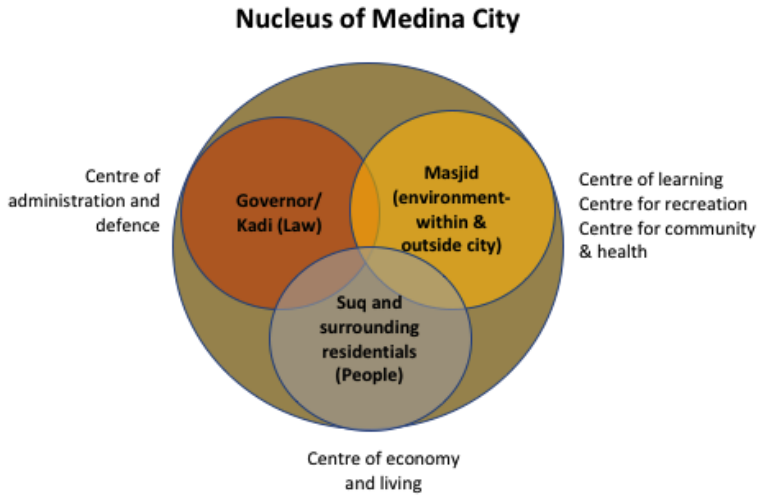

Figure 2. Nucleus of a Medina/ City by Imam Abu Hanifa and Imam Malik *(**Source:** Besim Hakim, 1986. Illustrated by Author)*

In the layout of a *medina*, the proximity of different income groups within the same cluster encourages interdependence and mutual respect to neighbours regardless of their income or status (Besim Hakim, 1986). This is in contrast to

contemporary cities, which encourage segregation based on plot size, which invariably means economic and social segregation. The medina cities were also built based on Shariah, and the neighbourhood building guidelines prioritize the aspect of privacy and safety. Free water supply is also a crucial aspect in a *medina*. The evidence is clear based on the history of Sayyidina Uthman, the Prophet's companion, whom bought the water well in Medina and later open free for all communities because water is the right given by Allah to human being without charge. Finally, in Madinah, the Islamic governance embraced the different cultural and religion and thorough consideration was given in the Madinah Constitution for the peacefulness of the city. Each culture has their own area to freely conduct their practices without conflict with others. The spaces to meet and mingle are in the common areas such as the street, the market and open spaces. Based on the discussion above, it can be concluded on the basic principles implemented in Arab-Islamic cities are as shown in Table 1. Based on integrative theory of urban design (Sternberg, 2007) and the characteristics identified in the Arab-Islamic Cities, this paper will evaluate whether the same principles were applied in the context of the Malay-Islamic cities of Kuala Terengganu.

Table 1. Integrative Urban Design Theory and characteristic of Arab-Islamic Cities.

Integrative Urban Design Theory		**Characteristics of Arab-Islamic Cities**	**Descriptions**
Physical Dimension	Good Form	Based on the Islamic Jurisprudence (Law)	Response to the Natural Law, building principles & respect the culture of the place which is according to the guidance of the Quran
		Pedestrian-scaled environment (Religious and Cultural Beliefs)	Humane and comfortable to pedestrian – no cars Separating public and private domain – land use emphasizes the separation of male and female uses
		Same form & pattern for housing (Religious and Cultural Beliefs)	Only the size of living area, type of building materials and sophistication of applied decoration distinguish one from another
	Legibility	Legible to the locals but not legible for first timers/ outsiders	Well link to all three components (governance, masjid, *souq* & residential) within a 400m radius.

		The locals knew their neighbours well but it is not legible for first timers/ outsiders for safety purposes so that the neighbourhood knew that an outsider has arrived. Furthermore, it is legible with high accessibility and permeability.	Accessible and permeable within neighbourhood and to the three main components of the leader's house – the mosque -market & surrounding residentials
Functional Dimension	Vitality	Common public areas - Robust in function	Masjid, Market and Open spaces (e.g. streets are also use for children to play)
		Living and working area is in close proximity	low carbon foot print
	Comfort	Climatic responsive, safety and privacy	Well shaded and ventilated public spaces and considered the safety and privacy aspect
		Water for all	God Gift
	Meaning	Cluster according to kinship	Culturally responsive which allows different race and religion to practice their culture in their own vicinity Closely link neighbourhood – will know if strangers are in the area
		No segregation between housing area for rich and poor	Different status of people living next to each other and within the same housing cluster

METHODOLOGY

The research approach of a case study of Malay-Islamic Town of Kuala Terengganu. Kuala Terengganu was chosen because the city provides clear evidence of the implementation of Islamic laws, earlier than Malacca, and it was the last state in the country to accept a British advisor (Haji Buyong Adil, 1982). The town planning was established by the Malay Sultanate. However, it is believed that Islam has arrived earlier than the recorded date, because the Inscription Stone portrayed a very strong root of the Malays Muslim due to the establishment of *jawi* writing. The content of the Inscription stone bears an

established Language, Writing, Systemised Social Structure, Islamic Law, Economics, Astronomical Knowledge, Mathematics and others, and shows that Malay Muslim has established a civilisation and cities (Abdullah Zakaria Ghazali, 1984). Furthermore, the estimated population of Kuala Terengganu in 1905 was 25,000 people with the largest urban Malay population in Malay Peninsula. The population number was the largest in the Unfederated Malay state, five times larger than Kuala Lumpur. The town flourished economically the highest compared to any other state in Malaya during that time. It practices barter trading of its own resources such as brass, batik production with other parts of the world (Khoo Kay Kim, 1974). Most of the original urban footprint remained until today. The study employs qualitative technique using morphological analysis and content analysis of archival maps and literatures. Morphological analysis is used to understand the physical development of an area since its early establishment to the current situation. Observations using photography were used to document the existing physical development. Triangulation data from these techniques allowed the evolution of the actual urban space, its building forms and the city's core principles.

FINDINGS AND DISCUSSION

Through the morphological study, the Urban Design Principles in Kuala Terengganu are identified based on the description of the characteristic of town and its components as shown in Table 2. The city shares distinct similarities to the principles available in Arab-Islamic cities but was built within the needs of the Kuala Terengganu local context. The implementation of these principles in each settlement can be seen clearly in Kuala Terengganu. The houses were built according to the Islamic Jurisprudence, taking into consideration the privacy and cleanliness in its space planning and architecture based on the teaching of the Quran. Their design respects the natural law with the use of renewable material and responsive to the local climate and geographical context. The height of the buildings was comfortably humane and all streets were designed for pedestrian only - wonderfully achieved before motor vehicles were introduced to Terengganu. The form of the buildings had a strong identity, with the pointed roof and the *janda berhias* wall, which are identifiable as forming the character of the traditional house of Terengganu.

Table 2. Urban design principles in Kuala Terengganu Malay-Islamic town

BUILT BY THE GOVERNMENT			
Integrative Theory of Urban Design	*Urban Design Principles in the Malay-Islamic Settlement*	*Description of Malay-Islamic Settlement Characteristic*	Components
Functional Dimension			

Comfort	Complete neighbourhood	People can live, work and receive basic needs (shelter, food and clothing)	City has all basic needs (e.g market/ shops, masjid, governance, houses, rightful location of community well)
	Health & Safety	Safety and defence	Governance (e.g Palace)
			Defence (e.g Fort/ watch tower)
		Source of clean water	Community well
Vitality	Integration	Life Long learning	Masjid) / *Surau/ Madrasa*h *(Pondok)*
	Conviviality	Mix of different culture at common spaces	Shops & Market
			Open Space (*Padang*)
Meaning	Heritage Conservation	Preserve architecture and culture	Traditional Architecture
			Traditional Culture
Physical Dimension			
Good Form	Blue Green City	Response to the river as the source of water and main transportation mode	Palace / Government buildings
		Integrated with greens around the city	Trees planted around the cities
	Sustainable design	Uses green technology (e.g rainwater harvesting)	Government Building
	Efficiency	Energy & resource efficient e.g Well shaded and naturally ventilated	Government Building
		Well shaded	Streets
	Transition design	Growth according to the needs of people	overall city development
Linkages	Human Scale	Streets and height of building along the streets is pedestrian scaled	Government Building
			Streets
	Ease of Movement	Permeable	Streets
	Conviviality	Provision of three main components: Masjid, the palace and market/ shops within 400m radius	Public building/ space
	Public Space	Place for public gathering	Medan/ Padang
BUILT BY THE CITIZEN			
Functional Dimension			
Comfort	Compactness	Many close distance work and living. Agriculture field or jetty for fishing are within walking distance	house with working space

	Complete Neighbourhood	People can live, work and receive basic needs	Neighbourhood has all basic needs (e.g shops, surau, leader, houses, rightful location of community/ individual well
	Health and safety	Clean water for all	Well at house
Vitality	People's first	No segregation between rich and poor	No zoning of houses
Meaning	Conviviality	Neighbourhood clustered according to kinship	arrangement of houses
	Quality of life	Strong neighbourhood and help each other (*gotong royong*)	people's activity
	Heritage Conservation	Preserve architecture and culture	Traditional Architecture
			Traditional Culture
	Public space	neighbourhood gathering	*Laman*
Physical Dimension			
Good Form	Blue Green Neighbourhood	Response to the river as the source of water and main transportation (street)	Houses
	Sustainable design	Design response to climate and local resources	houses/ public building
	Privacy	Emphasize on the aspect of privacy (form and spatial layout)	Houses
	Efficiency	Well shaded and ventilated	houses/ public building
	Neighbourhood Character	Similar form and pattern for housing (But the size of spaces, type of building materials and sophistication of decoration applied distinguish one from another)	houses
	Human scale	Pedestrian Scaled Environment. Low rise buildings (2-4 stories)	houses/ public building
	Transition design	grow according to the needs of people	overall neighbourhood development
	Ease of movement	Well shaded	Street
		High permeability between buildings	Street
		Accessible (within neighbourhood and to all three main components surau, the leaders house and shops)	Street
	People's first	Pedestrian oriented (built for people not for cars)	Street
	Safety	Eyes on the street (With the long windows/ lattice/ carvings on the façade create a safe environment for people on the streets.)	Houses

Linkages		Legible to the locals (It is legible to the locals because they knew their neighbours well but it is not legible for first timers for safety)	Street
	Public space	neighbourhood gathering	*Laman*

This approach allows the rich and poor to leave next to each other without feeling inferior, creating a strong sense of belonging to a community. The difference between rich and poor houses can only be seen if one gets closer to the houses and examines the intricacy of its carvings and size of its spaces. Most people chose to stay close to their kin because of their strong bond. This setting encourages the beautiful culture of *gotong-royong* (helping each other) which is currently missing in the contemporary urban setting. The high windows in each house with the lattice or carvings allows for '*eyes on the street*' (Jacob, 1960) to happen throughout the settlement for safety purposes. These characters also allow for natural ventilation to be experienced in each house and building. Water harvesting are also practiced in the gathering of water from the roof and well of each house and building. Furthermore, the working environments being located below the houses creates vitality in terms of building usage. And for those working at the plantation or as fisherman, the field and jetty were at a walking distance (within 400m walking distance). This is similar to the mixed-use development promoted in the contemporary urban design principles, which helps to lower the carbon footprint of both the living and working environments. Linkages between the houses creates a *kampung* or village. These *kampung* merge into the central administration, economic and religious area that comprises of the main leader's house (palace)(law) – the main mosque (*masjid jamek*) (environment) and the main markets (*pasar payang* and *pasar tanjung*) and the residents of the kinship of the leader and workers/ artisans (people) . This vitality is further enhanced at the public open spaces connected to these main central components of the town, which draw various public activities to these areas. Amazingly, all of these important components of the town include wells, which allow free access to water. Linkages between these components are highly legible and pertinent to the locals, enhancing accessibility to all the major components of the town that bind together the community. However, strategically the organic nature of these settings was not legible to outsiders, which helps to enhance security measures in the neighbourhood. Based on this discussion it is obvious that each of the main components within the village make up a larger nucleus of the Malay-Islamic Town. The essence of the Islamic City can be felt with the duplication of these nucleus and the urban design principles applied within it. According to Shojaee, & Paeezeh (2015), Islamic cities are built based on the Islamic values and principles, but how people responded to them will

greatly differ in terms of geography and climate, time and accessibility of resources and facilities and this is evidence in Kuala Terengganu. Table 3 summarizes the Urban Design Principles in Malay-Islamic Town from the characteristic of the Malay-Islamic town of Kuala Terengganu.

Table 3. Established list of Urban Design principles in Kuala Terengganu Malay-Islamic town.

1) Blue Green City – the buildings are responding to the river/seas or green open space (*Laman*)	8) Neighborhood character –unique character and values that respond to the local context
2) Compactness –Distance between living and work. Houses combine with working area and distance to jetty or plantation area are in a walking distance	9) People first – cities are built with priority of the people and not for cars. And no segregation between rich and poor
3) Complete Neighborhood – People can live, work and received basic services within the neighborhood	10) Public spaces – open spaces for public gathering and link from one to the other
4) Conviviality – Neighborhoods are social and lively with personal space, family, community and with other cultures	11) Quality of life – Strong neighbourhood: culture of *gotong royong*
5) Ease of movement – the town is walkable within the 400m radius and also very permeable	12) Heritage conservation –traditional architecture and values are preserved
6) Health and safety – water, air quality and safety/ defense are the fundamental goal	13) Sustainable Design –green technology: water harvesting and local resources for the material
7) Human Scale – cities are built at human scale for the comfort of people	14) Efficiency – Energy and resource efficient: maximum use of natural ventilation
	15) Transition Design – the growth of the town happen as the need comes, change slowly does not transforms overnight

CONCLUSION

Kuala Terengganu is generally a worthy example of an early Malay-Islamic Town which portrayed clarity in its urban design principles. Fifteen Urban Design principles (Table 3) were derived based on the comparisons of the urban design principles in Arab-Islamic cities and the Malay-Islamic City of Terengganu. The findings are very important revelations that highlighted the significant and the relevance of our local heritage which already embedded the urban design principles that is currently being discussed and aimed to be achieved by contemporary scholars and Sustainable Development Goals. In conclusion, it is pertinent for the decision makers of future cities to re-examine and relearn from the achievements of earlier local cities and towns that have taken into consideration a great deal about the rule of the place, as guided by the Quran, and social, economic and environmental sustainability in Urban Design. It is highly

recommended for the development of future cities to take into consideration on the 15 Urban Design principles that has already been embedded in the Malay-Islamic town as stated in Table 3 as a framework to develop future cities in Malaysia towards effort to retain its identity and sense of place and a more sustainable city.

ACKNOWLEDGEMENT
This research is supported and funded by MOHE – Ministry of Higher Learning under TRGS16-03-0020-20002 and Universiti Sains Islam Malaysia (USIM).

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Received: January 2020. Accepted: 1st April 2020

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ISSN 16756215

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