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RETHINKING DENSITY IN URBAN PLANNING: POLICY DIRECTIONS IN THE POST-COVID-19 ERA IN MALAYSIA

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Abstract

Since the 'Coronavirus Disease 2019' (COVID-19) struck the world and Malaysia, the general attention of the media and leaders has been focused on the high population density areas that have high infection rates and deaths. This article aims to rethink population density in urban development policy, thus providing development for policy direction in the post-COVID-19 era in Malaysia. The available national development planning policies in Malaysia, i.e., the National Physical Plan and the National Urbanisation Policy, and scholarly articles related to the population density topic were investigated through a scoping literature review and a keyword analysis. The findings showed mixed results in terms of the relationship between dense areas causing higher rates of COVID-19 infection and death rates. This article argues that policies related to spatial urban planning should continuously advocate dense city planning in considering how to achieve economic, social, and environmental sustainability and human quality of life. To this extent, this article contributes to the densification topic in spatial urban planning policies in terms of their application in the post-COVID-19 era, which needs urgent direction and clarification.

Keywords: City planning, pandemic intervention, density planning, human connectivity, crowding and order, social distancing, coronavirus outbreak

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INTRODUCTION

Since the outbreak of Coronavirus in Wuhan, China in December 2019 until today, various public media and statistics have reported that dense areas are some of the spots highlighted that tend to bring closer human contact, facilitating the spread of coronavirus and thus possibly causing deaths (ourworldindata.org, 2021). On the international level, the New York Times reported that "The pandemic has been particularly devastating to America's biggest cities, as the virus has found fertile ground in the density that is otherwise prized" (Tavernise & Mervosh, 2020). CNN's article quoted the governor's expression, "It's very simple. It's about density. It's about the number of people in a small geographic location allowing that virus to spread.… Dense environments are its feeding grounds" (Shoichet & Jones, 2020).

In the local level media, the tone is similar to that of the international level. The Malay Mail quoted the Chief Minister of Selangor: "Population density among causes of high Covid positive cases in Selangor" (Malaymail, 2021). A town planner, writing in the Star, expressed the view that "COVID-19 may well disappear in a few years like many a pandemic before it, but it is teaching town planners a valuable lesson. Not through any particular uniqueness as a biological entity, but by the simple fact that disease spreads more easily among populations living in close quarters. Now is the time to get that into reverse gear" (Gunasilan, 2020). The official website of the Ministry of Health Malaysia stated that, "Although the CMCO (conditional movement control order) has averted the exponential surge of cases in Selangor and brought down the Ro [i.e., the average number of secondary cases that result from one infected person] from 2.2 to 1.4, the daily cases continue to increase slowly and consistently. Our concern is the high density and mobility of the people, plus we cannot test everyone coming out of the red zones" (Ministry of Health for Malaysia, 2020).

Thus, amid the COVID-19 outbreak, these media reports have raised concerns about population density, which is of the utmost concern in the spatial urban planning dimension and its policy design. The fundamental spatial planning principle that is dedicated to the quality of life, economic scales, and sustainable development opts for dense populations or compact city planning, thus avoiding urban sprawl (Hamidi et al., 2020). However, the density dilemma is that high urban density creates ideal conditions for the expansion of disease; at the same, cities also work as laboratories to defeat disease (Keil, 2020). Therefore, will the term 'density' be oversimplified by the media and cause worries and confusion to the urban planning doctrine and the post-COVID-19 urban development policy direction? Will the cause be not density but other factors, such as crowding, that matter for curbing the spread of the deadly coronavirus? (Jun, 2020). In answering these two research questions, this article seeks to investigate the relationship between the COVID-19 pandemic outbreak

and the population density, and suggest a pathway for post-COVID-19 urban development policy and professional practices.

The following section explains the methodology adopted in this study. Then, followed by the findings from the top-down policies, namely the Third National Physical Plan (NPP3) and the Second National Urbanisation Policy (NUP2), the selected scholarly articles were compared and analysed. The section ends with discussions on the possible suggestions for urban development policy and professional practices, and provides a conclusion covering the potential limitations and contributions of the paper, and further studies.

METHODOLOGY

This article applied the scoping literature review and keyword analysis methods. The scoping review method aims to extract as much relevant data or information as possible related to a predetermined scope (Peters et al., 2015). The review was not exhaustive but sufficient to cover the research scope. The scope set for this study was within the range of the COVID-19 pandemic phenomena in Malaysia and the population density. Using the Google search engine, keywords selected for the scoping searches included "COVID-19", "density", "Malaysia", "quality of life", and "urban planning". For the keyword analysis, the AntConc software was utilised for the 'density' keyword occurrence and co-occurrence count in selected documents. The findings were then presented in three parts: the overview of COVID-19 that led to a change in lifestyle, national urban planning policies, and scholarly articles related to COVID-19 and density.

FINDINGS

Current Outbreak of COVID-19, Work from Home and Lifestyle Changes

As of July 9, 2021, COVID-19 has claimed nearly 4 million lives worldwide and six thousand lives in Malaysia (WHO, 2021). People are curious about how long the COVID-19 pandemic will last, and a prediction could refer to previous pandemics, which typically lasted between 12 and 36 months (Krouse & Miller, 2021). Hence, counted from the first confirmed COVID-19 case in Wuhan, China, by the World Health Organization (WHO) on January 12, 2020, the estimated end date of COVID-19 would be around the end of 2022 with the effective worldwide vaccine injections.

During the COVID-19 pandemic period, strict movement controls were applied in various countries to curb the spread of the COVID-19, including Malaysia. However, these attempts at movement control, such as prohibition from crossing countries, states, and districts; avoiding confined and enclosed spaces; and social distancing of one to two metres to prevent close human contacts, have impacted people's lives (Lim, 2020). Nearly one-third of people's quality of life is at stake during the movement controls (UNDP, 2020), as visits

to confined and enclosed public areas, including shopping malls, restaurants, schools, and streets, are not advisable. Technically, the socialising space has been limited to the private space of one's home, and this has eliminated all the public spaces and social constructs that have been built for people. Thus, most family members are facing a sudden loss of community socialising and involvement (i.e., social isolation) and are forced to learn, work and play from their home, which is widely known as Work from Home (WFH) or even Life at Home (Bogle, 2020). People's lifestyles have been disrupted by the COVID-19, and a new normality is ahead. As lifestyles change, planning for a better quality of life in the post-COVID-19 era and upholding the new normality is essential, as the quality of life is always the ultimate aim in urban planning and development (Jun, 2020).

The Third National Physical Plan (2016-2020) (NPP3) and The Second National Urbanization Policy (2016-2025) (NUP2)

Under the national top-down plans, the authors analysed the keyword 'density'. The authors found that the concept of 'density' was not explained well in either the NPP3 or the NUP2. In the National Language version of NUP2, the terms 'density' or 'dense' (in Malay, *kepadatan* and *padat*) occur only eight times. The 'density' co-occurrence is related to two main themes: 1) the smart growth that supports high-density city development, transit-oriented development (TOD), mixed land-use development, and avoids urban sprawl, and 2) the high-density economy.

In the NPP3, the term occurred 18 times. Like the NUP2, the 'density' co-occurrence is related to high-density development. It argues that high-density development in urban areas generates economic activities in the cities, especially in the sectors of industry, commerce, and services by increasing the gross domestic product. Particularly in NPP3: Chapter 4, the 'density' keyword appears 14 times, and the example given for encouraging high-density development is that Kuala Lumpur city centre was redeveloping Pudu Jail into a high-density mixed-use development (KPKT, 2016, pp. 4–64). Besides, the discussion also reflects the population density in Peninsula Malaysia and Sabah. As of 2013, the density of the Peninsula is 8 persons/ac, which is slightly higher than Sabah, where it is 7 persons/ac (Table 1). This indicates a lower density level, and there is high potential in promoting Malaysia to become a higher-density country incorporating many large city centres.

Table 1: Population density in Peninsula Malaysia and Sabah

	Peninsula Malaysia			**Sabah**
	2005	**2010**	**2013**	**2013**
Percentage of Built-up area (%)	3.32	5.76	8.91	2.49
Population (million)	18.52	18.52	22.57	3.20

Density (population upon built-up area in acre)	17	10	8	7

Source: KPKT (2016)

In addition, under action KD2.1B of the Spatial Sustainability domain, the NPP3 policy is to apply development with 'sustainable density' (in Malay, *berdensiti mampan*) (KPKT, 2016, pp. 4–66). 'Sustainable' in this sense was translated as being high- to medium-density for development control, but without a clear operational definition of how to work with it. It postulated that a 'sustainable measure of density' plays a role in supporting the sustainable development agenda, liveability, and resilience of NPP3. Other than providing some aspects of high-density development, including the TOD, mixed-use development, and being a walkable city (KPKT, 2016, pp. 4–66), the policy stated that the degree of 'density' should be determined by local authorities (LAs) of each city. For the authors, this notably lacks clear top-down direction and will definitely increase confusion among LAs in self-judging the density criteria.

On the other hand, under action KD2.2: Managing a high-risk natural disaster area, the NPP3 mentioned that natural disasters tend to happen frequently if not properly controlled, and such impacts always occur in high-density areas (KPKT, 2016, pp. 4–72). For the authors, this leads to contradictions at the execution level, since action KD2.1B asks LAs to select high-density development, but in action KD2.2, a high-density development tends to be exposed to the risk of natural disaster. What is the control measure behind the situation that means responsibility is shouldered by the LAs? Again, all statements seem entirely dependent on local contexts, but there is no explicit mention of how to put it into practice. The authors foresee that, with these top-down contracting policies, the ability of LAs to translate such 'sustainable density' into high-density development is crucially important. Still, most of them are at a crossroads in terms of the need to make good decisions with limited human and financial resources (Bahardin et al., 2019). In addition, the NPP3 policy stated that low-density development is always related to non-sustainable factors contributing to urban sprawl (KPKT, 2016, pp. 4–66). To shed light on the statement, three issues would occur. First, how does sustainable development mean high density, and should LAs always look and approve those high densities or mixed-use developments? Second, how high is high-density in their local contexts, since a benchmark standard was not provided in the NPP3? Third, should LAs go for high-density, as most people wish to stay in medium to low-density areas in their imagined city centre lives? These issues shall be further discussed in the following sections of this article.

Reviews on Scholarly Articles Related to Density and Covid-19

High population density planning seems utopian as a sustainable type of development, considering its economic viability, and communication and transportation technology enhancement. However, this was not until the current outbreak of COVID-19, after which the media commented that the density could be a cause of the spread of COVID-19. This matter is the main concern of this article. This subsection reviews the scholarly articles and attempts to answer the research questions formed in the introductory section:

1) Is the term 'density' being oversimplified by the media, causing confusion for the post-COVID-19 urban planning policy direction?
2) Could it be not the density but other factors that matter in curbing the spread of the deadly coronavirus in terms of urban planning?

To answer the first research question, the authors found that it is crucial to define the meaning of 'density'. Generally, urban density is a concept used in urban studies, and related fields to describe the intensity of people, housing units, the total floor area of buildings, or some other measure of human occupation, and activity across a defined unit of area. There are various ways of defining the density of urban areas, namely site/parcel density, block density, net density, residential density, net residential building type density, gross density, city or municipal density, coverage ratio of neighbourhood and sub-area, metropolitan density and even employment density (Jenks & Dempsey, 2005; Rapoport, 1975).

In the media's description, urban density is generalised to the degree of concentration of people in a city. The high density of urban populations increases with the activities of people. Therefore, the likelihood of a COVID-19 infector and infectee coming into close contact is higher. This preliminary understanding is not incorrect but should be interpreted with caution because it mostly lacks a rigid definition of density, methodology and remains hypothetical. The media would mislead the public and offer implausible perceptions to planners that there is 'something wrong' with the high-density development belief and that future development should possibly opt for low-density development.

The above explanation leads to the second question, for which the reviews of scholarly articles showed mixed results. In the review of economic studies, i.e., Wheaton and Thompson (2020b, 2020a), with direct and straightforward statistical methods, it was found that they tend to prove density influences the spread of the pandemic. The same case happens in sources in geographical studies, i.e., Rahman et al. (2020) and Ramírez-Aldana et al. (2020), which confirmed the spatial (density of population) factor is correlated significantly to the COVID-19 spread. In this case, the geographical modelling studies tend to generalise the spatial only in two-dimensional views, thus ignoring the fact that density usually happens in a vertical dimension. On the other hand,

articles which include rigid testing, i.e., Almagro and Orane-Hutchinson (2020), Carozzi et al. (2020) and Hamidi et al. (2020), explained further that it is not density that is directly causing the spread of the virus, but other confounding factors are involved. The factors included are connectivity, crowding, and order.

In other words, in a high-density area, the spread of the pandemic virus does not necessarily increase if the contact between humans is maintained at a safe social distance. The connections or network linkages between domestic, commercial, industrial and logistical activities are necessary for economic purposes, but if they are under control and in order, and overcrowding can be avoided, the spread of the virus would also be prevented. This is the case in Singapore (Salama, 2020). On the contrary, in low-density rural areas with uncontrolled human behaviour, if disorderly daily connectivity activities happen simultaneously, with meetings, gatherings and allowing big crowds, such as in West Africa (Connolly et al., 2020), then perhaps the infection rate will be higher than in a high-density area. Further explanations of the results and observations of the reviews are shown in Table 2.

Table 2. Reviews of scholarly articles on population density and COVID-19

Scholar	Methodology	Finding	Observation
Wheaton and Thompson (2020b)	Used data from cities in Massachusetts to provide a cross-sectional analysis of the per capita infection rate.	Found that population density has an economically and statistically significant positive effect on the incidence of the disease.	The statistical analysis and regression were direct, and other controlling factors were not analysed.
Wheaton and Thompson (2020a)	A continuous cross-sectional analysis from previous publications, from April to May 2020.	Again, they found that councils with greater density and a greater share of land use in commercial categories have a higher per capita incidence of the disease.	As above.
Ramírez-Aldana et al. (2020)	The analyses applied to cumulative cases of the disease in Iran through a Bayesian technique and relative risks.	Urbanised, highly connected provinces with older population structures and higher average temperatures were the most susceptible to presenting a higher number of COVID-19 cases.	The geographical analysis generalised the spatial in a two-dimensional view and potentially ignored that density is counted vertically in reality.
Rahman et al. (2020)	Data at the district level in Bangladesh were analysed through a spatial regression model (SRM).	Four factors significantly affected the COVID-19 incidence rates in Bangladesh: urban population, monthly consumption, number of	As above. It is worth noting that a greater distance from the capital city would mean the pandemic spreads, because it pushes people

		health workers, and distance from the capital.	to leave their home places.
Almagro & Orane-Hutchinson (2020)	Examined the data on the number of tests and positives across New York City (NYC) zip codes.	Found a significant positive relationship between population density and the share of positive tests, but this relationship seems to decline over time. Crowded spaces play a more important role than population density in the spread of COVID-19.	Through a rigid statistical test in this study, the conclusion is essential in clearing the doubt that it is a 'crowded space' (or inevitable physical distance) but less so the 'population density' that spreads the coronavirus.
Carozzi et al. (2020)	Quantitative methods; case study of 1759 counties in the United States, 93% of the total U.S. population.	Density affected the timing of the outbreak, with denser locations more likely to have an early outbreak. However, no evidence was found that population density is positively associated with the time-adjusted number of COVID-19 related deaths. This study cast doubts on hasty predictions of the consequences of dense urban living.	The statistical comparison methods by Carozzi et al. (2020) are convincing, where controlling the confounding factors yields the result that deaths are not affected by density but crowding differences in preventive measures, and access to healthcare; demographics may contain the spread.
Hamidi et al. (2020)	Use of structural equation modelling to account for impacts of density on the COVID-19 infection and mortality rates for U.S. metropolitan counties	Documents a flat relationship between density and the infection rate after controlling for population. Connectivity matters more than density. They recommended that planners should continue to advocate dense development.	These findings, in suggesting that connectivity matters more than density in the spread of the COVID-19 pandemic, are valid evidence for a rethinking of the density issue in urban development.

Source: Authors' compilation

DISCUSSIONS

From the keyword analysis, both the NUP2 and NPP3 policies advocated a high-density development direction. However, as aforementioned, a lack of clear direction in terms of 'density' was found in the policies. The NPP3 stated that the actual density of development should be dependent on the judgment of LAs regarding environmental effects and people's lives. This would lead to uncertain actions and contradictory spatially urban planning decisions among LAs and other urban sectors. Furthermore, the analysis of the scholarly articles showed mixed results. Those geographical modelling and economic studies with direct

statistical methods supported the media hypothesis that density is the main reason for the spread of the pandemic. However, those scholarly articles that incorporated multiple methods and testing found that population density is not a straightforward reason for the spread of coronavirus, but this spread is also contributed to by other confounding factors such as connectivity, crowding, and order. This finding echoes the opinion by Keil (2020, p. 1288) that "there are no linear density-disease relationships here but complex and contradictory ones".

As such, the authors argue that the media (including the leaders) have oversimplified the understanding of population density. In referring to the findings from rigid scholarly articles, the connectivity of humans or network linkages is the most important factor, and attention to this is needed. A density calculation of the total population per space occupied can go upwards, into vertical space. Hence, there are different density calculations for people per floor space area or people per land-use area. To this extent, those from the geographical modelling outlook potentially tend to ignore the use of floor space density but generalise land-use area, especially for a large city that is compounded with many high-rise residential areas. High-rise buildings such as apartments are designed with a high population density per land-use area but relatively lower density per floor-use area. Controlling crowds of people and the use of public spaces, such as issuing orders for ensuring good social distance, wearing protection masks, and using public space according to time booking, has been proven to effectively control the spread of the virus, even in a dense city area. Thus, if such measures happen, they would possibly contribute to misinterpretations of the results.

According to best practice, dense (compact) city planning is intended to cater for economic, social and environmental problems, especially in coping with the phenomena of urban migrants as well as the pace of urbanisation in a city. Dense city planning helps to avoid urban sprawl, leveraging the usage of health and other social facilities, and maintaining the land prices in the city area (Gunasilan, 2020; Yin & Abdullah, 2020). With the spurious hypothesis that a high density invites the higher spread of coronavirus disease, this article suggests denying it, and that the urban development planning policy should continuously advocate dense city planning as part of moving towards resilient economic and social conditions, environmental sustainability, and human quality of life. Here, the term 'resilient development' becomes the most appropriate to make a city or settlement always ready and able to recover fast from any disasters.

At the spatial planning level, the upcoming NPP and NUP are urged to clarify the order concerning the human level of connectivity linked together through economic, social and commuting relationships (refer Hamidi et al, 2021). It should not leave an ambiguous state such that LAs self-regulate spatial density issues but provide direction on the human level of use and the connectivity of public spaces. It should incorporate dynamic-resilient space planning and design, allowing social and physical distances when needed. Moreover, there should be

a dedicated space for quarantine when the pandemic breaks out. That is a new challenge for the urban planning profession. From the experience of one of the authors engaged in a series of stakeholder engagement sessions, the draft of the fourth NPP still covers density very briefly in relation to its impact on the pandemic. However, the plan will have a section about responding to the post-pandemic situation, namely strengthening the national border and food security, promoting a healthy and green lifestyle, strengthening communal public spaces, and ensuring safe environments.

Currently, there are 154 LAs in Malaysia. City Councils make up 11%, 25% are Municipal Councils, 3% are modified LAs, and the majority, 61% are District Councils (KPKT, n.d.). The lack of professional staff in council administration is an issue (Bahardin et al., 2019). It is suggested that the top-down policies of the NPP and NUP provide further details on population density taxonomy. This taxonomy should cater for different levels of municipalities, such as District Councils, which administer rural-based areas of less than 150,000 people; elaborating the human levels of use and the connectivity of private and public spaces. As aforementioned, this connectivity and order should include the new normality of WFH and social distancing with good human relationships. Whereas there is nothing wrong with continuous advocacy of spatial high-density development, the additional details of density taxonomy and the detailed conditions of human levels of usage and the connectivity of public and private spaces will give confidence to the urban planning practice and related professions. The details to consider include planning a population density with adequate public spaces, such as wider corridors in public housing, more spacious urban parks and playgrounds; and safeguarding hygiene factors, such as safe water and sewage systems, and sanitary physical conditions (Salama, 2020).

CONCLUSION

The relationship between density and the spread of infectious disease is not a straight line, but is complex and subject to various confounding factors. These include connectivity, crowding and order. Therefore, this article concludes that policies related to urban planning should advocate the provision of a high quality of life in terms of economic, social, and environmental sustainability, which should continue for compact city planning. Having said that, the spatial-level of a high population density-driven policy, as stated under the NPP3 and NUP2, needs to provide further clarification on the order of human levels of connectivity that link together through space, and through economic, social, and commuting relationships. Among the demands that are required to be incorporated are the new normality of the post-COVID-19 era. Apart from having greater accessibility to health and social facilities through dense area planning, the human-to-human relationship is an essential feature in striving towards a better quality of life.

The limitation of this article is that it is on the review level. Thus, more empirical studies with rigid methodologies are suggested to provide more of a spatial density taxonomy concerning the human level of usage and the connectivity of public and private spaces. However, it is worth noting that this article has contributed to rethinking the spatial urban planning related policies by incorporating density and its relationship to the spread of infectious disease. Policymakers and urban planners could refer to this review and make judgements on future spatial planning, in particular on high-density development that should always attempt to relate to human planning levels. As aforementioned, a high-density development should incorporate a dynamic-resilient concept, that is, a development that prioritises security, health and a prosperous living environment.

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FORMULATION OF A MALAYSIA MODERN RURAL DEVELOPMENT FRAMEWORK: SYNERGISING RURAL FOR CHANGE

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Abstract

Malaysian government aims to transform rural areas into economic focal points, improves rural livelihoods, living environment and narrows the life quality gaps between those living in urban and rural areas. Inspired by the government directive-aspirations and the emergence of new technologies in national and global rural practices, this paper attempts to discuss the formulation of a framework for rural development in Malaysia based on a modern approach. The process undertakes two main stages, namely focused literature study and review of the national existing policies and strategies to identify the key assessment elements and criteria for modern rural development. The next stage was to conduct an expert view survey to validate the developed elements and criteria, and then formulate a Malaysia modern rural development framework (FMRD). The FMRD was finally formulated by incorporating the elements and criteria promoted in the national policies and strategies and integrating them with smart technologies and ICT practices to reflect a holistic approach for rural issues. This paper concludes that the FMRD is a timely approach for the rural assessment measure to maximise its performance towards the future niches in Malaysia - rural liveability-resilient-and-smart.

Keywords: Modern rural, liveable-resilient-and-smart, rural infrastructure, Internet of Things, Industrial Revolution 4.0

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INTRODUCTION

In Malaysia, there were more than 26,400 villages in 2017 that contributed to as much as 26% or 7.8 million of the nation's total population (Dasar Perancangan Fizikal (DPF) Desa Negara, 2017). Moreover, the rural population size is expected to slowly decrease by years and will reach approximately 7 million in the year 2030. These circumstances are mainly due to the increase of out-migration especially youths from rural to urban areas as a result of limited economic boosters, lack of investments and technology practices, that consequently, contribute to low productivity, older human resources, low wage, etc. (see Hassan & Mustafa, 2012; Rashid, 2019). Omar et al. (2018) also highlighted the importance of youth facilities which were akin to urban standards to ensure youth would be engaged in community programmes and rural human resource.

In responding to the alarming situations, various national development policies and strategies were introduced to reduce the urban and rural development gaps as well as to improve the social well-being of the rural community. As the national development plans are accordingly aligned with the impact of the internet of things (IoT) and Industry Revolution (IR) 4.0, the existing rural development strategies should be realigned to meet the new economic movements (Malaysian Institute of Microelectronic System-MIMOS, 2015). Currently, as a continuation to this initiative, the most important ongoing policies are DPF Desa Negara 2030 (launched in 2017), which is Malaysia's first form of rural-national spatial development policy, Dasar Pembangunan Luar Bandar (DPLB) 2030 (in 2018) and the most recent is the Wawasan Kemakmuran Bersama (WKB) 2030. These are the most important development tools to synergise rural change and social well-being which are aligned with the Sustainable Development Goals (SDGs, 2015) within Malaysian national agendas. To this extent, rural assets and resources (agricultural, entrepreneurship, business, tourism) should be further explored to prevent any obstacles or difficulties faced by rural communities in fulfilling their needs in the global urbanisation challenges.

Inspired by this, the current research aims to formulate a framework for modern rural development in Malaysia based on a new approach – focusing on rural infrastructure planning and technology practices. That is part of an approach to empower rural actors by providing them solutions through a measure – a missing link approach for synergising rural change and community social well-being towards a modern concept.

MODERN RURAL APPROACH: LIVEABLE, RESILIENT AND SMART

The concept of modern rural development is mainly concerned with the development intention in the early industrial revolution era (Levin & Feniger, 2018). It aims to transform the village into a modernised area while impacting the rural economy, social, environment and technology, and bringing enhancement to rural communities' livelihoods. Hence, the term modernisation can be broadened to reflect the varied ways in which it has been practised and the way these variations resulted in diverse visions of modernisation. In the emergence of the digital era with the Internet of Things (IoT) (see Morgan, 2014) and other enhancements such as drone technology practices, Geographic Information System (GIS), etc., the Malaysian government seizes these opportunities and is playing a vital role in improving rurality development as well as its support systems towards the establishment of a modern rural area. Many Asian countries such as India, Indonesia and Malaysia, as well as European countries have embarked on the task using this approach, particularly in smart village initiatives (see ENRD, 2018; Smart Village, 2017; Rahmawati et al., 2017, Razak et al., 2013). As suggested in the literature, development criteria of a modern rural village should include such as strengthening local business, education, health and welfare, technology engagement, and food security: all of which are compulsory elements in the modern rural approach (Levin & Feniger, 2018; Rahmawati et al., 2017).

As such, this research would formulate a modern framework of rural development in a new way, based on the existing Malaysia National Policies framework, specifically the DPF Desa Negara 2030 – which focuses on liveable and resilient rural and the DPLB 2030 – to attain sustainable rural living, and efforts are embedded with the best practices of smart village models, internationally. To the best of our knowledge, only a few researchers have explored this area in Malaysia.

DPF Desa Negara 2030

The DPF Desa Negara 2030 was formulated as an essential blueprint to drive development actions towards rural communities' prosperity with the vision of **"**Prosperous Rural, Prosperous Nation". This vision puts rural areas as the most significant element of decision-making in urban and regional planning in Malaysia. It is oriented towards its objective "liveable and resilient rural". In line with the concepts of Sustainable Development Goals (SDGs) and 11th Malaysia Plan 2016-2020, the DPF Desa Negara 2030 was constructed by taking into consideration the vital elements in developments, which are physical, economics, social and environment to overcome the alarming issues of development imbalance between the urban and rural areas, as well as urbanisation.

In relation to the focus of the study, which is to identify rural infrastructures, facilities or any other rural physical attributes for modern rural development, four main thrusts were evaluated; Thrust 2, Thrust 3, Thrust 4 and

Thrust 5. Thrust 1 is deemed unsuitable as it focuses on the sustainable plan and strategy management of the rural environment that has less emphasis on the physical or infrastructure elements. However, the provision of environment-related-infrastructure is covered under Thrust 3 (Reinforcing rural liveability). Thrust 2 focuses on the strategy in reinforcing urban-rural relationship to improve rural dwellers' quality of living and living environment (such as more progressive, comfortable, inclusive and assuring social welfare, liveability and prosperity) through complete infrastructures, facilities and services especially at town and rural growth centre. Thrust 3 is the strategy to reinforce the liveability of the rural community by focusing on the basic facilities within the village besides exploring and promoting rural assets such as agriculture, traditional houses, and the aesthetics of the rural environment that might be unavailable or scarce especially in the city. Thrust 4 puts focus on the strategy of empowering rural economy through the exploration of diverse rural sources and integrating best practices to improve productivity, marketing technique and maximum revenue. Finally, Thrust 5 puts the focus on implementable rural management, as an instrument to the implementation of a targeted and sustainable rural development plan: the major factor in the effectiveness of a rural development implementation lies in its implementation or execution stage.

As a result, there are eight criteria groups were formed to represent 101 criteria derived from Thrust 2 to Thrust 5 of the DPF Desa Negara 2030, namely the rural infrastructures, facilities and rural economy and services as well as distinctive rural governance that are required for synergising rural change and community social well-being to establish a future rural face of modernisation, welfare and prosperity. Those criteria went through a validation process based on an expert view survey and were finalised in Table 2.

DPLB 2030

DPLB puts an emphasis on the vision, "A Prosper, Inclusive, Sustainable and Holistic Rural" as the main agenda in the process of developing Malaysian rural by the year 2030. This vision highlights the assurance of access for infrastructure and social facilities which are equitable to those in the city to the rural community. Most importantly, rural areas are targeted to offer jobs and business opportunities that are capable of increasing the income of the rural population and attract those who have left to come back and reside in rural areas. This target is aligned with the DPF Desa Negara 2030. Bachok et al. (2019) also highlight the need for the empowerment of rural products such as agro-tourism and other tourism-based initiatives to generate more income for the people. More importantly, it is projected that the rural area is able to contribute to creating new jobs and business opportunities, domestic and international tourism choice, thus, the rural population's income and living standard will increase.

Smart Rural Concept

It is not an easy task to identify the appropriate criteria for smart technology practices complementary to rural development execution in Malaysia as mentioned. It is due to many obstacles relating to mindset, capability, skills, preparedness, etc. (Razak et al., 2013). Having said that, benchmarking and positioning to the current best practices of international experiences is most important. Therefore, this research has selected six relevant projects/studies to extract the key assessment criteria for modern rural development in Malaysia (see Somwanshi et al., 2016; Kaur, 2016; Smart Village, 2017; Kamal et al., 2016; Natarajan & Kumar, 2017; Ramachandra et al., 2015).

Literally, the smart villages are rural areas and their communities which were built on their existing strengths and assets with new enhanced practices by means of digital communications and technologies, innovations and better use of knowledge. In other words, they are about rural communities taking the initiative to find practical solutions – both to the severe challenges they face and, importantly, to exciting new opportunities which are transforming rural areas (ENRD, 2018; Smart Village, 2017). The basic 'smartness' components include access to high-quality education, health care, information and communication technology, finance, clean water and sanitation, and enhanced livelihoods, including villagers' own value-added entrepreneurial activities. It also generates new forms of cooperation and alliances between farmers and stakeholders, the government and private sectors; from the bottom-up and enhanced with the top-down inputs (ENRD, 2018). Hence, Industrial Revolution 4.0 – as the key indicator for technological enhancement, currently becomes a new trend or trademark in all things, particularly the global development paradigms (Lom et al., 2016); indeed, rural development should align with technology-driven progress, distinctiveness and completeness.

By working on the six materials, this research then identified five criteria groups, which consists of 35 criteria as a catalyst for synergising rural change in Malaysia towards a smart village; that collaborates all potential criteria seamlessly to maximise the rural potential that benefits rural areas and the community as a whole. From those criteria, there are some criteria of the technology practices which are very new in Malaysian rural context such as smart health facilities, Fisheries Information System (FIS), vertical farming, drone technology, and others: all these were finalised in Table 2.

METHODOLOGY

Designing a Modern Rural Development Framework and Assessment Criteria Identification

As the pathways of modern rural development are divergent, they are inclusive of an integration of criteria namely liveable, resilient and smart: Hence, the process was structured into three stages as indicated in Figure 1. This research is

intentionally designed to look at rural infrastructures and the best technology practices in today's worldwide rural development.

Stage 1 is the review of contemporary concepts in rural development which focuses on the international smart village practices. Only six relevant materials were reviewed to identify the key assessment elements and criteria (i.e. infrastructures and technology practices) for modern rural development. These articles are selected since they incorporated the practised smart villages in India (see Natarajan & Kumar, 2017; Somwanshi et al., 2016; Kaur, 2016; Ramachandra et al., 2015), Bangladesh (see Kamal et al., 2016) and some other countries in the world such as Tanzania, Nigeria and the United Kingdom as comprised in Smart Village (2017). Based on the content analysis method (see Krippendorff, 2004), the extracted and rephrased contents were organised into four columns which comprised of article/report info, definition, concept, and technology practices; and these were followed by the two syntheses columns (the key assessment elements and criteria) in a summarised form to (a) potential criteria groups, and (b) potential criteria.

For Stage 2, the researcher conducted a similar process, which involved reviewing the contents the DPF Desa Negara (thrust 2 to thrust 5), and then the contents were classified and tabulated into the criteria groups and the assessment criteria (refer to the proposed infrastructures, public amenities, economic activities, etc., that benefit to rural communities). Without exception, the key important inputs from the DPLB 2018 were also included in the framework to ensure the developed framework would be in line with the government's aspirations.

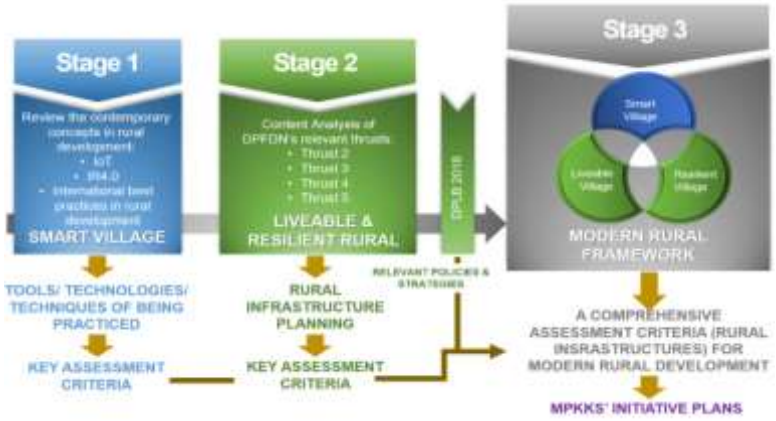

Figure 1: Conceptual process of designing a modern rural development framework.

The final stage is the formulation of the modern rural framework that is a combination of three dimensions: Resilient, Liveable & Smart with comprehensive assessment criteria that are centred to MPKK (*Majlis Pengurusan Komuniti*

Kampung) initiative plans thus would be useful and practical to undertake by rural actors. The key assessment elements were then structured into dimensions, criteria groups, and criteria.

Validation Process Through Expert Opinion Survey

The research applies a single-round expert view survey with a structured assessment form (rating priority exercise) to validate and assess the importance/relevance of dimension, group criteria and criteria considered in the study to reflect modern rural development outcomes. The designed assessment form also encouraged the experts to suggest additional criteria that they feel are relevant but not included in the list. They can also make recommendations to delete/combine/rephrase any dimensions, criteria groups, and criteria that they believe would improve the understanding and quality of the overall assessment for modern rural development.

Selection of experts was based on the involvement in the rural development projects and the formulation of rural development policies as well as participation in smart and green technology practices. The survey was administered by using docs.google.com which has been sent to respective experts either through email or WhatsApp. Eight experts were selected to participate in the survey representative of local academicians, international academicians, and professional/experts from agencies. Within 2 weeks of the given time (due to a limited time), only 5 out of 8 experts undertook the survey and provided their feedback accordingly. They are 2 from local academicians, one international academician and 2 representatives from government agencies. The number of samples is considered enough without compromising the quality of the results obtained since points of view came from academicians, implementers, and practitioners.

RESULTS AND DISCUSSIONS

By having the identified key assessment elements as structured into levels, namely: dimension, criteria group and criteria, this research, therefore, has proposed a framework of modern rural development (FMRD) as a new approach for synergising rural change (Figure 2) – to measure rural development progress towards a modern village.

The FMRD is formulated as an objective mechanism of model assessment - a translation of all the key criteria required in modern rural development. There are three dimension-objectives measures proposed in the framework, namely: (1) Rural economic boosters and catalyst infrastructures to represent the resilient concept, (2) Rural characters and social well-being infrastructures (represent the liveable concept), and (3) Smart and green technology practices (represent the smart concept). Moreover, Dimension 1 comprises three criteria groups and 68 criteria, Dimension 2 with five criteria groups and 33 criteria, and Dimension 3 offers five criteria groups and 35 criteria – to form the total of 136 assessment criteria of the FMRD.

The proposed framework relies on the adequacy of rural infrastructures, facilities, services and technology practices, particularly in agricultural, entrepreneurship and tourism developments. Empowered by incorporating the best practices or ideas of a smart village approach into the existing Malaysia rural development approach of liveable and resilient which is embedded in the DPF Desa Negara 2030 and the DPLB 2030, it would be a booster for synergising and rejuvenating rural areas and as a 'missing link' approach to the implementation of the existing policies and strategies, particularly the DPF Desa Negara 2030 and the DPLB 2030.

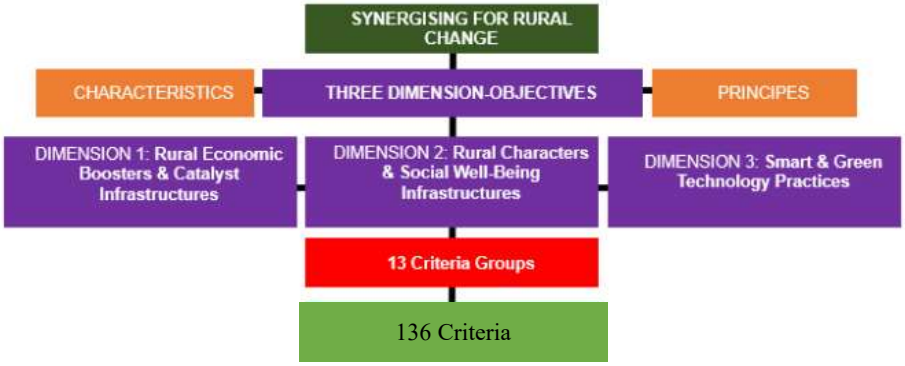

Figure 2: A framework of modern rural development

This section discusses the analysis of the results obtained from a single-round of the expert view survey. The analysis focuses on:

1. to rank the importance level of dimensions and criteria groups by calculating the mean values – where lower value is considered the most priority and so on, and,
2. to identify the relevant criteria to be used for further assessment of the modern rural development index. Only criteria that obtain 2 out of 5 values were selected.

Refining and Ranking of Dimensions and Criteria Groups by Priority Levels

Looking at each of the three dimensions, the results show that the dimension of rural economic boosters and catalyst infrastructures obtained the lowest mean value (or the most priority level), followed by rural characters and social well-being infrastructures and smart and green technology practices, thus, they have been ranked to 1, 2 and 3, respectively (Table 1).

Table 1: Mean value for each dimension and criterion group according to the judgement of priority level from experts

Dimensions	Criteria Groups	Priority Level by Experts (A to F)					*Mean Value	Rank
		A	C	D	E	F		
Rural Economic Boosters & Catalyst Infrastructures	Economic and Rural Services Centre (Town)	3	1	1	1	2	**1.6**	**1**
	Rural Growth Centre (RGC)	2	2	3	3	1	**2.2**	**2**
Mean value: 1.4 or ranked to 1	Rural economic cluster (agricultural, entrepreneurial, tourism)	1	3	2	2	3	**2.2**	**2**
Rural Characters & Social Well-Being Infrastructures	Efficient infrastructure	3	2	1	3	1	**2.0**	**1**
	Transportation networks of rural-town-city, and rural accessibility	4	1	3	1	3	**2.4**	**2**
	Rural governance (MPKK) and database	1	2	4	4	4	**3.0**	**3**
Mean value: 2.0 or ranked to 2	Internal village amenities	5	4	2	5	2	**3.6**	**4**
	Rural spatial characters and heritage	2	5	5	2	5	**3.8**	**5**
Smart & Green Technology Practices	Rural agricultural, infrastructures, technologies and innovations	1	5	1	1	1	**1.8**	**1**
	Rural entrepreneurial technologies and innovations	2	1	4	2	4	**2.6**	**2**
Mean value: 2.6 or ranked to 3	Rural marketing and e-commerce	5	2	3	3	2	**3.0**	**3**
	Smart and green technology practices	3	4	2	4	3	**3.2**	**4**
	Community-IoT-based smart technology practices	4	3	5	5	5	**4.4**	**5**

*where lower value is considered the most priority level and so on.

There are 3 criteria groups within the rural economic boosters & catalyst infrastructures. The relative importance level shows that the economic and rural services centre (town) becomes the most important (with 1.6 mean value) which ranked to level 1, and rural growth centre (RGC) and rural economic cluster (agricultural, entrepreneurial, tourism) obtained the same relative importance level to the position themselves at ranking 2.

Within the dimension of rural characters & social well-being infrastructures, efficient infrastructure has ranked to 1, followed by transportation networks of rural-town-city and rural accessibility, the lowest level of importance is rural spatial characters and heritage to rank at 5. Finally, among the five criteria

groups in the smart & green technology practices, rural agricultural, infrastructures, technologies and innovations are ranked top 1, followed by rural entrepreneurial technologies and innovations, rural marketing and e-commerce, and so on (see Table 1). It indicates that agriculture remains the most important sector for rural development in Malaysia, but there is a need to support other economic diversity as well as the smart and green technology practices, as synergy and stimulate factors to make rural areas growth better.

The Relevant/Additional Criteria for Modern Rural Development Framework

The experts were encouraged to rephrase or remove any criteria that they believed duplicated another criterion, and also to suggest additional criteria that suit the FMRD's aim. Therefore, some experts took the liberty to rephrase or make minor changes to the existing criteria and suggest a number of new potential criteria. By then, the suggestions from the experts ranged from rephrasing to remove the criteria due to duplication. To that extent, Table 2 outlines the finalised criteria after taking into action such as removed, added new and a little changed and rephrased them into a localised context.

Table 2: The finalised criteria by their dimensions and criteria groups

Dimension 1: Rural Economic Boosters & Catalyst Infrastructures (70 Criteria)
1 | *Economic and Rural Services Centre (Town)*
Economic Development: Mini market; Retail: food and beverage; Retail: home appliances; Retail: vehicle equipment; Retail: agricultural equipment; Souvenir Shop; Market/ Stall/ Bazaar; Farmer's Market/ Night Market/ Day Market; Restaurant; Food Court; Small-medium Business; Agricultural product collection centre; Petrol station; Insurance company; Hotel/ Boarding House/ Guest House. **Infrastructure Facilities:** Road network; Power and water supply; Telecommunication and ICT services; Bus Station/ Terminal; Bus stop; Railway station; Ferry/ Boat Terminal. **Service Centre:** Secondary school; Primary school; Kindergarten; Mosque; *Surau*; Church; Hindu temple; Buddhist temple; Cemetery; Health clinic; Rural clinic; Police station; Fire station; Multipurpose Hall; Public Hall; Community working hall (*Balai raya*); Rural library; Local Park; Neighbourhood Park; Playground; Bank; Registered bank agent; Rural Trade Centre (RTC). **Human Development:** Local Centre for Business and Consultation Services; Entrepreneurship skills training centre; Community Rehabilitation Programme (CRP).
2 | *Rural Growth Centre (RGC)*
Economic Development: Agricultural product collection centre; Small scale retail; Shop that supplies modern agriculture equipment and technology (including technical services); Workshop that provides services for maintenance/ repair of agricultural equipment; Hardware shop. **Infrastructure Facilities:** Road network; Power and water supply; Telecommunication, high-speed broadband and other ICT services; Public transport terminal. **Service Centre:** Community and recreational facilities; Mobile Community Transformation Centre (CTC); Registered bank agent. **Human Development:** Community Rehabilitation Programme (CRP); Elderly activity centre; Youth & innovation centre.
3 | *Rural economic cluster (agricultural, entrepreneurial, tourism)*
Tourist information centre; Homestay operated by the community through MPKK; and additional criteria; Cheap accommodation/ budget motel; Traditional and casual food premise concept; Permanent Food Production Farm (TKPM); Rural trade and retail; Broadband facilities for retailer and purchaser
Dimension 2: Rural Characters & Social Well-Being Infrastructures (33 Criteria)

1	*Rural spatial characters and heritage*
Rural boundary and mapping rural resources; Rural landmark (gateway, statue and welcoming signage); Excellent rural asset development award; Agricultural areas as buffer zone; New development of low-density housing (detached) suits with rural characters and B40; Adaptive reuse or restoration of old house; Preservation of traditional Malay house (or maintain the traditional archi-style; Individual registration as National Heritage Living Person (WAKOH).	
2	*Transportation networks of rural-town-city, and rural accessibility*
Bus stop for stage bus (500m distance from village); Shuttle train station; Water transport jetty; Rural paratransit stop (mini bus/van); Paved main entrance/access; Paved rural internal road; MyCar, Grab and any other e-hailing service providers.	
3	*Efficient infrastructure*
Continuous and adequate water supply; Extensive power supply; 1 Malaysia Internet Centre (PI1M); High-speed broadband; Fibre optic (fixed bandwidth) coverage; Cellular/ broadband coverage; Sanitary landfill; Recycling centre operated either by government-driven or partnership with the local community; Septic tank system.	
4	*Internal village amenities*
Mobile facilities (clinic and library); Community hall / rural community centre; *Surau;* Football field / recreation / sports; Healthcare centre (elderly, disabled people, and neglected mother); Temporary shelter/transit service for disaster (dedicated command centre in separation with school).	
5	*Rural governance (MPKK) and database*
MPKK working room; Rural community Co-operative centre; Rural village database managed by dedicated or paid staff.	
Dimension 3: Smart & Green Technology Practices (36 Criteria)	
1	*Rural agricultural, infrastructures, technologies and innovations*
Tractor; Plough; Harvesting machine; Micro-watershed management; Farmers Information System (FIS) and drone technology; Drone or UAV technology (crops monitoring and pest control); Smart database for agricultural through sensors and satellite data; Smart weather and irrigation system; Vertical farming; Vinyl greenhouse agriculture; Smart dairy through smart devices (livestock); Production of a high-demand agricultural products (Kenaf, vanilla, basmathi rice, *musang king*, stingless bee/ *lebah kelulut*, *burung walit*).	
2	*Rural entrepreneurial technologies and innovations*
Agro-industry basic facilities (i.e. incubator centre for up to district scale) (incubator); Community biogas plant for entrepreneurship activities; Market analysis tools/ software; Village community radio; Telecommunication and video conferencing; ICT related materials & outsourcing training; Mentor-mentee training programme or rural icon in business.	
3	*Rural marketing and e-commerce*
Fresh fruit stall (GBBS); Agrobazaar; KShoppe; Training centre and e-commerce services (equipped with high-speed broadband).	
4	*Village smart and green technology practices*
Rainwater harvesting; Renewable energy (through solar rooftop PV, solar micro grid, micro-hydroelectric, solar farming); Generate energy through biogas digestion; Solar cookers; LEDs; Low-energy motors; Flood risk alarming through smart phone; Biochar for transforming garden waste into organic fertilisers – waste-to-wealth.	
5	*Community-IoT-based smart technology practices*
Smart healthcare facilities/ healthcare mobile apps; Waste monitoring and management system through wireless sensor monitor; Smart education (through videos, smart classroom, fun-toy library); CCTV cameras/ Smart surveillance system; Goods and services delivery system via mobile apps.	

As a result, the finalised criteria for the FMRD are 139 criteria by adding up three more to the earlier proposed. 70 from Dimension 1, 33 from Dimension 2 and the remaining 36 from Dimension 3 – are very important to materialise the capabilities of the FMRD as a missing link for synergising rural change in sustainable and prosperity ways, and more importantly, reflect the people's aspirations in fulfilling the livelihoods. These criteria need to be endorsed as a new assessment measure to modern rural development in Malaysia.

CONCLUSIONS

This research has introduced the modern rural development framework (the FMRD). That is, an integrated approach between the smart village and liveable and resilient concepts, aimed at synergising rural change in terms of physical, economic, social and technology practices. The FMRD is designed based on three dimension-objective measure which in turn comprised of 13 criteria groups and 139 criteria finalised from the single-round expert view survey. It is evident that the stages, analyses, and interpretations in this research need to be endorsed since the elements discussed help identify the emerging new paradigm shift in villages and societies' approach in the rural areas. Moreover, the FMRD is a timely approach for the rural assessment to maximise the rural performance towards establishing future niches in Malaysia - rural liveability-resilient-and-smart. However, at this stage it remains as a measurement idea until it undertakes real case studies. It shall be demonstrated in other work to come.

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KEY APPROACHES OF LIFE-CYCLE COST IN GREEN GOVERNMENT PROCUREMENT (GGP) FOR GREEN PROJECTS

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Abstract

Sustainability has emerged as a critical concern in any viable physical planning and development. Hence, the Malaysian government has promoted the concept of green procurement also known as Government Green Procurement (GGP) that aims to minimize environmental degradation. In GGP, life cycle perspective thinking is introduced where life-cycle cost (LCC) tools act as decision-making in controlling the initial and future value of building ownership. Despite the increasing importance of green procurement and LCC in the planning phase of green projects, the viability and implementation of LCC is still lacking. Many have stated the benefits of LCC in green procurement for green building projects, however the criteria of LCC are not clearly determined. The study aims to determine the important level of LCC components relating to the green project planning phase. Questionnaire survey was distributed to 50 respondents composed of project team members that were involved in the selected green government projects. 32 respondents returned their responses to the survey. The results revealed that the highest rank of LCC components in green procurement is energy consumption cost, greenhouse gas (GHG) savings cost, acquisition cost, energy simulation cost and utilities cost. These results would elevate the use of LCC in the green procurement adoption and viability of green projects.

Keywords: Life cycle cost, government green procurement, planning phase, green projects

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INTRODUCTION

Over the last decades, sustainability has emerged as a critical concern that must be addressed in any viable building planning and development strategy, including in achieving green buildings. In Malaysia, sustainability and green growth in the building project's planning has been addressed in the Construction Industry Transformation Plan (CITP) 2016-2020 and 11th Malaysia Plan (2016-2020). To cater the sustainability agenda, the Malaysian government has promoted the awareness of green growth and the concept of government green procurement (GGP) as a method to maintain and minimize the environmental effects (Adham et al., 2015; Buniamin et al., 2016; Kahlenborn et al., 2014). This plan refers to the purchase of products, services and related works in the public sector that take into account environmental criteria to conserve the environment and natural resources, and minimize and mitigate the negative impacts of human activities (Bohari et al., 201; Musa et al., 2013).

Furthermore, Malaysia as a member of the global community is working toward the reduction of carbon under the Low Carbon City Framework (LCCF) (as shown in Figure 1), that sets a target for carbon reduction in the country by 40% in the year 2030. Align to the government's commitment towards reduction in carbon footprint, the LCCF makes a difference partners in cities and townships to define their needs and create activity plans to diminish the carbon outflows as it centers specifically on methodologies and measures towards carbon lessening (KeTTHA, 2011). It is also aligned to the National Planning Policy and Green Neighbourhood Policy sets in the PLANMalaysia (Department of Town and Country Planning) under the Ministry of Housing and Local Governance Malaysia. With the framework and strategic direction in place, the construction industry will need to evaluate its current position and gear its effort in line with the national master plans and agenda.

Due to the importance of public green purchasing and procurement, Malaysia had already established a government green procurement (GGP) guideline for products and services in 2014 and 2018. The guideline was introduced for government procurers through the Ministry of Energy, Green Technology and Water (KeTTHA) (or currently known as KASA) with Malaysia Green Technology Corporation. The GGP guideline was improvised through its latest issuance in the year 2018, where 20 products and services were incorporated instead of 6 products and services in 2014. By adopting a policy and guidelines through GGP establishment, the public sector can also strongly influence the strategies and behaviour of private sectors and organisations, pushing them towards cleaner and more feasible generation designs (Bohari et al., 2020; Razali et al., 2021; Giacomo et al., 2019; Testa et al., 2016).

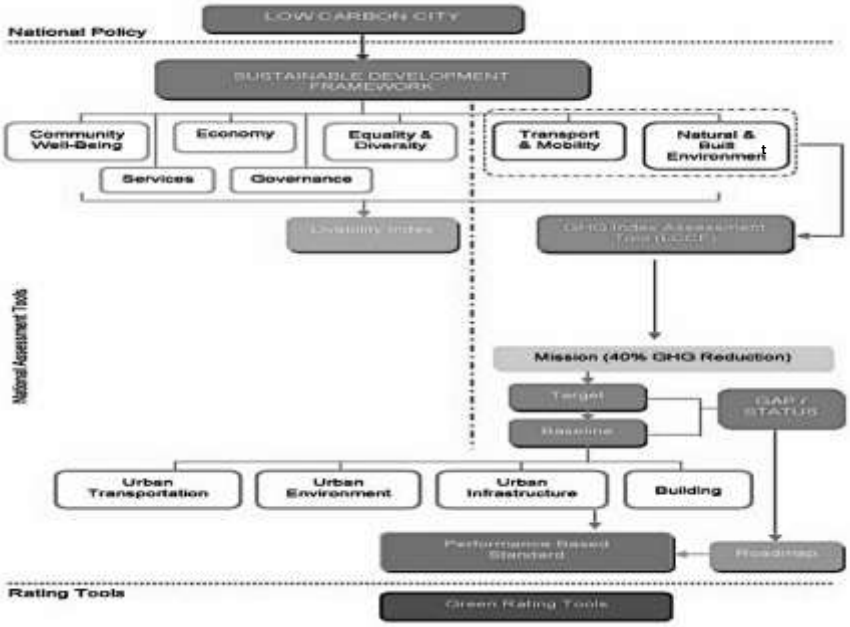

Figure 1: Sustainable Framework for Low Carbon
Source: KeTTHA (2011)

One of the key approaches introduced in green procurement is life cycle perspectives thinking (Giacomo et al., 2019). According to UNEP (2013), life cycle thinking relates to green procurement policy. It represents a holistic approach that allocates life cycle management tools to assist in decision making at development and project stages; including green and sustainable product development, production, green procurement, and final disposal. One of the tools in life cycle management is known as Life Cycle Cost (LCC). According to Oduyemi et al. (2018), LCC is beneficial in allowing owners and clients to make an informed decision about the facility of products before it is used. LCC is a financial assessment towards a decision-making approach that determines the cost of ownership of a facility. It is a useful tool that facilitates controlling the initial and future value of building ownership. In LCC exercise, procurement decisions based on the lowest price risk the systematic exclusion of environmentally friendly options (Giacomo et al., 2019).

Ideally, the concept of sustainability is composed of environmental protection, economic growth, and social equality. In today's critical economy, expectations have gone beyond the design and construction of sustainable and green buildings. As stated by Kshirsagar et al. (2010), owners have broadened their perspective to include operations, maintenance, repair, replacement, and

disposal costs. Therefore, a full implementation of the LCC approach in procurement procedures and all costs brought about amid the lifetime of the green ventures ought to be taken into consideration (Giacomo et al., 2019; Marchi & Zanoni, 2017; Pombo et al., 2016). LCC helps public authorities to consider all costs-in-use including the maintenance and salvage cost that are not preliminarily allocated during the product's acquisition (European Commission, 2016). As supported by Dwaikata and Ali (2018), the stakeholders undertook a holistic approach in achieving high efficiency in the procurement process by acknowledging the whole life cycle costs during the planning phase of green projects.

The incorporation of LCC in the decision-making process encourages public administrations to proficiently select between competing items as the purchase costs, maintenance, refurbishing and operating costs are all taken into account, and are expressed in comparable amounts (Heralova, 2014). As mentioned by Giacomo et al. (2019), green procurement and LCC are the catalyst and leads to both environmental public policies and sustainable supply chain management strategies that should be adopted by the government. The relationship of green procurement, life cycle cost and total cost of ownership is depicted in Figure 2.

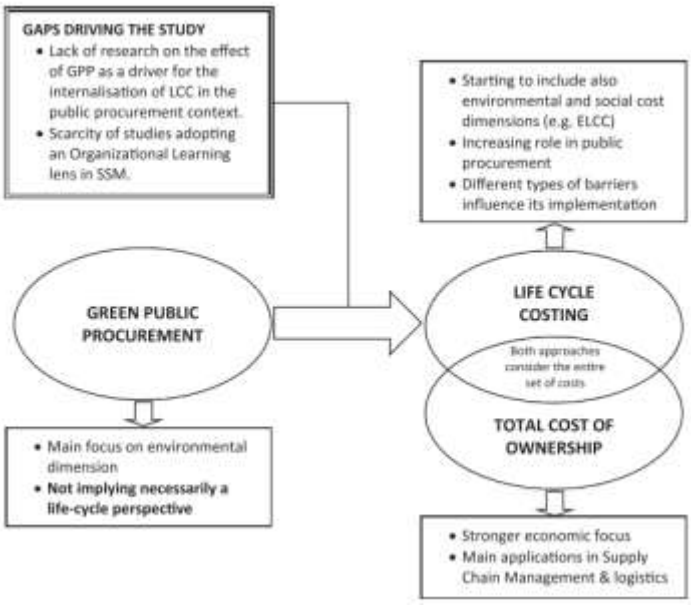

Figure 2: Relationships between green procurement, life cycle cost and total cost of ownership
Source: Giacomo et al. (2019)

PROBLEM STATEMENT

It is noted that the significant barrier for growth in the green building market is the perception of higher initial costs associated with these buildings. It becomes evident that the position of sustainable and green buildings in strategies towards achieving a healthy and sustainable built environment cannot be overemphasized. One of the performance criteria stated in the *Urban Infrastructure* of Low Carbon Cities Framework (LCCF) is energy. The criteria is intended to optimise energy consumption through a design review, technology and innovation with a target of 10% to 40% reduction of electricity by the year of 2030. Among the recommendations stipulated in the key features of energy criteria of LCCF is to encourage the use of low-energy consumption bulbs and other alternative energy-efficient approaches for carbon emission reduction. This is also mentioned by Abu Bakar et al. (2020) that highlights purchasing energy-efficient products and appliances during the planning of physical development will enhance the environmental behavioural and awareness among stakeholders. However, the acquisition costs of energy-efficient devices and bulbs are higher than conventional appliances. This is where life cycle cost (LCC) can play a vital role in enabling the owners and stakeholders to take informed decisions upfront and thereby promote a higher level of sustainability at large (Weerasinghe & Ramachandra, 2018). Therefore, LCC is crucial for decision-makers to survey and evaluate recognizable esteem from introductory capital and operating costs. As supported by Heng et al. (2019), the perceptions of stakeholders are essential where decision making acts as a continuous process in order to satisfy the preferences and needs of decision makers.

Despite the increasing importance of green procurement and LCC in the planning phase of green projects, the viability and implementation of LCC is still lacking. Many have stated the benefits of LCC in green procurement for green building projects, however the criteria are not clearly determined. For example, studies have investigated the relationship between green procurement and life cycle cost (Giacomo et al., 2019), suitability of GGP in an economic crisis (Adham et al., 2015; Nikolaou & Loizou, 2015), stakeholder values and behavioural in green procurement (Bohari et al., 2017; Preuss & Walker, 2011; Testa et al., 2016). Few studies (for example: Antoniadou & Papadopoulos, 2017; Sun & Hong, 2017) are delineated to energy performance criteria rather than looking into the aspects of life-cycle costing. In Malaysia, even though GGP guidelines are introduced for government procurers, the application has yet to be fully implemented due to many issues including data scarce, lack of expertise in LCC techniques, ambiguous input parameters, the rehabilitation time, and the inclusion of the social factors cost (EPU, 2020). Several green project studies in the global context also showed that LCC is not utilised to its full potential data scarcity (Heralova, 2014), inconsistent data collection (Giaconomo et al., 2019) and insufficient collaboration between stakeholders (Higham et al., 2015).

According to Oduyemi et al. (2018), LCC provides more accurate precise evaluation and long-term cost effectiveness of sustainable buildings compared to conventional economic approaches that focus merely only on initial capital costs in the very short term. This is achievable by considering the criteria of life cycle cost (LCC) in the inception and planning stage of green building projects. Decision of green elements and green requirements should be determined in the inception phase of building, by prioritizing the active elements and passive building elements. Hence, a proper plan of these active and passive design elements leads to a sustained performance of green buildings.

METHODOLOGY

The study adopts a quantitative method where the questionnaire is used as the survey instrument. The questionnaire is distributed to 50 respondents, using a purposive sampling method. Purposive sampling is known as non-probability sampling that is a form of intentional selection of informants where researchers rely on their judgment when choosing members of the population to participate in the study (Chua, 2011). As the study is narrowed to the government green projects and the established GGP guidelines, hence the sampling is drawn to the stakeholders in the green government projects, consisting of enabler and user category (Table 1). User category comprises project team members that have been involved in the previous green government projects only, while enabler category comprises experts that are involved in the establishment of GGP guidelines for products and services. The survey was carried out from April to June 2020 via an online platform. The online survey has received 32 responses from the targeted sampling, where the response rate is 64%. According to Creswell (2012), data is valid to have more than 50% responses from the total sampling population. Hence, the data is sufficient and relevant to the purposive sampling concept.

Table 1: Questionnaire's distribution to the respondents using purposive sampling

No.	Respondents' category	Engagement	Total purposive samples (N)
1	Enabler	GGP Core Team (government agencies)	10
2	Enabler	Enabler for green government projects	18
3	User	Consultants for green government projects (architects, engineers, surveyors)	22
Total Number of Respondents			50 (distributed)

The questionnaire consists of 22 components of LCC. The LCC criteria was initially retrieved and compiled from *Garis Panduan Kos Kitaran Hayat*

(JKR, 2012) and also from precedent studies on the LCC to green buildings and energy efficiency. The focus phase is narrowed to the key approach of LCC in the inception and planning phase, as referred to the project stage in the *Garis Panduan dan Peraturan Bagi Perancangan Bangunan* (EPU, 2008). The respondents were asked to rate their agreement level on the importance of the LCC criteria in the inception and planning phase of green projects. Five (5) numerical Likert-scale is used to measure their agreement level, i.e., strongly disagree (scale 1) to strongly agree (scale 5). The questionnaire covers the respondents' agreement level on the LCC components and criteria related to LCC for green government projects.

RESULTS

In examining the completeness of the returned questionnaires, all the raw data was entered into the Statistical Package Software System (SPSS) Version 24. The Cronbach alpha test was performed to ensure the instrument consistently measures the variables. Based on the test, the alpha values are at 0.864. The scale items have an acceptable level of reliability or internal consistency, and no serious problem of multicollinearity exists if the value exceeds 0.70. Hair et al. (2006) further mentioned that an alpha value of 0.60 is also acceptable in exploratory study. The analysis is presented in descriptive statistics using frequency, percentage, mean score, and standard deviation. Figure 3 shows the industry sectors represented by the respondents. The result showed that 65% or the highest respondents represent government officers (n=21), followed by 22% from private organisations (n=7) and 13% from government link companies (n=4). The result of mean score and standard deviation on the costing components is shown in Table 2. The results are arranged in the order of top rank (most important) to the lowest rank (least important).

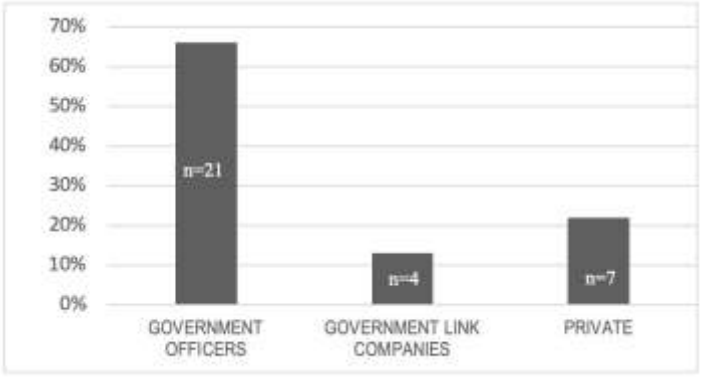

Figure 3: The industry sectors represented by the respondents (n=32)

Table 2: Result on the mean rank of the LCC components

No.	Components and Criteria of Life-Cycle Cost in the Planning Phase of Green Projects	Mean Score	Standard Deviation (*sd*)
1.	Energy consumption cost	4.69	0.535
2.	Green House Gas (GHG) savings cost	4.62	0.554
3	Acquisition cost of green materials	4.59	0.622
4.	Green and energy simulation cost	4.56	0.675
5.	Utilities cost	4.56	0.848
6.	Green buildings certification cost	4.53	0.677
7.	Servicing, repairing and replacement cost	4.53	0.626
8.	Initial Construction Cost (awarded contract sum)	4.53	0.621
9.	Eco-label certification cost	4.50	0.855
10.	Residual cost / salvage cost	4.44	0.675
11	Disposal cost	4.41	0.761
12	Wastage cost	4.41	0.667
13	Discounted cost	4.38	0.877
14	Facility Management Cost	4.38	0.805
15	Inspection Cost	4.38	0.608
16	Development Cost	4.31	0.938
17	Feasibility Studies Cost	4.31	0.783
18	Environmental Management Cost	4.31	0.807
19	Preventive and Schedule Maintenance Cost	4.28	0.779
20	Document preparation cost	4.19	0.842
21	Advertisement Cost	3.72	0.677
22	Value Management Cost	3.66	0.938

DISCUSSION OF RESULTS

Table 2 shows that the mean value ranges from the highest mean score (4.69) to the least score (3.66). The standard deviation (*sd*) value depicts a smaller scattering on the data dispersal, and the obtained *sd* score is less than the mean, ranging from 0.535 to 0.938. The standard deviation shows that the ratings are constant among all respondents; hence, the data are reflected as valid and reliable. By referring to the mean value, it also depicted that the respondents' agreement level on the importance of the LCC components is perceived as moderately agreed to very agreed.

The result shows that the top three (3) important LCC cost to be considered during inception and planning phase is energy consumption cost (mean=4.69, *sd*=0.535), followed by greenhouse gas (GHG) savings cost (mean=4.62, *sd*=0.554) and acquisition cost of green materials (mean=4.59, *sd*=0.622). Energy efficiency and savings on GHG has been the core concern for the green projects. This is parallel to Kale et al. (2016) that mentioned energy consumption cost as the key component in reducing the LCC and the significant annual expenditure. Environmental-friendly or green construction materials utilised less energy and resource consumption during their usage, which leads to reduction in the operational costs. As one of the most widely adopted environmental management practices, these findings support evidence from

previous studies (Asmone and Chew, 2018; Chew et al., 2017; Conejos et al., 2019; Khan et al., 2018; Mostavi et al., 2017; Oduyemi et al., 2018). The studies are rationalized by considering opportunities and reducing energy consumption to make savings for green projects.

Acquisition costs of green materials are also one of the top three important component costs to be considered for green projects. Wimala et al. (2016) revealed in their study that over than 30% respondents voted higher costs for green building options than conventional ones as barriers to green projects movement. However, Shamsuddin et al. (2017) argued that even though the initial cost of green materials are higher than conventional materials, the cost savings can be achieved by considering weightings on the cost of ownership or LCC. Hence, understanding the LCC concept is very crucial for green project stakeholders.

The next important LCC costs to be considered during the planning phase are green and energy simulation cost, utilities cost, green buildings certification cost, replacement cost, initial construction cost, eco-label certification cost, salvage cost, disposal cost, wastage cost, and discounted cost. These components are ranked at 4^{th} to 13^{th} rank as the important components of LCC, respectively. Ideally, the components are the general items needed for LCC application. However, for green building certification cost and eco-labelling cost, focus should be made on the incentives or solutions that can reduce the cost. As the components are also important, Wimala et al. (2016) suggested that a reduction of certification fee should be considered to raise interest from the stakeholders to label their green products and buildings.

Next, the LCC components are facility management cost, inspection cost, development cost, feasibility studies cost, environmental management cost, preventive and schedule maintenance cost. Even though these components are ranked at 14^{th} to 19^{th} rank important components, the components are parallel to the study by Kshirsagar et al. (2010); Mostavi et al. (2017) and Shamsuddin et al. (2017). All phases of building life cycle including material extraction and production, maintenance and replacement and demolition should be included in LCC. The least important of LCC components in the planning phase of green projects is document preparation cost, advertisement cost and value management cost. Ideally, all of these three components are similar items needed for all kinds of project, including for conventional projects (Abdul Lateef et al., 2013). It is not merely for green projects. For government projects, value management is mandatory for public projects exceeding RM50 million which is subject to the authorisation of Value Management (VM) Circular 3/2009 by the Economic Planning Unit (EPU) (Maznan et al., 2012). Therefore, value management cost is not only for green projects.

The above results are able to help project stakeholders in determining the viability of green projects through LCC application. Consequently, it is

justified to summarise that the LCC analysis can provide a method of determining the entire cost of a structure over its expected life and operational and maintenance cost for green buildings.

CONCLUSION

The life cycle cost (LCC) constitutes a significant aspect of the considerations. Understanding the crucial aspects of green requirements will lead to a better capacity to select appropriate goals and benchmarks over asset, design, project and building life cycles. The significance of LCC to building development stems from long-term speculation for all costs and benefits all through the length of proprietorship. It is hoped that this study will strengthen the LCC adoption and is systematically implemented in the green procurement process.

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ANALYZING THE CRITERIA OF PLANTING DESIGN FOR VISUAL LANDSCAPE QUALITY IN CAMPUS

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Abstract

Planting design is the art of composing plants to create a campus landscape design. The composition may influence the students' preferences owned by the criteria of planting. This study aims to identify the planting design criteria towards enhancing visual landscape quality in campus environment. The photograph-based method used to collect the landscape planting images and compose it into a questionnaire. This photo-questionnaire design is mostly practiced by academicians in this research field. The question uses five Likert-scale format to analyse the preference rating. The descriptive and correlation analysis are used to quantify the mean results and the relationship between the criteria. The finding represents the most influencing factor in landscape planting preference is arrangement with a score 4.34 while texture is less considered with 3.71 rating score. Most of the attributes were significant except for attributes planting with variety of forms, texture intensity and different species arrangement. As a result, this research finding is able to guide designers to sensibly setting the planting design, particularly in the campus environment.

***Keyword**:* Planting composition, planting design, criteria, campus, landscape preferences, well-being

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INTRODUCTION

The artistic approach of planting design is developed through the plant compositional arrangements inspired by aesthetic principles groupings of plants. Some studies mentioned plants can stimulate the thinking process through regular interactions with students (Ali et al., 2020). Currently, several attempts have been made to corelate the relationships between planting in landscape and well-being. For example, Akhir et al. (2019) studied on planting design as influencing factors to visual landscape quality and well-being. At the same time, Liu and Schroth (2019) assessed the aesthetic preferences concerning vegetation in enclosed urban park. Hoyle et al. (2017) explored the wow factor in urban planting correlated with restorative effect and perceived biodiversity. These emphasize that landscape planting attributes have a significant impact on visual quality (Polat & Akay, 2015), and healing process as well as towards preventing mental disorder (Gerstenberg & Hofmann, 2016). However, there is a concern on the criteria for planting architecture are posed to enhance the quality of the visual environment and well-being. This research will discuss planting composition in the campus to identify the ranking of planting design criteria in which to increase students' well-being. It is crucial to understand that the planting criteria in constructing the campus landscape includes possessing high aesthetic quality and simultaneously possessing a stress relieving efficiency.

Planting Composition Attributes

The purpose of this research is to explore on how the criteria of planting composition and landscape preference can be brought together. In visual landscape quality, plant is an extremely powerful element in comparison to other variables in landscape. The existing studies on the relationship between green spaces and visual quality is emphasized (De La Fuente De Val & Mühlhauser, 2014; Ulrich, 1986) and certainly green is reflected to plant species. Jiang et al. (2014) determined that the amount or density of trees was a positive predictor of mental restoration or aesthetic. People feel calmer when they are round around plants (Kaplan & Kaplan, 1989). The residential area without trees resulted in a dramatic growth of stress and low preferences (Jiang et al., 2014). Still, planting that is too dense can undermine regeneration as well as increasing the feelings of insecurity (Van den Berg, Jorgensen & Wilson, 2014). Flowers, especially brightly coloured flowers, can develop higher rating of preferences (Hoyle et al., 2017). Their study also positively resulted contribution of flowering plants to the psychological well-being. Example in this case, planting with 27% or more of flower cover is much more eye-catching rather than lower floral cover. In general, areas with bundles of trees and shrubs are more preferable. Nowadays, brightly colour flowers are grown in many parks. Whether or not bright flowers are better suited to the development of visual appreciation and mental well-being instead of a more naturalistic atmosphere is a topic that needs to be explored further.

Therefore, the planting composition attributes should be measured, in identifying its reliability and influences on visual quality of landscape planting area. The criteria selected in this study are based on the formal aesthetic of plants such as size, colour, shape or form, texture, density, arrangement, vividness and naturalness. These eight attributes will be analysed to determine the ranking that mostly influence the landscape aesthetic planting scenes. The scenic beauty of landscapes has a direct influence on the aesthetic qualities of planting design, and is currently becoming an integral part in strategies of landscape planning and management (Daniel, 2001). Visual preference from highly beautiful and attractive landscape directly impacts public choice, perceptions and their activities (Daniel, 2001; Daniel & Vining, 1983). Therefore, visual quality is also a major purpose of landscape planting, as plants give pleasant sensory experiences and inspirational opportunities particularly within a campus.

RESEARCH METHODOLOGY

Research Design

Assessment of the visual quality of campus landscape planting areas used in this study was the psychophysical method (Zube et al., 1982). The study was based on the photograph-based method used by most academics in this research field (Daniel & Vining, 1983; Kaplan & Kaplan, 1989; Lothian, 2000; Polat & Akay, 2015; Ulrich, 1986). The technique used in this research are by taking planting pictures of the study area and by applying a statistical assessment into the photo-questionnaire that was designed according to the relevant pictures.

Study Area

Human interrelationship dimensions with the environment refers to areas where human interrelationship variables with the environment are manifested (Bakar et al., 2017). Therefore, the study area was chosen based on similar settings or situations in which students and campus environment interactions take place. The campus of Universiti Putra Malaysia (UPM) was selected as the research area. This campus is located in Serdang, Selangor (Figure 1). The scale, structure and distribution within the faculties of the campus is taken into account for the site selected. UPM has a land area of 1245.056 hectares, consists of 15 faculties and has about 25,000 of students. The survey areas chosen were those with green spaces with accessible landscape planting scene in each faculty where places that can be physically and visually assessed by students.

Figure 1: The UPM Serdang in Selangor
Source: Google satellite image

Photography

For photography, the researchers used a digital single-lens reflex (DSLR) camera with a 12.3-megapixel resolution, the lens has an18x optical zoom and the panoramic shooting mode was chosen. The panoramic photograph field method was employed by Sevenant and Antrop's (2009) to capture the entire environment. Photographs were taken over the weekends of May 2019 to reduce human inclusion within the area. The images were taken in between 8am to 11am as it is an ideal time to take outdoor photos (Firmansyah et al., 2017). Photographs shot in different angles of panoramas mode which reflected the whole landscapes of planting design areas. The images taken reaching 95 landscape planting scenes from the whole area of each faculty. Following this, only 51 photographs were chosen with the assistance of subject experts from academicians in the field of landscape architecture. The selection performed based on the main elements on planting design which accurately reflected the composition. Then, each image was grouped into seven criteria which defined accordingly in Table 1.

Photo-Questionnaire

A total of 51 number of landscape planting photographs was placed on A4 size paper. The photo-questionnaire contained the questions on the demographic profile of respondents such as gender, age, race, level of education, semester, and faculties. Second, the respondents were questioned to evaluate the visual quality of each landscape planting photograph on a five Likert scale. The respondents can choose between 'strongly disagree', 'disagree' at the negative end of the box while at the positive end, they can choose wither 'agree' or 'strongly agree'

(Kaplan & Kaplan, 1989). The survey was conducted to assess whether the planting composition attributes affects the respondents' preferences.

Sampling Strategies

In this study, the sampling method used was the purposive sampling. The purposive sampling was used as it focuses on a characteristic of a population which enable researcher to answer their chosen research questions. Hence, to ensure this study can represent the population of samples from UPM, 319 responses among students of different faculties were collected.

Research Procedures

The collected data were arranged in the SPSS software version 23.0. The averages visual quality score of each photograph and attributes of the planting composition were then calculated. Spearman's rho correlation analysis was used to analyse the significant relationship between landscape planting preference and factors or attributes that influence respondents' preferences.

RESULT

Visual Quality Scores of Photographs and Attributes

In the photo-questionnaire result, the average respondent scores on the visual quality of each image were determined. Beforehand, 51 images were grouped using factor analysis in SPSS. There were seven groups divided with criteria explained in Table 1. The table also shows the mean values for the landscape planting preferences. An observation was done and it revealed that the characteristics of visual quality preferences were higher for B1 (balance with plant species diversity) that is most preferred and appreciated photographs with scores of 4.18. The B7 group of photographs were the least appreciated photograph, with a score of 3.26.

Table 1: The criteria from landscape planting images

Code	Criteria	Photo's No.	Mean score
B1	Balance with plant species diversity	6	4.18
B2	Street planting with coherence design	7	3.94
B3	Complexity with coherence composition	7	3.85
B4	Dense tree form with clean base	7	3.73
B5	Planting with variety of forms	8	3.61

B6	Planting with texture intensity	8	3.45
B7	Different plants species arrangement	8	3.26

Source: Author (2020)

The result for planting composition attributes which represent the most influencing factor in landscape planting preference is reflected in Table 2. Attributes that are ranked with the highest influence is A6 (Arrangement) with a score of 4.34, by comparison, planting composition of A3 (texture) has the least influence, scoring 3.71.

Table 2: The planting composition attributes score ranking

Code	Attributes/ Factors influence preferences	Mean score
A1	Size	4.02
A2	Colour	4.15
A3	Texture	3.71
A4	Shape	4.10
A5	Density	4.19
A6	Arrangement	4.34
A7	Vividness	4.01
A8	Naturalness	4.18

Source: Author (2020)

Relationship between the Visual Quality of Photographs and Attributes

Tables 3 shows the Spearman's rho correlation analysis results. The findings ascertain the relationship between the visual qualities of photographs and planting composition attributes. Based on the results, it was determined that most of the attributes were significant but certain attributes were not significant for photographs groups in B5, B6 and B7. B5 is a group of photographs reflected planting design with a variety of forms. However, this B5 group of photographs were not significant with attribute A4 (shape). B6 and B7 were also not correlated with A4 (shape) and A2 (colour). It is shown that, B7 was identified as not correlated with A6 (arrangement).

Table 3: The relationship between visual landscape images and attributes in planting composition

Spearman's rho		A1	A2	A3	A4	A5	A6	A7	A8	B1	B2	B3	B4	B5	B6	B7
A1	Correlation coefficient															
	sig. (2-tailed)	.														
A2	Correlation coefficient	.350**														
	sig. (2-tailed)	0.00	.													
A3	Correlation coefficient	.165**	.308**													
	sig. (2-tailed)	0.003	0.00	.												
A4	Correlation coefficient	.155**	.213**	.326**												
	sig. (2-tailed)	0.005	0.00	0.00	.											
A5	Correlation coefficient	.341**	.167**	.171**	.317**											
	sig. (2-tailed)	0.00	0.003	0.002	0.00	.										
A6	Correlation coefficient	.244**	.326**	.145**	.410**	.414**										
	sig. (2-tailed)	0.00	0.00	0.01	0.00	0.00	.									
A7	Correlation coefficient	0.091	.231**	0.107	.277**	.199**	.377**									
	sig. (2-tailed)	0.103	0.00	0.055	0.00	0.00	0.00	.								
A8	Correlation coefficient	.257**	.350**	.173**	.273**	.275**	.324**	.327**								
	sig. (2-tailed)	0.00	0.00	0.002	0.00	0.00	0.00	0.00	.							
B1	Correlation coefficient	.197**	.234**	.202**	.165**	.240**	.255**	.156**	.289**							
	sig. (2-tailed)	0.00	0.00	0.00	0.003	0.00	0.00	0.005	0.00	.						
B2	Correlation coefficient	.251**	.220**	.159**	.135*	.215**	.259**	.207**	.272**	.696**						
	sig. (2-tailed)	0.00	0.00	0.005	0.016	0.00	0.00	0.00	0.00	0.00	.					
B3	Correlation coefficient	.210**	.235**	.176**	.146**	.224**	.217**	.237**	.287**	.693**	.735**					
	sig. (2-tailed)	0.00	0.00	0.002	0.009	0.00	0.00	0.00	0.00	0.00	0.00	.				
B4	Correlation coefficient	.203**	.196**	.178**	.143*	.250**	.259**	.181**	.239**	.681**	.791**	.793**				
	sig. (2-tailed)	0.00	0.00	0.001	0.011	0.00	0.00	0.001	0.00	0.00	0.00	0.00	.			
B5	Correlation coefficient	.179**	.184**	.178**	0.106	.182**	.175**	.232**	.242**	.683**	.812**	.813**	.835**			
	sig. (2-tailed)	0.001	0.001	0.001	0.059	0.001	0.002	0.00	0.00	0.00	0.00	0.00	0.00	.		
B6	Correlation coefficient	.130*	0.065	.143*	0.06	.168**	.116*	.185**	.197**	.617**	.702**	.802**	.788**	.778**		
	sig. (2-tailed)	0.02	0.248	0.011	0.288	0.003	0.039	0.001	0.00	0.00	0.00	0.00	0.00	0.00	.	
B7	Correlation coefficient	.114*	0.044	.189**	0.073	.136*	0.094	.153**	.151**	.581**	.671**	.703**	.728**	.795**	.764**	
	sig. (2-tailed)	0.041	0.438	0.001	0.191	0.015	0.094	0.006	0.007	0.00	0.00	0.00	0.00	0.00	0.00	.

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Source: Author (2020)

DISCUSSION

Factors affecting aesthetic preferences are the features of the landscape (Sevenant & Antrop, 2009) and how the interaction occurs in the different situation (Bakar et al., 2017). Thus, it was ensured that the characteristics of the planting displayed a distribution that represent of the landscape planting on the campus. As a result, plant structure, plant density and naturalness of plants were all related to visual consistency in planting design among different planting composition attributes. The highest ranking of planting criteria is a balanced arrangement of planting design with species diversity. This happens due the coherence design that is correlated with balanced characteristics of planting design based on the survey. Although the variety of plant species is one of the key visual quality requirements in campus landscape planting, it can also decrease the visual appearance of

landscape quality if the arrangement, density and naturalness of the plants are not carefully composed. Therefore, for B5 (planting with various forms) group of photographs were not parallel with the attribute in A4 (shape). Hence, the relationship is not significant. This is because, the group of photographs in B5 is does not the variety of forms with balance arrangement. The public may not be aware of principles context relation to planting, but their preference is essential in order to assist designer in order to understand the principles of planting to allow the merge of design idea with public preferences, for example, landscapes with a suitable plant balance have exceptionally high appreciation rates. In line with the findings, it was previously claimed that the planting structures with magnificent beautiful features consist of a wide variety of plants with well-organized layout (Akhir et al., 2019).

CONCLUSION

The main contributions of planting design to the visual quality of landscapes have been revealed in several literature. Therefore, results of this study can potentially be used for the purpose of designing, planning, as well as managing the landscape on campus. These findings should be taken into consideration for any landscape campus initiatives that aim to improve the visual and aesthetic quality of campus areas. Further focus and consideration should be paid to the arrangement of plant patterns, density, naturalness and variety of plants when planning green space areas on campus. A similar study could be beneficially carried out in other universities or programs and courses in particular concerning planting, taking into account the above-mentioned data in order to explore other significant relationship.

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SATISFACTION ANALYSIS OF FLOOD VICTIMS TOWARDS HOUSING RELOCATION SCHEME DURING POST OCCUPANCY AT KUALA KRAI, KELANTAN

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Abstract

This study aims to determine flood victims' satisfaction towards housing relocation at Kuala Krai, Kelantan, during the post-occupancy period. The evaluation of satisfaction criteria of housing relocation is derived from the literature review conducted. Throughout this study, a questionnaire survey was used to obtain the required data. This quantitative research method employed a questionnaire survey to identify flood victims' satisfaction towards housing relocation established from the selected 13 criteria. The data were collected from 80 out of 100 targeted respondents among the flood victims in Kuala Krai residing in this area. The data obtained were analysed using the Statistical Package for Social Sciences (SPSS) version 23.0 software. The data were also interpreted in a table and ranked according to the mean score range. Hence, this study's overall findings indicate that the respondents were not satisfied with the relocation building's performance, particularly on housing design, indoor air quality, waste management, public amenities, public transportation, safety and were most dissatisfied with public areas. Therefore, it is hoped that this study's findings will be benefited mainly to improve the post-disaster housing construction for the flood victims in the future since the satisfaction level for every element is highlighted in this study.

Keywords: Flood victim, satisfaction, housing relocation, post occupancy

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BACKGROUND OF FLOOD SITUATION IN KELANTAN

In Malaysia, flood accounts for 62% of a natural disaster occurring and the severity of floods had increased in magnitude over the last decade, a point in case is the 2014 flood causing massive damage to Kelantan, Terengganu, and Pahang (Karim et al., 2016). Hence, one of the most devastating effects of these flood cases is the destruction of houses. It is indisputable that housing is the most valuable asset for people and is a highly affected property in most disasters. During flood rapid-onset events, houses are usually the most extensively damaged or lost element, representing the most significant total impact on the national economy. The Federal Emergency Management Agency (FEMA) reports that approximately 90 per cent of all disaster-related property damage results from flooding each year. The government and organisations will analyse and evaluate their losses to develop a long-term and effective relief plan for the flood victims. As for the massive flood that hit Kelantan in 2014, the government came out with an effective housing relocation plan for the disaster impact area. The flood victims losing their houses would be provided with new homes through the housing relocation plan, namely Rumah Kekal Baharu (RKB).

However, there are few highlighted issues in the housing relocation for flood victims in Kuala Krai, Kelantan. According to the first series of the Auditor-General's Report 2015 audit of the National Disaster Management Agency (NADMA) under the Prime Minister's Department, the report criticised the poor utilisation rate of the allocation as only RM75.95 million of the RM246.73 million flood reconstruction fund (31 per cent) was used as of January 8, 2016. Other than that, it was reported that some contractors tasked with the RKB construction did not fulfil their obligations. For example, some new homes that were supposed to be 800 square feet in size were constructed at only 660 square feet (Malay Dewan Rakyat, 2015). According to the Malay Dewan Rakyat (2015), the delay in commencement of construction works was due to the constraints of construction works implementation in the early stages. This project lacked suitable land for RKB development, high infrastructure costs, and a private land acquisition process requiring site verification, consideration, and approval of the authority.

As stated in the previous research, many reconstruction projects have failed due to housing that does not respond to the relocates' needs. According to Hanafi (2018), the occupants were pleased with the house replacement for post-disaster housing in Kuala Krai, Kelantan. However, they were not pleased with the conditions of the house. It was discovered that certain housing necessities and local traditions were not considered in the original house design (Hanafi, 2018). These shortcomings were the major reasons that forced some occupants to modify their houses even with meagre financial resources. However, the majority of the

occupants could not afford to improve their houses to meet their needs. Therefore, this research paper aims to determine the flood victims' satisfaction towards housing relocation at Kuala Krai, Kelantan, during the post-occupancy phase.

LITERATURE REVIEW

Housing Relocation

Housing is a major global concern, as a country's well-being reflects its people enjoying a particular standard of living (Husin et al., 2018). As stated by Carrasco et al. (2017), residential and neighbourhood satisfaction are important. Relocation refers to the change of place for residence, and it usually a short distance and within the same city (Wang, 2015) or as a moving away of people's lives, from places in which people are accustomed to living and working among many others.

Housing Relocation Evaluation Criteria

Husin et al. (2018) developed the occupants' framework post-occupancy evaluation integrated with the safety elements: structural, services, space, amenities, fittings, materials, environment, and workmanship. The identification of the safety elements and attributes incorporated into the framework was first gathered from the preliminary survey using a questionnaire survey involving industry practitioners with previous or current experience in relocation development in Malaysia. Hence, it is important to understand the flood victims' satisfaction level towards housing relocation criteria during the post-occupancy stage to build better relocation housing in the future. Based on the literature review, criteria affecting the occupants' satisfaction towards relocation housing were derived and 13 criteria were identified to determine the occupants' satisfaction level via post-occupancy survey towards housing relocation at Kuala Krai, Kelantan.

METHODOLOGY

Study Area and Housing Relocation Programme in Kelantan and Kuala Krai

According to Hanafi (2018), the government and its agencies had established the provision of relocation housing for flood victims in Kelantan in 2014. The relocation housing is known as Rumah Kekal Baharu (RKB). The National Disaster Management Agency (NADMA) stated that 1824 relocation housing would be built in various villages across Kelantan.

Questionnaire Survey

This study was conducted by using a quantitative approach through a questionnaire survey. Questionnaires were distributed to the occupants of Rumah

Kekal Baharu (RKB) in Kuala Krai, Kelantan. The questionnaires for data collection were chosen because it is one of the most widely used social research techniques. A questionnaire was designed to collect data to generalise a sample to a population. This survey dealt with questions. It was fulfilled by a number of respondents with certain opinions towards this research issue. The questionnaires were prepared in the simplest form for effortless understanding. It is also to avoid misinterpretation of respondents that may cause an error in the data analysis.

The sampling method used for this research was the simple random sampling technique. Simple random sampling (also referred to as random sampling) is the purest and the most straightforward probability sampling strategy. The simple random sampling is done by selecting a sample from the population in such a way that each item has an equal chance of being selected as a sample. The sample is then drawn randomly from a sampling frame. For this study, the population list's sampling frame has been derived from the Jabatan Kerja Raya (JKR) Kuala Krai. The JKR provided information regarding the number of houses provided for the flood victims and the location of RKB, Kuala Krai. With the information provided, a random sampling frame had been chosen without any bias. Among the recipient's population of RKB at Kuala Krai, around 6% (Leh, 2018) were chosen randomly as respondents for the post-occupancy survey to measure flood victims' satisfaction towards housing relocation criteria. Subsequently, 75 samples (6%) from the 1257 population of flood victims at Kuala Krai were required for this research. However, to get a 100% returned rate, 100 questionnaires were distributed. Eighty were returned and analysed as the findings of this study.

ANALYSIS AND DISCUSSION

Demographic Profile of Respondents

The gender distribution of the respondents shows that there is an equivalent number of male and female respondents of 50% each. The involvement of both male and female respondents provides different opinions on answering the questionnaires. Further analysis shows that most of the respondents aged between 40 to 60 years (73%), and none of the respondents are less than 20 years old. It indicates that respondents for this survey are mature enough to understand the survey questions; thus, providing valid and reliable results. Next, 38% of the respondents indicate that they lived in the provided house more than 20 hours per day during weekdays and 58% on weekends. Hence, this result shows that most respondents were housewives or independent workers because of the tendency to be in the house for more than 20 hours during weekdays.

Flood Victims' Satisfaction Level towards Housing Relocation Criteria

The housing relocation criteria for this research consist of 13 variables: 1. Indoor Air Temperature; 2. Indoor Lighting; 3. Indoor Air Quality; 4. Noise; 5. Water Supply; 6. Indoor Layout; 7. Design; 8. Waste Management; 9. Safety; 10. Public Transportation; 11. Public Area; 12. Public Amenities; and 13. Community. The mean score and rank for each factor involved were analysed in the following Table 1.

Table 1: Flood victims' satisfaction level towards housing relocation criteria

Item	Housing Relocation Criteria	Mean	Item	Housing Relocation Criteria	Mean
1.	Indoor Air Temperature		7.	Design	
A	I am satisfied with the temperatures in my home during day time	2.06	A	I am satisfied with the appearance of the house	2.66
B	I am satisfied with the temperatures in my home during night time	2.91	B	I am satisfied with the outside view	2.59
C	I feel that my home is quick to cool down during day time	2.23	C	I am satisfied with the cleanliness of common areas	1.65
D	I feel that my home is quick to cool down during night time	2.88	D	I am satisfied with the size of my house	2.74
2.	Indoor Lighting		E	I am satisfied with the amount of storage in my house	2.78
A	I am satisfied with the amount of electric lighting in my house	3.61	8.	Waste Management	
B	I am satisfied with the brightness of electric lighting in my house	3.65	A	I am satisfied with the waste collection in my housing area	2.61
C	I am satisfied with the amount of natural daylight in my house	2.84	B	I am satisfied with the cleanliness of the communal waste area	2.04
3.	Indoor Air Quality		C	I am satisfied with the access to the communal waste area	2.11
A	I am satisfied with the air quality in my house	2.48	9.	Safety	

B	I am satisfied with the air quality outside my house	2.31	A	I am satisfied with the windows and doors security	1.75
C	I am satisfied with the air movement within my house during the day	2.11	B	I am satisfied with the level of security in my housing area	1.90
D	I am satisfied with the air movement within my house during the night	2.40	C	I am satisfied with the safety of my house during day time	2.16
E	I am satisfied with the odours in my house during day time	2.21	D	I am satisfied with the safety of my house during night time	1.86
F	I am satisfied with the odours in my house during night time	2.39	10.	Public Transportation	
4.	Noise		A	I am satisfied with the frequency of buses in the local area	1.68
A	I am satisfied with the noise level in my home	3.70	B	I am satisfied with the distance to the nearest public transport	1.49
B	I am satisfied with the noise level from other rooms	3.40	C	I am satisfied with the amount of traffic within my housing area	2.98
C	I am satisfied with the noise level from my neighbours	2.71	11.	Public Area	
D	I am satisfied with the noise level from the traffic	3.40	A	I am satisfied with the quality of parks/ open space	1.25
E	I am satisfied with the noise level from other sources	3.03	B	I am satisfied with the distance to parks/ open space	1.48
5.	Water Supply		C	I am satisfied with the maintenance of parks/ open space	1.35
A	I am satisfied with the water pressure in my home	3.88	D	I am satisfied with the cleanliness of parks/ open space	1.21
B	I am satisfied with the taste of drinking water	3.18	12.	Public Amenities	
C	I am satisfied with the size of my toilet	3.41	A	I am satisfied with the educational facilities in the area	2.10

6.	Indoor Layout		B	I am satisfied with the exercise facilities in the area	1.90
A	I am satisfied with the internal layout of the living and dining area	3.29	C	I am satisfied with the health facilities	1.83
B	I am satisfied with the internal layout of bedroom 1	3.13	D	I am satisfied with the community facilities	1.86
C	I am satisfied with the internal layout of bedroom 2	2.51	E	I am satisfied with the postal services in the area	1.46
D	I am satisfied with the internal layout of bedroom 3	2.44	F	I am satisfied with the variety of shops in the area	2.74
E	I am satisfied with the internal layout of the kitchen	1.59	13.	Community	
F	I am satisfied with the internal layout of the bathroom and toilet	2.76	A	I am satisfied with the overall services of the local council	3.19
			B	I am satisfied with the information received from the local council	3.14

Flood Victims' Satisfaction Level towards Housing Relocation Criteria Analysis:

Criteria 1: indoor air temperature

From Table 1, it is apparent that a few factors contribute to the flood victims' satisfaction level towards indoor air temperature of the housing relocation at Kuala Krai, Kelantan. Findings show that the respondents were satisfied with the housing air temperature at night with a mean of 2.91. They also agreed that the house was easy to cool down during night time with a mean of 2.88. However, during day time, respondents were not satisfied with the housing's indoor air temperature (mean = 2.06). Results also indicate that respondents expressed dissatisfaction with cool down during day time (mean = 2.23).

Criteria 2: indoor lighting

The factors that may influence flood victims' satisfaction towards indoor lighting were also analysed. From Table 1, 'I am satisfied with the amount of electric lighting in my house' takes the first rank among the other factors, indicating that the respondents were satisfied with the amount of lighting provided in the house.

Respondents also agreed that they were satisfied with the brightness of electric lighting in their house (mean = 3.65) and the amount of natural daylight in the house, with an average mean of 2.88. Overall, respondents provided positive feedback on the indoor lighting criteria of the housing relocation at Kuala Krai.

Criteria 3: indoor air quality
Table 1 provides the breakdown of flood victims' satisfaction towards indoor air quality of the housing relocation. As shown in the table (above), the average mean range for six (6) items under indoor air quality criteria was below 2.50. It indicates that the respondents were not satisfied with the indoor air quality in their house, including air quality, air movement, and odours indoors during day and night.

Criteria 4: noise
From Table 1, it is apparent that several factors contribute to occupant's satisfaction on noise criteria of their house. Based on the average mean range analysis, respondents were satisfied with their house's overall noise level (mean = 3.70). However, they have mixed feelings about the noise level from other rooms and the traffic, with a mean of 3.40, respectively. The analysis shows that the occupants also have mixed feelings about the noise level from other sources. The noise from the neighbourhood has the lowest mean of 2.71.

Criteria 5: water supply
As presented in Table 1, a few factors influence occupants' satisfaction towards the water supply provided in their house. With an average mean range of above 3.00 on three (3) items under the water supply criteria, it can be summarised those respondents have mixed feelings about the water supply provided. However, they agreed that the water pressure in their house is sufficient (mean = 3.88).

Criteria 6: indoor layout
Table 1 shows the factors contributing to flood victims' satisfaction with the indoor layout of the housing provided to them through the relocation incentives. The respondents have mixed feelings on the following items: internal layout of living and dining area, toilet, and internal layout of bedrooms in the house. However, with an average mean range of below 2.00, the respondents were not satisfied with the kitchen layout (mean = 1.59) in their house.

Criteria 7: design
As obtainable in Table 1, a few factors influence occupants' satisfaction regarding the housing design. Based on the analysis, respondents have mixed

feelings on the following items (average mean between 2.59 to 2.78): the amount of storage provided in the house, house size, appearance, and outside view. However, respondents were not satisfied with the cleanliness of the common area (mean = 1.65).

Criteria 8: waste management
From Table 1, it is apparent that there are a few factors contributing to the flood victims' satisfaction level towards waste management of the housing relocation at Kuala Krai, Kelantan. Findings show that the respondents were not satisfied with the relocation area's overall waste management, especially on the communal waste area's cleanliness (mean = 2.04). It is followed by dissatisfaction with the communal waste area's access (mean = 2.11). Lastly, respondents have mixed feelings about the waste collection in the area.

Criteria 9: safety
Table 1 shows the breakdown of safety criteria of housing relocation rated by flood victims at Kuala Krai. It indicates that respondents were not satisfied with the relocation area safety with an average mean range between 1.76 to 2.16 on the following items: security of the windows and doors, the safety of the house during night time, level of security provided in the area and safety of their house during day time.

Criteria 10: public transportation
Table 1 illustrates some of the factors contributing to occupants' satisfaction towards public transportation in the relocation area. Respondents have mixed feelings on their satisfaction regarding the amount of traffic within the housing area (mean = 2.98). The findings show that respondents were not satisfied with the frequency of buses in the area (mean = 1.68) and the distance to the nearest public transport provided in the area (mean = 1.49).

Criteria 11: public area
Table 1 above presents the factors impacting occupants' satisfaction concerning the relocation area's public area. The results obtained from the analysis show that the respondents were not satisfied with all items under public area criteria with an average mean of below 2.00.

Criteria 12: public amenities
Table 1 shows the factors contributing to flood victims' satisfaction towards public amenities provided in the relocation area of Kuala Krai, Kelantan. The respondents have mixed feelings about the variety of shops in the area (mean =

2.74). However, based on survey findings, respondents were not satisfied with the area's overall public amenities. Respondents' dissatisfaction was rank in the following manner: educational facilities (mean = 2.10), exercise facilities (mean = 1.90), community facilities (mean = 1.86), health facilities (mean = 1.83), and postal service facilities (mean = 1.46) provided in the housing relocation area.

Criteria 13: community
As presented in Table 1, a few factors influence the occupants' satisfaction regarding the relocation area's community. Overall findings show that respondents have mixed feelings towards the local council's information (mean = 3.14) and the local council's overall services (mean = 3.19) at the Kuala Krai relocation housing area.

Housing Relocation Criteria Overall Ranking
Table 2 indicates the housing relocation criteria 'overall ranking based on respondents' survey analysis conducted at Kuala Krai, Kelantan.

Table 2: Housing Relocation Criteria Overall Ranking

Item	Housing Relocation Criteria	Overall Mean	Satisfaction Indication	Criteria Ranking
1	Indoor Air Temperature	2.52	Mixed feelings	6
2	Indoor Lighting	3.37	Satisfied	2
3	Indoor Air Quality	2.33	Dissatisfied	8
4	Noise	3.25	Mixed feelings	3
5	Water Supply	3.50	Satisfied	1
6	Indoor Layout	2.62	Mixed feelings	5
7	Design	2.48	Dissatisfied	7
8	Waste Management	2.25	Dissatisfied	9
9	Safety	1.92	Dissatisfied	12
10	Public Transportation	2.0	Dissatisfied	10
11	Public Area	1.32	Very dissatisfied	13
12	Public Amenities	1.98	Dissatisfied	11
13	Community	3.17	Mixed feelings	4

The mean score for the main criteria is identified, analysing the breakdown of each category's factors. According to Table 2, 'Water Supply' (mean = 3.50) criteria of flood victims' satisfaction towards housing relocation takes the first rank among all the others. It is followed by 'Indoor Lighting' at the second rank with an average mean of 3.37. The third highest mean score is

'Noise' (3.25), continuing with 'Community' (3.17) at the fourth rank. 'Indoor Layout' (2.62) of the housing relocation provided at Kuala Krai takes the fifth rank, followed by 'Indoor Air Temperature' (2.52), 'Design' (2.48), 'Indoor Air Quality' (2.33), 'Waste Management' (2.25), 'Public Transportation' (2.00), 'Public Amenities' (1.98), and 'Safety' (1.92), in that order. Lastly, respondents were least satisfied with the 'Public Area' (1.32) of the housing relocation.

Table 3: Final Summary of Flood Victims' Satisfaction towards Housing Relocation Criteria

Satisfied	Mixed Feeling	Dissatisfied	Very Dissatisfied
Water Supply	Noise	Design	Public Area
Indoor Lighting	Community	Indoor Air Quality	
	Indoor Layout	Waste Management	
	Indoor Air Temperature	Public Amenities	
		Public Transportation	
		Safety	

Table 3 summarises the findings derived from Table 2. Overall, it can be concluded that respondents were satisfied with only two housing relocation criteria, which are Water Supply and Indoor Lighting. They have mixed feelings regarding Noise, Community, Indoor Layout, and Indoor Air Temperature. Flood victims expressed their dissatisfaction concerning the housing Design, Indoor Air Quality, Waste Management, Public Amenities, Public Transportation, and the area's safety. Finally, respondents were very dissatisfied with the Public Area provided at the housing relocation area. According to Saraf (2019), the flood risks cannot be eliminated despite many mitigation programmes which both federal and state governments have executed. However, it is noted that this research's findings were contradicted with a previous study conducted by Leh (2018). Leh found that the majority of the respondents were satisfied with their redeveloped houses and the infrastructure provided at the RKB.

CONCLUSION AND FUTURE STUDIES

In conclusion, the findings show that most respondents were not satisfied with their houses under the RKB programme. There were 13 housing relocation criteria identified in this study. The flood victims were dissatisfied with 7 out of 13 criteria (around 54%), including Design, Indoor Air Quality, Waste Management, Public Amenities, Public Transportation, Safety, and Public Area. Hence, results of findings on occupants' satisfaction level towards housing relocation at Kuala Krai, Kelantan during the post-occupancy stage can be

perceived as dissatisfied with the house provided as the actual outcome is lower than their expectation. The respondents were dissatisfied with the performance of the relocation housing in which the mean score for the occupants' satisfaction towards the relocation of housing using post-occupancy evaluation (POE) performance criteria was below 3.50 except for the Water Supply and Indoor Lighting with four mixed feeling results of these variables: Noise, Community, Indoor Layout, and Indoor Air Temperature. Therefore, it is hoped that this research's findings will provide an insight into the flood victims' satisfaction level; thus, developing a comprehensive housing relocation that meets occupants' needs and expectations.

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STRATEGIES, CHALLENGES AND SOLUTIONS TOWARDS THE IMPLEMENTATION OF GREEN CAMPUS IN UiTM PERAK

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Abstract

Green initiatives have become a phenomenon globally now. This has taken seriously all parties regarding the process of environmental sustainability. Sustainable Development Goals had been used as a guideline towards this agenda. The Malaysian government issued the Green Technology Policy in July 2009 to accelerate the national economy and promote sustainable development. Meanwhile, green technology has been applied to universities in Malaysia to achieve green campus status under the UI Green Metric. Numerous universities in Malaysia have begun to take this issue seriously, including UiTM Perak. Three research objectives had been developed; (1) to determine strategies in promoting green campus in UiTM Perak, (2) to identify challenges in implementing green campus in UiTM Perak and (3) to recommend solutions to overcome the challenges in implementing green campus in UiTM Perak. A qualitative method approach by using a semi-structured interview with the Green Campus Committee had been adopted. The data is analysed using content analysis. The research revealed that despite several green initiatives implemented by UiTM Perak, there are also challenges occurring. Among them are financial, awareness and knowledge. To overcome these challenges, the management of UiTM Perak had outlined several actions to be taken. In conclusion, the green campus initiative can give many benefits towards a sustainable environment in UiTM Perak. Indeed, this agenda needs support by all parties.

***Keywords**:* Green initiatives, strategies, challenges; green campus, UiTM Perak

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INTRODUCTION

Green Campus rewards long-term obligation to continuous environmental improvement from the campus community. Green Campus status is attained by making significant improvement in across campus community collaboration under one or several of the following themes: Settings and Infrastructure, Energy and Climate Change, Waste, Water, Transportation and Education. The Universitas Indonesia GreenMetric Rankings are provided for universities to measure and assess the level of sustainability of the environment in the campus (Uche et al., 2013). According to Omar, Saruwono and Mohammad (2010) green campus refined the quality of human life while living within the carrying capacity of supporting ecosystems. Its implementation in higher education institutions can give many benefits to the campus community by living in a harmonious environment and green lifestyle. Indeed, universities hold responsibility in implementing sustainable universities on campus to promote sustainability culture among their students and staff.

Numerous leading universities across the world have been implementing this agenda including Malaysia. However, despite several green campus initiatives taken, there are also challenges. This research aims to examine challenges in implementing green campus at UiTM Perak. In line with this, three research objectives were established (1) to determine strategies in promoting green campus in UiTM Perak (2) to examine the challenges in implementing green campus at UiTM Perak and (3) to propose solutions in implementing green campus at UiTM Perak.

LITERATURE REVIEW

Definition and the Importance of Green Campus

Most researchers have similar definitions on green campuses. Hosna Ajilian (2014) and Husaini and Jusoh (2017) defined green campus as sustainability made and kept up the conditions in which people and nature can exist productively, permitting social, economic and environment to advance. Uche et al. (2013) stated that green campus can be referred to as reducing negative impacts on environment pollution and human health to promote environmental sustainability. Concurring into this, Ragazzi and Ghidini (2017) added that in promoting green campus, the university should use their resources and experiences in teaching, research, and stewardship in approaches to enable society to make changes to a green lifestyle.

There are several benefits and importance to implementing a green campus as stated by numerous scholars. Omar, Saruwono and Mohammad (2010) mentioned that the green campus aims to improve and promote sustainability and work with others to implement and practice sustainability development. Green campus initiatives confirm the well-being of humans by integrating economic

viability, conservation and protection of environment and social equity throughout construction, operation design, maintenance and waste (Yiing, Yaacob & Hussein, 2013). In addition, green campus will minimise negative environment, economic, society, and well-being impacts of the campus communities towards a better practical lifestyle (Kristanto et al., 2017; Ragazzi & Ghidini, 2017; Foo, 2013).

Sahoo (2008) stated that a green campus will diminish the maintenance cost and productivity gains for the residents of the campus. The sustainable campus can create teaching future experts and improve skills and knowledge on sustainability development. It also enhances energy proficiency on campus, moving to renewable energy, food and other possessions used on and off campuses. Moreover, it can improve the university's social responsibility on environment protection and conservation resources (Yuan, Zuo & Huisingh, 2013). University Environment management system (EMS), which relates to environmental management initiatives on the campus for decreasing environmental effects and for development of a greener campus.

Xiong et al. (2013) viewed green campus as green education via green curriculum. Through a green curriculum, knowledge and information about green campuses can be distributed to all individuals. Green campus or sustainability universities are firmly identified with interdisciplinary, innovation, and complexity. Subsequently, it requires alternate approaches such as online learning rather than traditional, lecture-based pedagogy (Du, Su & Liu, 2013) to reduce energy use and wastes on campus. Indeed, it requires commitment and the firm administration of the university itself (Castro, José & Jabbour, 2013). Education for Sustainable Development also empowers individuals to build up the learning, value and aptitudes to make decisions on the method in which they were done by an individual or grouping, locally or globally that enhance the personal satisfaction without harming the planet (Kay, Hassan & Che, 2012).

University Sustainability Ranking System: UI GreenMetric

There are various global sustainability rating tools available such as GREENSHIPS, The Sustainability, Tracking, Assessment and Rating System (STARS), The College Sustainability Report Card @ Green Report Card and UI GreenMetric. Amongst these rating tools, UI GreenMetric is the most widely used in Asian, European and U.S. universities (Lauder et al., 2015).

The UI GreenMetric is a tool to assess the sustainability of universities and is a simple tool for self-assessment of campus sustainability efforts. Its aim is to assess policies and activities within green campuses so as to promote a sustainability culture in higher education institutions worldwide. Ragazzi and Ghidini (2017) acknowledged that this ranking is considered as the most important global sustainability ranking for universities as it allows universities to share their experience and best practices on sustainability issues, as well as to

measure their sustainability policy, facilitating a comparison between them. UI GreenMetric has developed their ranking instrument based on the sustainable development concept that encompasses the three Es of mutually reinforcing pillars: Environment, Economics and Social (Suwartha & Sari, 2013). There are six categories used in the ranking with their weighting and indicators (UI GreenMetric, 2016) and (Benjaoran & Chunko, 2018). A total of 39 indicators are provided for the categories and a specific score is assigned to each indicator. These are (i) Setting and Infrastructure (*Weighting*-15, 6 indicators), (ii) Energy and Climate Change (*Weighting*-21, 8 indicators), (iii) Waste (*Weighting*-18, 6 indicators), (iv) Water (*Weighting*-10, 4 indicators), (v) Transportation (*Weighting*-18, 8 indicators) and (vi) Education (*Weighting*-18, 7 indicators). The final score is the sum of the scores achieved for each indicator.

Challenges in Implementing Green Campus

Hosna Ajilian (2014) stated that lack of indicators to measure sustainability in higher education institutions is among the challenges in implementing a green campus. There is a lack of organization initiatives to concentrate on the relationship among the indicators in universities since the universities only focus on research, education, community and operation (Husaini & Jusoh, 2017). Failure to select suitable indicators may result in lack of a clear opinion on sustainability. In Malaysia, the use of sustainability gage is still new and very uncommon in practices (Darus & Atikah, 2012). The common challenges are that higher education institutions are the non-current of systematic framework to precisely measure campus initiatives and deficiency of specialists to be able to and conserve the environment (Luís, 2015). Moreover, absence of motivations from universities to encourage green education and activities to all communities in campus, lack of construction standards and control from authority to ensure the quality environment is safe and higher maintenance cost (Abubakar, 2020). Likewise lack of education and activities in sustainable design and development (Tarigan, Prayogo & Mardiono, 2012).

According to Hopkins and Hopkins, (2016), lack of knowledge and exposure among the university facilities director about sustainable development is another challenge in supporting the green campus agenda. There is also a lack of motivation at the faculty to reduce maintenance cost and long-term energy. Tiyarattanachai and Hollmann (2016) recommended that a green campus may not be the best if the university is not well prepared for it. Green campus agenda needs support from all university stakeholders such as the management team, faculty members, staff, students, parents and its alumni (Yuan, Zuo & Huisingh, 2013).

Besides that, campus expansion has changed the mode of transportation to motor vehicles in universities, thus contributing to traffic congestion, reduction

of air quality and unhealthy environment in campus. This gradually affects green spaces in the campus (Foo, 2013).

The Implementation of Green Campus in Malaysian Public Universities

In general, there are several universities in Malaysia that have adopted green campus initiatives. It is reported that 17 from 20 listed Malaysian public universities have participated in the UI Green Metric and five of the universities are in urban areas. Among the universities according to the highest ranking are Universiti Putra Malaysia (8000 score), Universiti Malaya (7900 score), Universiti Teknologi Malaysia (7275 score), Universiti Teknikal Malaysia Melaka (6775 score) and Universiti Sains Malaysia (6450 score). The universities concurred that green initiatives are very important towards university's sustainability, particularly for energy efficiency, water saving, less waste, and less carbon in campus and can progress a healthy environment. However, the implementation of green campus initiatives varied in every university in Malaysia.

Several previous studies (Gholami et al., 2020; Gomez et al., 2019; Razman et al., 2018) highlighted the several green campus initiatives that had been implemented by the Malaysian public universities. Among the universities and their strategies are:

a) Universiti Sains Malaysia (USM) - implemented a future sustainable platform to support the major international goals such as the Millennium Development Goals and Education for Sustainable Development. In doing so, USM opted to venture forward based on the "Blue Ocean Strategy", which requires a unique and innovative way of thinking, taking actions and setting goals compared to the norms
b) Universiti Utara Malaysia - won the global gold medal at the Green World Award 2016 for education and training and being known as the Ambassador of Green World 2016/2017. The university had implemented Electric Pedal-Assisted Bicycles as its initiative towards promoting green campus
c) Universiti Teknologi Malaysia - introduced preservation policy and framework of comprehensive programme to give ordinary balance on environment, reduce carbon, practice to protect resources, waste/garbage reduction and increase in recycling
d) Universiti Teknologi MARA (UiTM) - has established the Institute Sustainable Initiatives UiTM that consists of ten faculties and 39 excellence entities to initiate Greenation @ UiTM. This institute was initiated to stimulate and encourage students and visitors on sustainability, experience, and interaction towards a healthy lifestyle.

Green Campus Initiatives in UiTM Perak Branch

The implementation of a green campus in UiTM Perak is included in the UiTM Perak Branch Strategic Plan (2016-2020). The objective is to create a green and harmonious environment within campus and in line with the university motto i.e., Learning in Green Environment. There are five green campus teams under this committee namely Green Technology Design and Infrastructure, Green Office, Green Lifestyle and Recreational Support, Green Entrepreneurship and Innovation and Green Education and Awareness. Each of the team have different responsibilities and functions in implementing Green Campus Strategies.

The Green Technology, Design, and Infrastructure team are to implement green construction and green technology. It leads to the use of green materials, natural ventilation, and natural lighting on buildings. Other than that, for green technology, this strategy emphasises more on energy efficiency, reduction of waste and water saving. There are several green technologies that can be used to achieve green campus goals such as installation of solar workbench and Lighting Emitting Diode (LED) that will contribute to energy efficiency.

The Green Office team focuses on staff only, which is within office management of every department in UiTM Perak. Meanwhile, the Green Lifestyle and Recreational Support team was recognised to encourage all communities to be involved in green activities and green campaigns in UiTM Perak. They can impart and educate the community about green campus lifestyle with a happy and fun program.

The Green Entrepreneurship and Innovation team has the main roles in creating many entrepreneurs and fertigation activities in UiTM Perak that can generate income. The team also encourages students and staff to get involved in green entrepreneurship activities. Finally, the Green Education and Awareness team is to share knowledge and awareness about green campus in UiTM Perak. The team is responsible for organising green talk/seminars, conferences, and workshops to educate campus communities on sustainable matters.

RESEARCH METHODOLOGY

A qualitative method was adopted via semi-structured interviews. The Coordinator of Green Campus UiTM Perak (R6) and five heads of every green campus team were selected. They were requested to explain the strategies and challenges in implementing a green campus in UiTM Perak, as well as the solutions to overcome the challenges. These teams are the Head of Green Technology, Design & Infrastructure (R1), Head of Green Office (R2), Head of Green Lifestyle and Recreational Support (R3), Head of Green Entrepreneurship and Innovation (R4) and Head of Green Education and Awareness (R5).

During the interview, they were briefed on the overall procedure before their expert opinions on green campus inventiveness were asked. Every interviewee was given a standard question to ensure that their comment was

consistent and in a comparable platform. Next, the data obtained is analysed using content analysis.

FINDINGS AND DISCUSSIONS

The Strategies in Promoting Green Campus

Green projects and green activities

There are many strategies implemented by UiTM Perak in promoting green campus. According to R1, R2, R4 and R5, under the Green Campus Team, UiTM Perak has organised several green projects and green activities to educate campus communities on green elements. Among the projects undertaken are:

a) solar charging hub besides the library building to generate electrical energy. The solar panel can supply electrical energy to the library compound and will reduce electrical supplies dependency from the Tenaga Nasional Berhad (TNB).
b) changing from fluorescent to light-emitting diode (LED) lamp. LED lamps are installed in every building in UiTM Perak phase by phase. It can reduce the electricity consumption rate because LED is very efficient for energy saving.
c) usage of bottles in the reddening cistern to reduce the use of water and increase water pressure during flushing.
d) reuse of rainwater or lake water to water the fields and trees in the campus. Lake water will be pumped out by using an electric water pump and the water will be distributed to all pipes to water the field and trees
e) provide rainwater harvesting at the college rooftop. This activity contributes to water saving. Rainwater will be collected and stored in a water tank to be used.
f) reduce the usage of polystyrene and straw in the campus at all cafeterias/canteens in the campus. They are recommended to use other alternative materials such as oil paper to replace polystyrene as a food wrapper.
g) construction of a green roof at the architecture building. This is a collaboration project between the green committees and students.
h) tree planting at office buildings or also known as biophilic. It focuses on every department office building at UiTM Perak. By planting small trees such as cacti will help to increase the quality of oxygen in the working space of an office.
i) fertigation of various types of fresh vegetables such as tomatoes, chillies, and others. This activity is for all UiTM Perak communities. The vegetables will be sold under the Malaysian Academy of SME & Entrepreneurship Development (MASMED) of UiTM Perak to generate income. Organic fertilizer is used for the fertigation process to make sure the product is safe and does not convey any harm towards consumers.
j) generating income through `*Madu Kelulut*'. This is a collaboration project between UiTM and Federal Agricultural Marketing Authority (FAMA). The honey products will be sold to FAMA. FAMA will manage all the works in terms of operation and honey extraction process whereas UiTM Perak will provide space and nests.

Campaign on green campus

R1, R3, R4 and R6 indicated that executing a green campus campaign in UiTM Perak is one of the strategies to enhance the campus communities to be more concerned about the importance of a sustainable environment. Among the campaigns organised by the Green Campus Committee are:

a) sticking saving energy stickers at every switch at the office and classroom.
b) organising the Recycle , Reuse and Reduce (3R) program.
c) reduce the use of plastic, polystyrene, and straw on campus.

These campaigns aimed to create awareness and educate UiTM Perak communities on how to live in a good environment. Despite organising green campaign awareness, R5 and R6 viewed that sharing knowledge about green campus using email and social media is the best approach to promote green campus, particularly among students. On top of that, the Green Campus Committee and UiTM Perak Corporate Unit had launched a green campus official website to convey all information about green campus at UiTM Perak.

R5 stated that the Green Education and Awareness team had proposed a green hub as a one-stop information centre providing information and knowledge about green campus and all UiTM Perak green activities to the communities. It has been approved by UiTM Perak top management and currently is under construction. This is in line with (Lozano et al., 2013) stating that green education should be integrated into every community to promote the concept of sustainability.

Challenges in Implementing Green Campus

Lack of financial

Majority of the interviewees agreed on the main challenges in applying for a green campus due to lack of financial. According to R1 and R2 the cost for implementing a green campus is very expensive. Concurring to this, Finlay, Massey and Massey (2012) stated that the main issues in implementing a green campus are inadequate financial resources for initial investment. Idris et al. (2015) stressed that the cost will be much higher than the normal building due to the specification of green elements and the limitation of green product suppliers. With these issues in hand, R4 and R5 implementation of green campus in UiTM Perak is planned according to phases, thus, it took a longer period.

Lack of knowledge and awareness

Lack of knowledge on green campuses among staff and students are highlighted by R1, R2, R3 and R6 as among the challenges in implementing a green campus in UiTM, Perak. According to Yuan, Zuo and Huisingh (2013) and Hopkins and Hopkins (2016), lack of knowledge among staff's management will affect the implementation of sustainability higher education fail. Tiyarattanachai and

Hollmann (2016) emphasized that a green campus agenda may not be the best approach for every university, particularly if the organisation is not ready for it. He highlighted that awareness about sustainable universities are influenced by several factors such as age, gender and level of education. There is still a lack of research on sustainability in the university curriculum and sustainable development resulting in the failure in implementing the green campus agenda (Uche et al., 2013).

R2 and R3 indicated that it takes time to educate and change human behaviour to be more concerned about a sustainable environment. They found that it is difficult to gain full participation among staff to attend green workshops or green talk organised by the university. Perhaps they are busy with lectures and other university programmes or they are not interested in the area.

Maintenance issues

R4 highlighted the disturbance of wild animals such as monkeys, dogs and boars as among the challenges in implementing a green campus in UiTM Perak. He added that the animals had harmed almost all vegetation areas and the bee nest (*Madu Kelulut*) for food and vandalised the facilities at the academic block.

Meanwhile, R1 and R6 stressed on the maintenance issues. It is because each green campus project and initiative are essential to be preserved and maintain its performance. So, it can avoid damage and operational failure due to weather conditions and overall period taken. This is in line with (Uche et al., 2013) stating that green initiatives and development require frequent maintenance works and this involves high cost to preserve quality and performance by phase to ensure efficiency and effectiveness of the green elements. Yet, there is a lack of experienced workers to manage green campus projects and to maintain the performance quality.

Solutions to Overcome the Challenges in Implementing Green Campus

Green workshop, green education, experience committee and participation among student and staff

R2, R3 and R6 indicated that green education was one of the subjects that must be taken by all students in UiTM Perak. This can change their mindset and behaviour against the importance of a sustainable environment. There are many topics that should be included for green education such as energy efficiency, waste, transportation, water saving and others. Also, competition-based initiatives and programmes are effective mechanisms for a green environment (Aziz & Said, 2018) are also recommended to be structured among UiTM Perak's students and staff. For staff, green workshops or green talk/seminars have to be organised. The participation and support is the key to achieve green campus goals to spread the green campus strategies to all communities in UiTM Perak. Hence, this will yield a harmonious atmosphere as we live in a healthy environment since all parties are involved and concerned about a green campus and a sustainable environment. To advance the quality of the environment, it is important to plan a green program that everyone in a

certain area can participate in (Kristanto et al., 2017). R6 also added that green education must be taught from childhood to develop a good attitude towards the environment. This is in line with Xiong et al. (2013) stating that green education should be implemented in the universities at all faculties to encourage the idea of sustainability. Moreover, he added that publishing of "green course books" and relative journals ought to be encouraged in each academic course.

Appoint support staff and experience committee

R3 and R5 stated that the Green Campus Committees require more support staff to assist the tasks systematically. Currently, the majority of green committees are lecturers. They are quite busy and do not have enough time to divide between the lecture sessions and green campus works. R4 suggested that the Green Campus committee should be familiar with the implementation of a green campus. By adopting a qualified green initiative, management can make the university achieve environmental sustainability and green campus status (Sahoo, 2013). According to (Kristanto et al., 2017) a strong commitment from campus management is some of the key factors that need to be considered when such an environmental sustainability program is initiated. Thus, well-founded affirmative policies that could affect human behaviours (Bakar, Mustapa & Mohammad, 2020), intervention measures in form of subsidies (Nasrudin et. al., 2020) along with the commitment are seemed the plausible way forward to inculcate comprehensive green campus measures.

CONCLUSION

The strategy for sustainable campus development needs a complete understanding of the factors involved in the complete operations of the university. In Malaysia, since most of the public universities were built before the awareness of sustainable development declaration, to achieve a sustainable campus is a challenge. The commitment of all stakeholders, including the campus community is important.

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APPLICATION OF MACHINE LEARNING IN ANALYSING HISTORICAL AND NON-HISTORICAL CHARACTERISTICS OF HERITAGE PRE-WAR SHOPHOUSES

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Abstract

Real estate is complex and its value is influenced by many characteristics. However, the current practice in Malaysia shows that historical characteristics have not been given primary consideration in determining the value of heritage properties. Thus, the accuracy of the values produced is questionable. This paper aims to determine whether the historical characteristics of the pre-war shophouses at North-East Penang Island, Malaysia contribute any significance to their value. Several Machine Learning algorithms have been developed for this purpose namely Random Forest, Decision Tree, Lasso Regression, Ridge Regression and Linear Regression. The result shows that the Random Forest Regressor with historical characteristics is the best fitting model with higher values of R-squared (R^2) and lowest value of Root Mean Square Error (RMSE). This indicates that the historical characteristics of the heritage property under study contribute to its significant value. By considering the historical characteristics, the property's value can be better predicted.

***Keywords**:* Pre-war shophouses, machine learning, historical characteristics, random forest, price prediction

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INTRODUCTION

In 2008, George Town Penang Island Malaysia was recognized as a historic city inscribed by the UNESCO World Heritage Site (Azizan & Desa, 2020). This recognition was granted due to the prevalence of diverse tangible and intangible heritage surrounding the George Town area (Rahman, 2018). This paper focuses on the cultural heritage site which is made up of pre-war shophouses located within the core and buffer zones in George Town. Being labelled as a tangible cultural heritage, the property's value is of historical significance. Hence, there is a crucial need to conserve and preserve this heritage property as part of an economic indicator. According to Ruijgrok (2006), the preservation of cultural heritage produces considerable benefits in terms of economic and financial value. The total economic value of cultural heritage sites consists of their use-value and non-use value (Palanca-Tan, 2020). In terms of economic value, the heritage pre-war shophouses have a use value due to their status as private property. The owners are the direct beneficiary of the value due to their direct consumption of the property (SGS Economics and Planning, 2017).

In real estate valuation, it is important to estimate the possible value of a property in order to achieve the accurate value (Mohamad & Ismail, 2019). In the study by Mohamad, Ja'afar, and Ismail, (2020), the accurate valuation of a heritage property is indicated to facilitate better decision making. Thus, others would appreciate, acknowledge and assist in the management of heritage property so as to produce a proper and reliable method for their valuation.

Mohamad, Ismail and Rahman (2015) questioned about the proper historical characteristics that should be considered when valuing heritage property. Based on the study by Mohamad and Ismail, (2017); Zin and Ismail, (2019), there are several characteristics influencing the value of heritage property such as property transaction characteristics (e.g. tenure, lot number, building number, share, year of valuation), structural characteristics (e.g. main floor area, building improvement, types of floor, wall material, maintenance inside and outside) and historical characteristics (e.g. façade status, ensemble and authenticity). Ismail and Zin, (2019) recommended a proper and updated of historical characteristics in valuing heritage property so as to enhance the accuracy of existing heritage property valuation methods. The study by Ja'afar & Mohamad (2020) took into consideration historical characteristics by using the multiple regression analysis with higher R^2. The aforementioned studies revealed the importance of considering historical characteristics in valuing pre-war shophouses.

In the existing studies, several approaches had been used for estimating real estate property such as the sales comparison method, contingent valuation method, hedonic pricing method and travel cost method; while in the industry, the approaches used include the sales comparison method, income method and cost method (Ja'afar & Mohamad, 2020; Ruijgrok, 2006). This study aims to

estimate the tangible heritage property value of pre-war shophouses; thus, the researchers need to identify the relevant historical characteristics for estimating the value price of the heritage property as there are no solid evidence of a proper valuation method for heritage property (Ja'afar & Mohamad, 2020). Besides that, authors also suggest observing the collected heritage characteristics using the most current and widely used statistical technique namely machine learning. Authors also pointed out that machine learning had been mostly used in estimating the value of residential properties and yet no study has been conducted in estimating the value of privately-owned heritage properties specifically in Malaysia, thus the study of heritage property using machine learning remains undiscovered. To study the heritage property's characteristics, the researchers had to identify which historical characteristics could give the most significant value to the pre-war shophouses using machine learning.

According to Baldominos and Blanco (2018), through the use of machine learning, the hidden value in data sources can be analysed to derive actionable insights from the data. The application of machine learning can also help identify more opportunities in the real estate market. This would drive real estate investors to give more attention to a property's surroundings. Thus, this study attempts to identify the physical aspects of heritage property of which characteristics are significant and should be considered in heritage property valuation, besides focusing on the historical group features which could facilitate competent property practitioners in determining the ways in which to determine heritage property values.

RESEARCH BACKGROUND

Heritage

According to the National Heritage Act 645 (2005) (NHA), the generic meaning of "heritage" entails sites, objects and underwater cultural heritage. This current paper focuses on pre-war shophouses that are labelled as cultural heritage. There are several definitions of cultural heritage. Gabriel (2020) defined it as the handiwork of humans that are deemed worthy of preservation and of which can be tangible or intangible. Thus, pre-war shophouses are known as tangible cultural heritage following the decree of the NHA which states that an area, monument or building in this category is deemed as tangible cultural heritage. UNESCO recognized the pre-war shophouses located within George Town as a World Heritage Site because the buildings possess all the criteria mentioned in the Outstanding Universal Value (OUV). The criteria include: (i) representing the multi-cultural trading town which involve Malay, Chinese, Indian and European cultures with different architectures, technologies and monument arts, (ii) representing multi-cultural traditional living influences be it tangible or intangible aside from the existence of various religious buildings, languages,

foods, daily life habits and ethnicities, and (iii) reflecting the various cultural architectures from the Malay Archipelago, India, China and Europe via the presence of unique building types and cultures (Azizan & Desa, 2020; Foo & Krishnapillai, 2019). Figure 1 shows the classification of heritage sites in Malaysia. This study identifies significant historical characteristics through empirical and theoretical study using machine learning modelling.

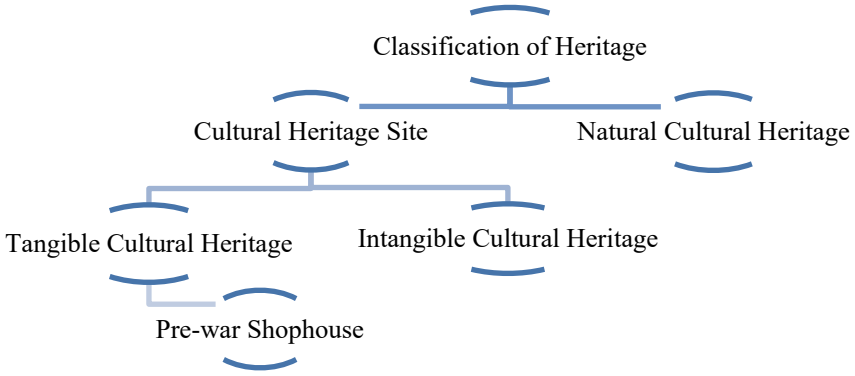

Figure 1: Classification of Heritage Site

Factors Affecting Pre-War Shophouses

Historical characteristics

Every heritage building has its own valuable historical characteristics which in turn represent an image of its prestige and attraction to the property (Azizan & Desa, 2020). There are various ancient cultures throughout human history; hence, researchers cannot simply ignore historical characteristics in valuing heritage property. This study examines the historical characteristics of the George Town World Heritage Site Incorporated (2016) pre-war shophouses in George Town which has six heritage shophouses from different periods with different facades and characteristics. In the context of this current study, the historical characteristics taken into consideration include transacted price, year of transaction, street of property, storey, land area, main floor area, roof material, floor material, ceiling material, maintenance inside and outside, historical styles, five-footway/walkaway, multifunction building, architectural, functionalistic, ensemble and authenticity (Mohamad & Ismail, 2019; Mohamad et al., 2020; Yeow Wooi, 2015). These historical characteristics are used in the modelling using the machine learning statistical technique.

Non-historical characteristics

Non-historical characteristics refer to characteristics with no historical value or heritage context. Normally, in valuing real estate properties like housing or private shophouses, the characteristics that will be taken into consideration include age of building, location of property, land area, storey, tenure, neighbourhood and main floor area (Zulkarnain, 2020). These characteristics are valued based on the conditions and sales evidence from the open market on the property types; hence, they are different from historical characteristics which cannot be easily compared to other properties (Shipley, 2000).

Machine Learning

Machine learning has become a popular programming practice among researchers for solving problems by predicting current existing data gathered from past data records (Milutinovic, 2019). There are two categories of problem-solving using machine learning namely supervised learning and unsupervised learning algorithms (Fiorucci & James, 2020). Between the two, the most commonly used is the supervised learning algorithm specifically for predicting ϒ (Horino & Nonaka, 2017). The supervised learning algorithm is used for predicting the outcome of a given input; it uses the examples of the input or output pairs and requires human effort to create a training set for building the machine learning algorithm process (Jordan & Mitchell, 2015). Unsupervised learning algorithms are different because they have no known output and no instructor to instruct the learning algorithms; they also involve the analysis of unlabelled data from assumption i.e., the extraction of information from the input data to build algorithms (Muller & Guido, 2017).

The machine learning approach has been used in the real estate field for several years. It is used to determine the market value of buildings, predict long term values, match profiles, and generate real estate listings and other information related to property forecasting (Phan, 2019). However, the machine learning approach is seldomly employed in the real estate industry in Malaysia. Therefore, in order to assess any benefits that could be gained from it, researchers apply it as a price prediction. There are five most commonly used algorithms in real estate analysis namely Random Forest, Decision Tree, Linear Regression, Lasso Regression and Ridge Regression as shown in Figure 2.

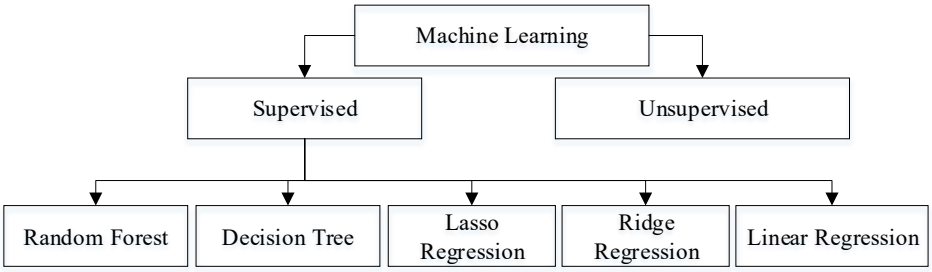

Figure 2: Machine Learning Algorithms Diagram

According to Mohamad et al. (2020), the most successful supervised machine learning algorithm as identified in various studies is the Random Forest algorithm. Random Forest is also known as an ensemble learning which can be used in classification and regression problem methods; one of its advantages is protecting against overfitting which in turn improves performance (Sabbeh, 2018). It is usually used as a decision-making tool in real estate specifically for predicting the price of housing (Horino & Nonaka, 2017). Random Forest has a Decision Tree collection known as "Forest", but Random Forest generalizes better than Decision Tree towards improving accuracy i.e., by selecting the highest votes (Fiorucci & James, 2020).

Next is the Linear Regression algorithm or better known as ordinary least square OLS (Varma & Sarma, 2018). Linear Regression is used to estimate the cost of houses, total sales and number of calls. There are two types of Linear Regression namely simple linear regression and multiple linear regression. Simple linear regression uses one independent variable while multiple linear regression employs more than one independent variable. Basically, Linear Regression is applied for predicting, forecasting and studying the relationship between two variables. Linear Regression equation is $Y = a + \beta x$ where Y is the market price of property and x is the given input (Borde & Rane, 2017).

Next, the Decision Tree algorithm is used in classification and regression problems but mostly for classification. It is used for visualizing the decision-making process. More commonly, it is used for selecting variables, accessing the significant connections between variables, monitoring missing values, and predicting data and management (Song & Lu, 2015). According to Sabbeh (2018), Decision Tree generates a tree-like structure which comprises internal nodes, branches and leaf nodes and represents the decision model.

Next is the Lasso Regression algorithm, which stands for Least Absolute Shrinkage and Selection Operator (Satish & Rao, 2019). According to Shinde and Gawande (2018), Lasso Regression is known as an L1 regularization technique because it is one of the most powerful formulas in regression, it works by reducing the error between the predicted and actual observations. Last but not

least is Ridge regression, a linear model for regression which uses the same formula used in predictions using OLS (Muller & Guido, 2017). This algorithm is able to fit an additional constraint called regularization during training data. Ridge regression is known as L2 regularization which prevents overfitting during training. In modelling, the evaluation formula for determining the performance metrics used root mean square error and R-square to show the good values predicted by the algorithm performance (Mohamad et al., 2020).

Machine learning has numerous benefits. It is classified as a continuous improvement approach because most machine learning algorithms are capable of learning from available data and constantly provides new knowledge as well as enhances the accuracy and efficacy of decision making with subsequent training. In addition, it helps in recognizing patterns and trends of data in huge volumes and in discovering patterns and trends that are not obvious to humans i.e., by browsing and purchasing history of data to disclose the finding (Levantesi & Piscopo, 2020). However, there are also flaws in machine learning such as the necessity to acquire large volumes of high quality and accessible data to train on. Occasionally, there is a need to wait for the production of new information as the machine learning algorithms require adequate time to learn and improve with a significant amount of precision and relevance to fulfil their purpose (Borde & Rane, 2017; Raschka, 2020; Voutas Chatzidis, 2019).

METHODOLOGY

Dataset

To compensate for the lack of literature on historical characteristics and other related criteria, researchers have collected several historical characteristics from empirical and theoretical study regarding the pre-war shophouses. There 19 heritage pre-war shophouses characteristics used in the machine learning modelling such as transacted price, year of transaction, street, storey, land area, main floor area, roof material, floor material, wall material, ceiling material, maintenance outside, maintenance inside, multifunction, five-footway, architectural functionalistic, historical styles, ensemble, authenticity and position. Dataset for empirical observation was collected from the National Property Information Centre and inspection, while the theoretical study was taken from a book entitled "George Town Historic Cities of the Straits of Malacca Special Area Plan" (George Town World Heritage Incorporated, 2016; Gwynn Jenkins, 2013). These books were supported by the Penang Island City Council, Penang Town and Rural Planning Department and World Heritage Organization (WHO). As the property is a tangible cultural heritage, the researchers had to differentiate between the historical characteristics and non-historical characteristics in modelling using machine learning so as to determine the variables that could affect the heritage property's price.

Selected Variables

To train the variables using machine learning, the researchers divided the variables into three groups called features. The first group is called "All Features" comprising all the historical characteristics and non-historical characteristics of the properties to estimate the extent of their significance. The second group is named "Historical Features" comprising only the historical characteristics of the properties. The third group is called "Non-Historical Features" comprising only the non-historical characteristics of the properties. Through these different features used in training, the researchers can observe the outcomes of the machine learning at the end of the process.

Table 1: Features in Machine Learning

All Features (19 variables)	Transacted Price, Year of Transaction, Street, Storey, Land Area, Main Floor Area, Roof Material, Floor Material, Wall Material, Ceiling Material, Maintenance Outside, Maintenance Inside, Multifunction, Five-Footway, Architectural, Functionalistic, Historical Styles, Ensemble, Authenticity, Position.
Historical Features (18 variables)	Transacted Price, Year of Transaction, Street, Storey, Land Area, Main Floor Area, Roof Material, Floor Material, Wall Material, Ceiling Material, Maintenance Outside, Maintenance Inside, Multifunction, Five-Footway, Architectural, Functionalistic, Historical Styles, Ensemble, Authenticity.
Non-Historical Features (8 variables)	Transacted Price, Year of Transaction, Street, Storey, Land Area, Main Floor Area, Position.

Models Configuration

As mentioned earlier, this paper will predict an outcome from the given variables. Here, the researchers will identify the features that could influence the property's price by using the performance metrics. Thus, the machine learning model was built from the given features into training sets before the evaluation of the models. This model entails several processes refer Figure 3.

Figure 3: The Configuration in Modelling the Machine Learning Algorithms

According to Figure 3 above, there are five steps in modelling the machine learning in this paper. The steps are as follows:

1. Upload the files containing dataset (csv files) for inspecting the data in Python platform to loading and inspecting data.
2. Import machine learning libraries by calling Sklearn or Scikit-Learn libraries.
3. Select the features as shown in Table 1. The researchers had divided the variables into three groups namely: (1) All features, (2) Historical features, and (3) non-Historical features. This is to help determine the variables that influence the property's price.
4. Conduct the Auto Hyper-Parameter Tuning, by calling the *"best_estimator"* in Scikit-Learn library to help optimize the tuning configuration.
5. Lastly, conduct the evaluation process by analyzing the performance metrics using the R^2 and Root Mean Square Error. The result will show the selected algorithm by referring to the best performance metrics in Table 2.

RESULTS

After modelling the three features, the machine learning produced the correlations between the features and the results of the features with the selected algorithms. Each feature was generated with the chosen algorithms which were evaluated using the performance metrics i.e., the R^2 and the RMSE. The Root Mean Square Error is a standard way for measuring how errorless the model is in predicting quantitative data; meanwhile, the R^2 indicates the significant effects on the dependent variable (Ho, 2020; Yilmazer, 2020).

The correlation results of each properties characteristic calculated by machine learning are land area = 0.60, year of transaction = 0.38, main floor area = 0.35, position = 0.30, architectural functionalistic = 0.23, storey = 0.18, wall material = 0.13, historical styles = 0.12, street = 0.08, roof material = 0.04, ensemble = 0.018, five-footway = 0.009, multifunction = 0.0077, authenticity -0.061, ceiling material = -0.0814, maintenance inside = -0.13, floor material = -0.14 and maintenance outside = -0.15. The results show that there are correlations between the dependent and independent variables of property characteristics. The dependent variable is transacted price, and the remaining eighteen are the independent variables. The highest independent variable is land area while the lowest independent variable is maintenance outside. From this result, we can see that each characteristic has its own connection in influencing the property's price prediction.

Table 2: The Result of Features using Machine Learning

No	Algorithm	All Features		Historical Features		Non-Historical Features	
		R^2	RMSE	R^2	RMSE	R^2	RMSE
1.	Random Forest	0.917	415258.7	0.971	242625.4	0.912	427367.7
2.	Decision Tree	0.821	611493.4	0.833	590643.1	0.899	459491.8

3.	Lasso	0.807	635270.7	0.822	610198.8	0.799	648317.9
4.	Ridge	0.804	640737.7	0.604	910646.3	0.799	637353.4
5.	Linear	0.380	746071.9	0.328	776845.2	0.806	648316.1

As presented in Table 2, there are three different features namely “All Features”, “Historical Features” and “Non-Historical Features” together with different results. For the “All Features", the selected algorithm was Random Forest based on the performance metrics with the highest R^2 which is 0.917 and the lowest Root Mean Square Error which is 415258.7. This feature comprises all the property characteristics as shown in Table 1. Next, “Historical Feature" also nominated Random Forest as the most suitable for this dataset based on the performance metrics with the highest R^2 at 0.971 and the lowest Root Mean Square Error at 242625.4. Lastly for “Non-Historical Features", once again Random Forest was shown to be the most suitable algorithm based on the performance metrics of R^2 and Root Mean Square Error of 0.912 and 427367.7.

DISCUSSION

From the finding, the best algorithm is Random Forest model, because the result of R^2 and Root Mean Square Error are the best within other algorithms. The significant contributions by Random Forest model are through the result of accuracy. Accuracy is an indication of prediction price values, if prediction price were correctly formulated and modelled to achieve a fairly high level of accuracy, the level of prediction values will be the higher one. Thus, the accuracy achieved by Random Forest model is the higher one so it was formulated and modelled correctly.

In addition, data of features also contribute to the high accuracy. Among the results of features, “Historical Features” were selected as the best features dataset due to its accuracy from the Random Forest model. Dataset of “Historical Features” contain more variables than “Non-Historical Features”. The same variables in both features are transacted price, year of transaction, street, storey, land area and main floor area only and the rest features are different. Thus, the differences of additional variables influence the accuracy result of models.

In conclusion, the “Historical Features" performance metrics is better than the other features hence indicating that historical characteristics can influence the performance of price prediction. For future studies, historical characteristics shall be considered in price prediction apart from upgrading the crucial characteristics that visualize the image of Historical City.

CONCLUSION

This study applied five algorithms namely Random Forest, Linear Regression, Decision Tree, Lasso Regression and Ridge Regression on the heritage property

dataset. Within these algorithms, the findings showed that the model which best fits the data condition in modelling was Random Forest based on the performance metrics of the R^2 and the Root Mean Square Error. The best result for Random Forest was from the historical feature or historical characteristics data based on the highest value of R^2 and lowest value of Root Mean Square Error. Through empirical study, it helps in reviewing and restoring the latest recognition of historical characteristics areas for improvement of their special significance. By studying the different groups of property characteristics, the researchers had addressed the gap by presenting the empirical results from different property characteristics using the machine learning technique. However, machine learning also has its limitations including its need for high volumes of datasets for learning and predicting (Raschka, 2020). Another limitation is the lack of verifications on the standard of historical characteristics that should be considered in valuation. Future researches on historical characteristics are encouraged to improve or upgrade the historical characteristics based on the property's situation. This study is beneficial for the property owners in terms of income generation from the sale and purchase of their heritage properties. For the public, this study facilitates in defining its cultural identity apart from contributing to the preservation and conservation of historical characteristics (Armitage & Irons, 2013).

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ATTACHMENT AND FACTORS OF INVOLVEMENT AMONG YOUTH TO PADDY FIELD ACTIVITIES IN HOMESTAY PROGRAMMES

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Abstract

The homestay programme is a community-based tourism that offers tourists to experience the local lifestyle and heritage culture. Many studies focused on challenges of homestay programme, place attachment of hosts, contribution of homestay programme to rural economy. However, very few studies have focused on youths' involvement in homestay activities. This paper aims to examine the youth's involvement in homestay activities. A focus group discussion was conducted among the youth aged 20 - 34 years old. A non-probability sampling, that is, purposive sampling was employed. Multiple case studies in Homestay Kampung Jeruju, Homestay Kampung D'Belimbing and Homestay Kampung were selected to determine the differences between the locality factors. These findings indicate that youth's involvement in paddy field activities is based on social, physical, and economic factors. Thus, to attract youth to be involved in paddy field activities, it is recommended for the tourism players to pay attention to these three factors.

Keywords: Homestay programme, community-based tourism, attachment

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INTRODUCTION

The relationship between landscape and experience demonstrate that rural landscape characters are essential elements that need to be conserved and preserved to attract visitors to visit the rural area (Zakariya, Che Haron, Tukiman, Ab. Rahman & Harun, 2020). Homestay programme promotes a distinctive rural setting and unique cultural values for the visitors. Homestay programme has shown a steady growth since the Ministry of Tourism and Culture started to support this programme due to potential in rural tourism and community-based tourism (Aminudin & Jamal, 2006). However, one of the key issues in homestay programmes in Malaysia is the low involvement of rural youth in homestay activities. Numerous studies (Kayat, 2007; Sood, Lynch, & Anastasiadou, 2017) have shown that interest, motivation, and concerns of rural youth to engage in homestay activities are decreasing. Tourism development in rural areas will achieve success when it is supported by understanding and involvement of the community. This study aims to investigate the perception of youth involvement in paddy field activities in the homestay. According to Ibrahim & Razzaq (2011), youth involvement is an important aspect that needs to be developed in the Homestay Programme as they represent the majority population in rural settlement. Youth participation is highly sought to ensure that the development of this homestay programme is continuous (Ibrahim, 2004). According to Pusiran and Xiao (2013), the host homestay has a limited number of apprentices and this will affect continuity for future generations. According to Kayat (2009), Homestay Programs fail due to lack of local involvement, local leadership, knowledge, and skills, poor planning, and community structure. Hall, Kirkpatrick, and Mitchell (2005) explained that limited skills and knowledge of tourism could contribute to false expectations about the benefits of tourism and a lack of preparedness for the change associated with tourism.

LITERATURE REVIEW

Youth involvement and participation in homestay programmes cannot be discussed without considering power relations for equal rights. It is important that all youth could get involved in programmes which directly affect their lives. Community involvement is an essential part of community development and one of the most important factors in the community-based tourism development process, which allows involvement of people in the different stages of decision making (Aref & Ma'rof, 2008; Bozlul, 1994). In this study, the focus group are the rural youth who live in homestay villages. This study investigates the details on 'rural youth's involvement' in rice field activities in homestay.

Factors of Youth's Involvement in Homestay

Numerous studies have shown that there are many factors that influence youth to participate in homestay programmes. The factors include social, physical, and

economic factors. Previous studies by Kayat (2007), Razzaq et al. (2011), Pusiran and Xiao (2013), Sita and Nor (2015), Harun et al. (2017), and Sood, Lynch and Anastasiadou (2017) have listed a few factors that encourage youth to get involved in homestay programmes. The factors are social factors, physical factors, and economic factors.

Social factors

Social factors play an important role to encourage youth to get involved in homestay activities. Kayat (2010) found that family support is an important aspect to motivate youth to get involved in homestay activities. Furthermore, a study conducted by Harun et. al. (2017) explained that parents should give moral support to their children such as giving support to participate in the courses made by the parties involved. Youth's interest in the activities is also categorised as part of the social factors. Interest is one of the driving factors that motivate youth to get involved in the homestay programme. Youth who volunteer to help in the homestay activities are interested to know the cultural activities offered in the homestay programmes. Therefore, the previous findings prove that social factors play important roles in influencing rural youth to get involved in homestay activities.

Physical factors

Physical factors make a significant contribution to encourage rural youth to get involved in homestay activities. However, only a few studies were found to be in concern with the physical factors, especially the green natural environment. A study conducted by Razzaq et. al, (2011) revealed that only a few (34%) of youth joined the programme due to the physical factors. Furthermore, much of tourism developments depend on the environment. The relationship with the environment is related to the physical and human surroundings. Tourism development must protect the intrinsic values of resources of current and future (Murphy & Watson 1995). According to Latip et al. (2020), tourism can substantially support environmental conservation, protection and sustainable use of natural resources and restoration of biological diversity. Tourism development in the community's neighbourhood has created awareness among locals; this is because they noticed that the value of environmental resources has created tourism demands (Kuvan & Akan, 2005).

Economic factors

Another important factor that encourages youth to get involved in homestay programmes is the economic factor. From previous studies conducted by Kayat and Mohd Nor (2006), Razzaq et.al, (2011) and Harun et. al, (2017), the researchers revealed that income is one of the main reasons why youth are involved in homestay programmes. According to a study conducted by Razzaq

et.al. (2011), there were changes in income levels of communities before and after participating in the Homestay Programme. Before joining the programme, most of the operators earned income values in the range of RM500-RM1000. After participating in the Homestay Programme, their income increased. Participants found that the programme created opportunities for additional income. In addition, most participants indicated that the programme leaders in their communities played an important role in convincing them to become involved in the programme. This proves that economic factors have become a major factor in bringing youth to get involved in homestay programmes.

METHODOLOGY

The study was conducted in three homestays in the state of Kedah, which are Homestay Kampung Jeruju, Homestay Kampung D' Belimbing and Homestay Kampung Pantai Jamai. The selection of homestays represents the natural settings of the paddy fields in Malaysia. Multiple case studies create a more convincing theory when the suggestions are more intensely grounded in several pieces of empirical evidence. Thus, multiple cases allow the wider exploration into the research questions and theoretical evolution (Eisenhardt & Graebner, 2007). The criteria of case studies selection were based on age distributions of population and social organisation in rural areas (JKKK). This study adopted a qualitative method by using focus group discussion (FGD) on exploring in-depth information among rural youth aged 20 to 34 years old. A non-probability sampling, that is, purposive sampling was employed in this study. To achieve the aims of the study, the researcher decided to choose a smaller sample size. Hence, thirteen youths were selected for focus group discussions. The respondents were selected according to their family background, involvement in paddy field activities in homestays and their attachment to paddy field activities. The total respondents in focus group discussion using photos were 13 rural youths aged 20-34 years old (Refer Table 1). The researcher managed to conduct three focus group discussions with five respondents in Kg. D' Belimbing, five respondents in Kg. Pantai Jamai and three respondents in Kg. Jeruju, respectively. A thematic analysis was conducted in analysing the responses from the FGD session.

Table 1: Number of Respondents in each homestay

Homestay	**Number of Respondents**
Kg. D' Belimbing	5
Kg. Pantai Jamai	5
Kg. Jeruju	3
Total Sample Size	**13**

Thirteen respondents were named as R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12 and R13. The list of respondents in each homestay is listed in Table 2.

Table 2: Respondents in each homestay

	Homestay		
	Kg. D' Belimbing	**Kg. Pantai Jamai**	**Kg. Jeruju**
Respondents	R1	R6	R11
	R2	R7	R12
	R3	R8	R13
	R4	R9	
	R5	R10	

FINDINGS AND DISCUSSIONS

Based on the thematic analysis, seven themes emerged from the transcribed data. These themes are family support (1), establishing a relationship with tourists (2), gaining knowledge (3), contributing ideas (4), incentive (5), income (6), and environment (7). Based on these themes, three main categories were developed which are social factors, physical factors, and economic factors.

Category 1: Social Factors

Data from the focus group discussion indicate that rural youths who were involved in tourism activities related to rice field activities were those who were supported by their families. Out of 13 youths, 9 of the youth mentioned that they were involved in rice field activities because of family tradition. Some of the youths mentioned that they were involved in the activities to establish a relationship with tourists, gain knowledge and contribute ideas for homestay activities. Furthermore, some of the youths were involved in rice field activities to help the homestay operators to demonstrate the traditional activities to tourists.

Family support

From the focus group discussion, in Homestay Kg. D' Belimbing, two respondents who were R1 and R2 agreed with the previous research by Kayat (2009) that stated family support as one of the main reasons why youth are motivated to get involved in homestay activities. According to R1, family tradition as a paddy farmer is the main reason he participates in homestay activities. The respondent stated that he started to learn paddy farming in primary school. The respondent had always followed his father doing paddy farming and other rural farming activities. R1 stated that,

" I always asked my father about homestay activities…. Sometimes, my father asked me to join the homestay events…. I was so excited to follow my father

to the events…. He added that*,"…. If my father did not support me to get involved in homestay activities, maybe I would not be exposed to homestay activities….".*

Establishing a relationship with the tourist
The second theme is making a relationship with tourists. R3 and R4 in Homestay Kg. D' Belimbing agreed with the factor. All respondents from Homestay Kg. Pantai Jamai also agreed with the factor. In Homestay Jeruju, R12, did not agree with the factor because he found that the tourist factor is not a pull factor that motivates him to get involved in homestay activities.

Gaining knowledge
In Homestay Kg. D' Belimbing, R3 explained that he was willing to get involved in homestay activities because he had never experienced relationships with tourists or foreign tourists. In Homestay Kg. Pantai Jamai, all the respondents who participated in homestay activities, R6, R7, R8 and R9 agreed that homestay activities could establish the relationship between youths and tourists. All respondents in Homestay Kg. D' Belimbing, Kg. Pantai Jamai and Kg. Jeruju agreed that their involvement in homestay activities would give them the opportunity to gain knowledge. R1 explained that homestay activities give him new knowledge. Before he was involved in homestay activities, he got to know about homestay activities from his parents, and he never experienced the activities. R2, R3, and R4 gave a similar expression. They also gained knowledge from homestay activities, and before they were involved in the homestay activities, they did not know about traditional activities, such as, catching fish, making kites, making *orang-orang* and planting paddy. From these activities, now they gain basic knowledge on the activities. R3 and R4 have also started to help the homestay operators to demonstrate the traditional activities to the tourists. In Homestay Kg. Pantai Jamai, R6, R7, R8 and R9 also agreed that being involved in homestay activities gives them the opportunity to gain new knowledge.

In Kg. Jeruju, only R12 was involved in homestay activities, so he explains:

"Yes, I am gaining new knowledge from homestay activities. Before I got involved in homestay activities, I did not know about traditional activities. When tourists came to my village and asked me how to do this or that, I did not know how to answer their questions. However, now, when I have participated in homestay activities several times, I managed to answer all the questions. The committee also imparts a lot of knowledge to me. Now I enjoy giving knowledge to other youths in my village, and I hope more youths in my village can get involved in homestay activities".

According to R1,

" Half of the youth in my village participate in homestay activities and normally they are helping the organiser to give ideas in homestay programmes. Youth normally helps in active programmes namely. telematch games, paddy field activities and prepare food for tourists".

According to R6, almost all youths in the village would participate in homestay activities. This is because they have a special association for the youths in the village. For every event, the operator of the homestay will normally discuss with local youths for ideas to improve the homestay programme in the village. In addition, the involvement of youth in activities will allow them to be rewarded with some cash. R2 and R3 also agreed to R1's statements. R2 and R3 added that they participated in homestay programs to demonstrate how to make kites and play kites to tourists. R4 was also involved in homestay activities such as playing kites and catching fish in paddy field. R5 had never been involved in homestay program activities directly but she participated in homestay seminars for future generations. R5 explains that:

"The seminar is remarkably interesting as the organiser encourages youth to participate in homestay activities. I am extremely excited to get involved in homestay activities if tourists come to my village. I enjoyed the seminar very much and the seminar gave me a lot of knowledge on how to welcome the tourists, how to manage homestays and skills in traditional activities".

These findings revealed that social factors, especially family support, are the most significant factors that influence youth to get involved in homestay activities. The highest theme in social factors is establishing a relationship with tourists. The youth were found to interact with tourists because they appreciate building up new friends and getting new knowledge and information from tourists. They also like to know different cultures and exchange experiences in cultural activities. Regarding the second theme in social factors, which is social support, most of the youth mentioned that they have always seen their fathers being involved in homestay activities, and their fathers asked them to join the homestay events. These youth are so excited to follow their fathers' involvements in the homestay events. The findings confirmed that youth are attached to the rice field when their parents frequently use the rice field and perform rice field activities in their daily lives. If their parents like to plant paddy, their children also would be interested in doing the activities. Some other youths like playing traditional games in the rice fields, such as playing kites as their fathers frequently play kites. These findings confirm that parents play essential roles in shaping how their children use the rice field and become involved in rice field activities. This

finding is also consistent with previous studies that have suggested that family values towards nature form the most substantial factor that influences youth to get involved in the homestay programme (Kayat, 2007; Razzaq et al., 2011; Pusiran & Xiao, 2013; Sita & Nor 2015; Harun et al., 2017; Sood, Lynch, & Anastasiadou, 2017) through exposing them to natural landscapes.

The third theme in social factors is gaining knowledge. Knowledge gained through actual experiences of individuals and social groups is called tacit knowledge. It can only be shared or exchanged through people's interactions. Additionally, this knowledge is intangible, in contrast to the knowledge that can be made explicit and become information. Until now, tacit knowledge has not been favoured in productive processes nor formal education. However, rural communities have relied upon tacit knowledge for their development, survival, and resistance.

The last theme in social factors is the opportunity to give new ideas for homestay development. When comparing within three homestays, only Homestay Kg. Pantai Jamai has a unique association for youth. In this association, the committee can discuss homestay developments and youth's problems in villages. Additionally, when there is a meeting that involves the rural community in villages, the elderly can invite the committees of the association to the meeting. The youths in Homestay Kg. Pantai Jamai have opportunities to give ideas and opinions on the development of their villages. They have higher opportunities to give ideas for homestay development in Homestay Kg. D' Belimbing although some of the elderlies may disagree with their youths' ideas. This reaction was faced by the youth in Homestay Kg. Jeruju. When the youths participated in a meeting, the elders did not accept the youths' ideas and kept on using their existing ideas and strategies in managing homestay programmes. A few elderly villagers ignored the new ideas because they were not confident about the youths' potentials and capabilities in giving new ideas and strategies. The youths will be more appreciated in a community when their ideas and views are considered in homestays' development.

Category 2: Physical Factors

The environment is one of the main factors that encourages youth to get involved in homestay activities. When the youths are attached to the environment or a place, they will be excited to get involved with the activities. From the discussion, respondents R1, R2, and R3 in Homestay Kg. D'Belimbing and R6, R7 and R8 in Homestay Kg. Pantai Jamai agreed that the environment is one of the reasons why they participated in homestay activities.

Environment

R2 explained that the environment in his village itself encourages him to participate in the homestay activities. He added that the scenery of the paddy field

in his village is so beautiful, and the environment made him feel calm. When he saw the beautiful scenery of the paddy field, he always imagined how the paddy farmers plant the paddy and how they harvest the paddy. He also wondered why people did not fly kites every day. When he participated in the homestay activities, all the questions were answered. He hopes that the environment will remain for future generations. He is afraid that developers might try to build hotels or modern facilities for tourism purposes.

This finding indicates that physical factor is one factor that encourages youths to get involved in homestay activities in Homestay Kg. D'Belimbing and Homestay Kg. Pantai Jamai. In contrast with the youths in Homestay Kg. Pantai Jamai, none of the respondents agreed with the factor. This result also suggests that youths who have a connection with the natural environment will appreciate their surroundings and get attached to the place. Youth who agreed with the physical factor expressed their feelings towards the paddy field as beautiful scenery and loving their village's environment. Environment plays a vital role in providing youth opportunities to get involved and attached to nature, including paddy field landscapes. The youth mentioned that they are frequently involved in nature-based activities such as planting paddy, harvesting paddy, and playing near the paddy field. The results show that the paddy field's scenery in the village is so beautiful, and the environment makes them feel calm. Culture including the cultural landscape remind us of history and contribute to a sense of place (Suraiyati, 2013) This study found that attachment among the rural youth to the rice field and rice field activities were high regardless of their family backgrounds. This result also indicated that the youths' experience in rice field activities depends on how their family practices their daily lives.

Category 3: Economic factors

Income and incentives

In Homestay Kg. Pantai Jamai, the economic factor is one of the main reasons that encourages youths to participate in homestay activities. In Homestay Kg. Pantai Jamai, R6 interestingly answered that,

"Our committee has special fees for members who participate in our association. We use the money to prepare food or unique events. This is our own initiative to encourage youth to get involved in homestay activities.-preparing traditional food and delicacies, the committee will cook the traditional dishes using all the ingredients that we can easily get in our village. For example, we catch fish, get the ulam-ulaman, chillies for making sambal belacan, pucuk ubi for making masak lemak cili padi, and other menus to save the budget in preparing dishes. So, the committee will have extra money to give special incentives to the committee members. The activities that we offer to tourists also do not involve high budgets; for example, for playing kites, we use recycled paper

and collect the bamboo sticks in our kampong. For some of the activities, youths volunteer to help and are willing to get involved in homestay activities".

From R6's explanation, the researcher found that rural youths in Homestay Kg. Pantai Jamai have strong social connections with each other. The economic factor is one of the main reasons why they are involved in the homestay activities and are attached to the activities. In Homestay Kg. Pantai Jamai, rural youth have collected special fees for youth, and they used the money for homestay activities such as giving extra incentives for youths involved in homestay activities and preparing the activities. Interestingly, in Homestay Kg. Pantai Jamai, rural youth catch fish, get the *ulam-ulaman,* chillies for making *sambal belacan,* pucuk ubi for making *masak lemak cili padi,* and other menus to reduce the cost in preparing dishes.

R8 and R9 were involved three times in homestay activities. They enjoyed catching fish and playing kites in the paddy field. Besides that, R10 explained that she is interested in joining the homestay activities, but she is working and has limited time. R10 hopes that she could get involved in homestay activities in the future. As opposed to Homestay Kg, Jeruju, only 3 participants participated in the discussion, including one male (R11) and two females (R12 and R13). In homestay Homestay Kg. Jeruju, only R12 has participated in homestay activities. Economic factors include incentives and income. Youth involvement in Homestay Kg. Pantai Jamai, which offers income and incentives to youth, has the highest results than the other two homestays. The findings showed that only Kg. Pantai Jamai and Kg. D' Belimbing offers incentives for youth. Most of the youth in Homestay Kg. Pantai Jamai explained that the committee gives extra income to any youth who participate in homestay programmes. Giving incentives and extra income for youth has motivated them to participate in homestay activities. The committee of youths' association in Homestay Kg Pantai Jamai has collected fees for members who participated in the association. The youth will use the money to prepare food or organise unique events. Moreover, when preparing traditional food and delicacies, the committee will cook the traditional dishes using the ingredients they can quickly forage in their village. So, the committee will have extra money to give special incentives to the committee members. The activities offered to tourists only utilise small costs such as flying kites. This is because only recycled papers and collected bamboo sticks in their village were used to make kites by the youth. For some of the activities, the youth volunteered to help and were willing to participate in the homestay activities.

In Homestay Kg. Jeruju, the committee members do not give incentives to the individuals who participate in homestay activities. Youth participated in homestay activities because of their initiatives and voluntary activities, but the numbers were still small. Youth in Kg. D' Belimbing, and Kg. Jeruju were

involved in homestay activity because of their interest in traditional activities, and they have a 'sense of pride' towards their villages and culture in the villages. They would participate in the activities, whether the activities offer income or not. As a result, income and incentives are significant to encourage youth to get involved in the homestay.

CONCLUSION

Overall, the differences in social interaction between youths and elderlies in homestays influence youth involvement in Homestay Kg. D' Belimbing, Kg. Pantai Jamai and Kg. Jeruju. Social, physical, and economic factors are the main factors that motivate youth to get involved in homestay activities. Although previous studies have discussed homestay involvement, those studies lack focus on youth's homestay activities. Most of the studies explored the youth's involvement in the homestay programme as homestay operators. This research is distinctive because it explores the youths' involvement in rice field activities in the homestay programme. This study would help to ensure the sustainability of culture in tourism activities, and rural youths can learn the traditional activities in their daily lives. Further research with different methods and larger samples are recommended to be used to achieve stronger findings.

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TREE CROWN MAPPING BASED ON UNMANNED AERIAL VEHICLE (UAV) TOWARDS A GREEN-SUSTAINABLE RESIDENTIAL

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Abstract

Tree crown plays a crucial role in creating urban characters and spatial arrangements of living environment towards a green-sustainable city. It provides the fundamental needs for human's living quality and health conditions such as improving water quality, preserving energy, minimising greenhouse gasses, and beautification and comfortable purposes. Therefore, there is a need for urban planners to recognise its importance and plan for it wisely. This paper attempts to demonstrate a mapping tree crowns for a case of the residential neighbourhood using Unmanned Aerial Vehicle (UAV) based GIS technologies. Four main stages involved in a mapping tree crown process namely: flight planning, data acquisition, data processing and analyses and results. As a result, this paper able to show the capabilities of the technologies in measuring and mapping tree crowns for the residential neighbourhood. Moreover, it provides urban planners with informative scenario of the tree planting and clarifies its importance for future planning and benefits – in creating and promoting a green-sustainable and healthy living environment.

***Keywords**:* Unmanned Aerial Vehicle, tree crown, urban planning, sustainable residential

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INTRODUCTION

Tree crown or tree canopy plays an important role for people and all life on the earth surface. Many cities are becoming increasingly populous, bringing more impermeable lands and less spaces for vegetation-growing. Consequently, the dense urban areas require ecosystem of trees to maintain their sustainability in terms of minimising the climate change (global warming), good environment footprints and viable economic growth (Kanniah et al., 2016; Kamarul Zaman et al., 2017). As mentioned by Nowak & Greenfield, (2012), the tree canopy becomes an important element in cities or towns for physical and socio-economic and the human health in that area . According to Turner, (2019) the right amount of tree canopy will reduce the summer temperature by 10 degrees Fahrenheit during the day. This is because, trees in and around the city provide various benefits for the city and human health, such as improving a better environment and the visual character of the place (Wallace, 2021) and also make society more alive (Turner-Skoff & Cavender, 2019)**.** Well-maintained tree offers a critical role for the cities to well functions. It includes increase the quality of living environment for their inhabitants, and as one of the most cost-effective strategies to reduce the effects of urbanisation such as hot islands, excessive use of electricity for heating and cooling buildings and daily pressure (Bravo-Bello et al., 2020).

Tree crown also contributes significantly to environmental sustainability, economic viability and more importantly, urban settlements liveability (Kanniah & Siong, 2017). The trees have a symbolic and sentimental attribute for natural environment since they are expected to purify and beautify the urban areas. Trees are also required for absorption of the carbon produced from population growth and the number of vehicles used. Moreover, the trees nurtured many valuable things in our lives such as providing shade, food resources as well as generating social and economic benefits (Hasan et al., 2018). Therefore, the trees need to be preserved and thus it requires a proper plan in making more trees in urban living systems especially in dense inhabitant's areas. In other words, innovative planning and urban management on the trees will enable the existence of the structure and nature of a city (Jim et al., 2018). In micro dimension impacts, previous studies have demonstrated that the presence of tree crowns can improve the human physical health, increase attention and test scores of children, shift in the value of property of neighbourhood, reduce heating and cooling demands and decrease storm water runoff (Turner-Skoff & Cavender, 2019; Matasci et al., 2018; Lesher et al., 2014).

Moreover, it is intended to raise the consciousness of the positive effects and their benefits to the people. Human and environmental factors are inter-related in which urban planners should pursuit the information on them to improve the living environment of the residential neighbourhood. One of the crucial or important things is to have a better understanding on cultivation of trees

canopy (Lowry et al., 2012). Usually, the tree canopy information is generated through the interpretation of aerial photograph or images like LiDAR, Airborne Laser Scanning (ALS), satellite and field inventories. These methods, unfortunately, consume extra time, very expensive and require a trained person especially in data collection and image processing stages. Nowadays, the availability of unmanned aerial vehicle (UAV) technology allows urban planners to capture a valuable information of tree canopies in less time and budget, and more importantly, can provide a very high-resolution image (Preethi Latha et al., 2019; Mohan et al., 2017; Niluka et al., 2016). This technology becomes an alternative to manned aerial vehicle due to their flexibility, unique capabilities, and the ability to reduce operating costs while increasing safety (Jenkins, 2015)**.** UAV applications have been widely used in many areas such as vegetative health monitoring, precision farming, urban forestry, emergencies management, biological monitoring, and traffic (Ritter, 2014)**.** With the UAV technology, it can map the urban trees effectively and monitor spatial and temporal complex urban environment changes (Timilsina et al., 2020). Therefore, this technology is becoming more important in urban planning decision making in particular in physical development process (Noor et al., 2019). Hence, the current paper attempts to demonstrate a mapping tree crown for a residential neighbourhood using the UAV based-GIS technologies to promote a green-sustainable and healthy living environment.

METHODOLOGY

Study Area Description

The study area covers a residential neighbourhood of Puncak Iskandar, Perak with an area of 61.523 hectare at latitude 4º 22’ 26.4” N and longitude 100º 57’ 30.24” E (Figure 1).

Figure 1: The case study of Puncak Iskandar residential neighbourhood, Seri Iskandar, Perak
Source: (Keyhole, 2018)

Puncak Iskandar is one of the new residential area was developed in 2012 (or nearly 10 years in duration) in Seri Iskandar township. The development has taken multiple phases comprising multiple living houses types – detached, semi-detached, terrace with a modern houses design and compounded neighbourhood facilities and services to attract buyers to come in. This provides an appropriate case study to evaluate the trees species and its characteristic towards a green-sustainable residential. In this study, UAV DJI Phantom 4 pro was used for data acquisition in Puncak Iskandar residential area. The Agisoft Metashape Professional software is used to process all the images derived from UAV, while the ArcGIS software is used to determine the existing tree covers and mapping the entire area of the case study.

Tree Crown Mapping Process

The process of tree crown mapping involved four main stages which include preparation and flight planning, data acquisition, data processing, results, and analyses of the results. The discussion starts with elaboration of flight planning stage that consists of flight path and mission. It is followed by a discussion on data acquisition stage that comprises of image acquisition of the study area. The next is the data processing stage of being executed to generate the orthophoto. It is the crucial part to obtain the results. The final stage, that is, analyses stage.

Flight planning

Flight planning was setup with an application software named ground station pro (DJI GS Pro) for the UAV operations - a fully autonomous flight. The application automatically calculates the study area location and flight paths based on image overlap and pre-determined flying altitude. The flying height was set up to 150 m above ground level and the value of the ground sample distance (GSD) of 3.15 cm/pixel is automated calculated based on camera pixel size and flying height. Both the sides and front overlaps were set at 70 percent to provide more essentials for precise photogrammetric processing. The UAV operations is conducted using DJI Ground Station Pro (GS pro), an iPad application to implement the automated flight mission. All the parameters such as waypoints, flying altitude and overlapping images were configured using GS pro before flight mission (see Figure 2).

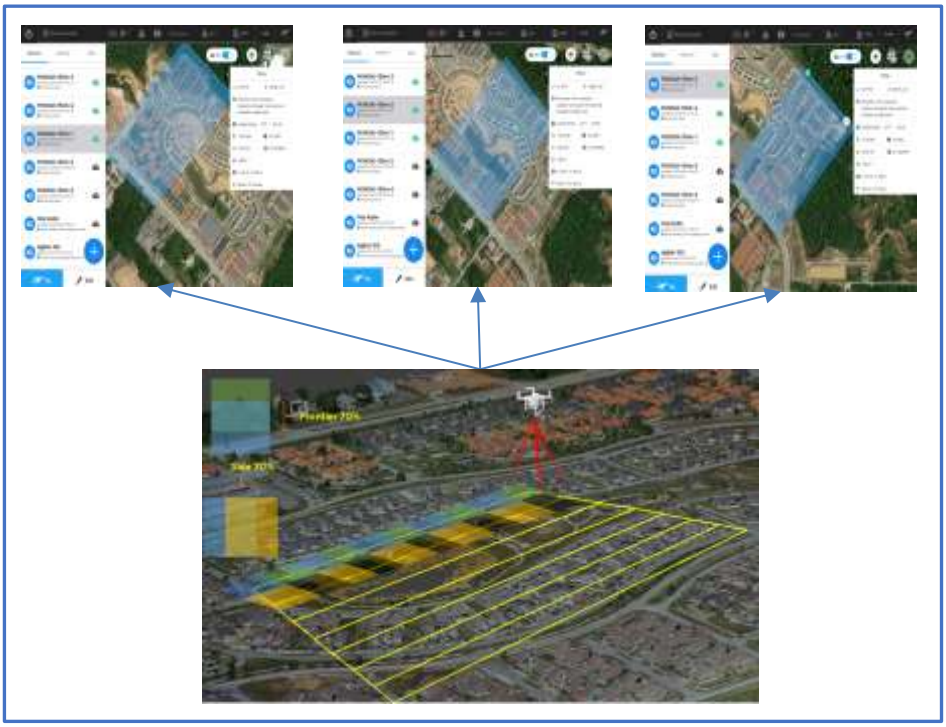

Figure 2: The flight planning process before the flight mission

Data acquisition

As continue to the above-mentioned process, the data acquisition was conducted using UAV DJI Phantom 4 pro to capture the photogrammetric images of the case study of Puncak Iskandar residential neighbourhood. In this study, the

separate mission of data acquisition was conducted for covering the whole area of Puncak Iskandar. It is because, the limitation of flying time which can only capture for 20 minutes per mission. As the results, a total of 990 images were captured covering the entire study area with a stereo camera view at 150 m flying altitude. As aforementioned, the flight was monitored using DJI Go software, which interconnected with the UAV through a wireless remote controller. Figure 3 shows the several images captured in multiple locations at 150 m flying altitude.

Figure 3. Example images derived from the UAV at 150 m flying altitude

Data processing

At this stage, all the captured images were processed using Agisoft Metashape Professional software to produce the UAV RGB images for generating DSM and orthophoto images. The process includes photo alignment based on the computer vision concept to ensure all the photo overlays are connected and fit all together. Another process is the build dense cloud to calculate the depth information for each camera. It was followed by generating the 3D model as a mesh building to create DSM, DTM and orthophoto images.

Figure 4 shows the entire images processing using the Agisoft Metashape Professional software to produce the orthophoto as the final expected product. The orthophoto image (Figure 4) was then processed for identifying the tree planting sites using UAV-based GIS in the ArcGIS software environment system.

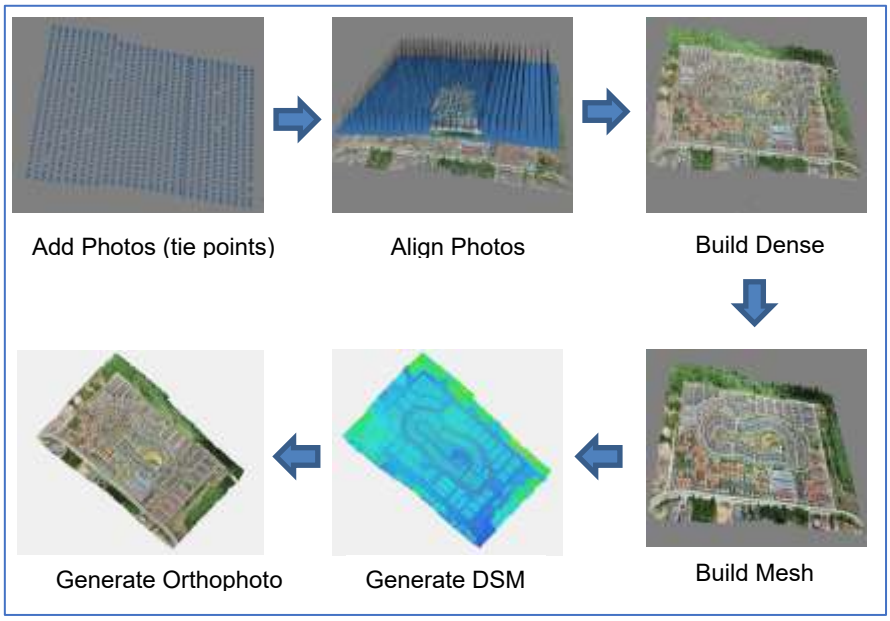

Figure 4: The process of images processing

Data analysis

Figure 5 shows the tree crown overlay (mapping) results in two forms of data produced in the ArcGIS namely: DSM data, and orthophoto data.

Figure 5: Tree crown overlay with (a) DSM data (b) Orthophoto data

As refers to Figure 5, the planted trees (in orange colour) are manually digitized based on orthophoto data and it is a clear indication that only a small per cent of the lands are covered with planted trees. The total area of planted and

non-planted were calculated to map the needs of tree canopy at Puncak Iskandar area. More detail discussion on the tree crown mapping results and the percentages will be presented in the next section.

RESULTS AND DISCUSSIONS

As discussed earlier in the introduction, the tree canopy planting is embedded with an essential desired outcome. At this extent, many cities in the world experiencing negative effects associated due to not maintaining an adequate level of tree canopy coverages.

Figure 6 indicates the existing tree crown coverage, where the orange colour represents the tree crown planted, while the hatch colour shows the non-planted. It proven that many areas are still left and not covered with the tree canopy to make it greener, comfort and healthy areas to absorb carbon and other pollutant agents.

Figure 6: The location of tree crown planted and non-planted (a) without Orthophoto (b) with Orthophoto

The tree canopy mapping at Puncak Iskandar area was determined based on the results shown in Figure 6. It was found that the canopy cover estimated derived from the UAV imagery indicates that the entire residential areas fall below recommend canopy cover levels. Hence, it indicates lacking in the social and environmental awareness that needs to be prioritized in particular by tree planting engaging collaborative groups from community stakeholders. The preservation and plantation of the tree canopy should remain as ongoing development continues to occur. In addition to that, the existing tree crowns along the streets mostly the sparse crown which is not fulfilled the distance as imposed by the National Landscape Department, Malaysia Negara (2020), where a single tree crown should cover for every two units of houses and with a suitable distance range of 30 ft. to 40 ft. The guideline is aimed partly to prevent any future problem and causing harm to people who lived in the areas.

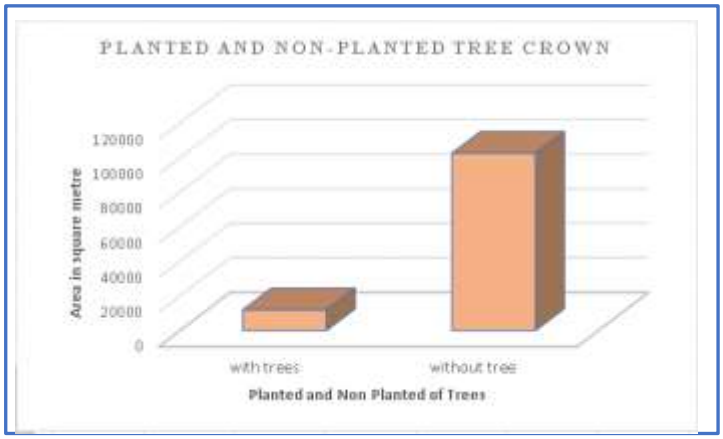

Figure 7. Percentage of the areas planted with trees (tree crown) compared to non-planted

In the percentage (see Figure 7), the tree crowns for the planted and non-planted were calculated as of 11,926.769 m² and 10,2566.473 m², respectively. The figures show an obvious difference between the planted crown and non-planted crown, and it would impact the residents' living environment. The amount of oxygen produced by a tree depends on several factors including tree species, age, health and environment of the tree. Mature leafy trees produce as much oxygen in one season as 10 people breathe in a year. On average, one tree produces nearly 260 pounds of oxygen each year (Helmenstine, 2019). Each hectare that consists of 100% canopy, balances the oxygen consumption from 19 people per year (Lucas, 2019). According to the existing situations, trees canopy was not good enough to accommodate the population inhabitant as of 59 hectares in the case study.

CONCLUSIONS

This paper showed the results of the tree canopy using UAV-based GIS technologies. The processes and results are significant to show the capabilities of the technology tools in mapping tree crowns for residential neighbourhood trees planning. By identifying the main structural trees throughout Puncak Iskandar, it can better understand on their role in providing a better ecosystem for the urban population. The tree crown assessment establishes a spatial data that can be used in conjunction with other infrastructure layers derived from UAV images. It is also used to identify the potential planting sites to increase canopy coverage especially in urban area. The detection of tree canopy can be determined by using the UAV technology as well as can identify the suitable areas for other trees planting.

Moreover, it provides urban planners or stakeholders with an informative scenario of the trees planting and managing the case study. As a working action by means, there is a need for further intervention in trees planning and planting in a neighbourhood area. Besides that, urban residents need to recognize and voiced up the importance of trees as a crucial component of a neighbourhood living environment and thus reducing the conflict between the people and the environment. Moreover, the selection of trees to make it compatible with the planting location is very important and these understandings should be applied among associated organisations. With this, makes urban and neighbourhood areas a better and safer to live, play and work. In the end, for many applications in urban planning decision-making, the capabilities of UAV and GIS technologies are opened and thus will illustrate in other works.

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VEGETATION EXTRACTION WITH PIXEL BASED CLASSIFICATION APPROACH IN URBAN PARK AREA

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Abstract

Information on urban vegetation and land use is critical for sustainable environmental management in cities. In general, urban vegetation is important for urban planning because it helps to maintain a balance between the natural environment and the built-up region. The assessment of the composition and configuration of the vegetation is important to highlight the urban ecosystem. Thus, obtaining information about urban vegetation is critical for developing a sustainable urban development strategy. Remote sensing is increasingly being used to generate such data for mapping and monitoring changes in urban vegetation. The aim of this study is to identify and classify vegetation using the high-resolution Pleiades satellite image in urban park areas using pixel-based image analysis. Pixel based method was applied and support vector machine algorithm was used for classification of urban vegetation. Comparison of accuracy was made from the error matrices, overall accuracy and kappa coefficient for vegetation and non-vegetation classes. The overall accuracy for the classification approach was 98.98% and a kappa value of 0.97. The result demonstrates the ability of high-resolution imagery to accurately extract urban vegetation despite the complex surface of the urban area. The findings can be used to support other research and applications related to urban green space monitoring, conservation, and future urban vegetation planning.

Keywords*:* Remote Sensing, Urban Vegetation, High Resolution, Pixel-Based Classification and Support Vector Machine.

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INTRODUCTION

In general, urban vegetation provides critical ecological services to support sustainable development policies, environmental conservation, and the urban planning process s (Lehman et al., 2014; Wolch et al., 2014; Niemela, 2014). However, mapping and monitoring urban vegetation has emerged as a major concern for urban planners in terms of future development. (Puissant & Roger, 2014; Wong et al., 2017). Urban vegetation is important for improving air, water, and land quality, as well as absorbing and mitigating carbon dioxide and other pollutants, lowering urban temperatures, and reducing storm water runoff (Pu, 2009; Pu et al., 2006; Weng et al., 2004). Urban vegetation is substantially different from natural vegetation because of extensive human impact on their ecosystems (Rosina & Kopecke, 2016). Mapping and monitoring urban vegetation are critical tasks due to their functions such as air management, contribution to human well-being, and increasing the value of real estate in urban areas (Weber & Hirsch, 1992). Urban vegetation, such as urban trees, is an important tool for urban preservation because it serves a variety of social and environmental functions (Hamzah et al., 2018). According to Rosli et al., (2020), green spaces promote physical activity by providing free and easily accessible locations for active pastimes. Therefore, precise data on the state and structural change of these ecosystems is critical for formulating sustainable development strategies and enhancing urban settings (Song, 2005; Yang et al., 2003). The urban vegetation inventory system is created at the local level and is usually created through traditional methods such as field surveys. This information is only available to local coverage and is restricted to the public domain (Puissant & Rougier, 2014). As ecosystem services are important to understand, researchers are becoming more aware of the role of urban vegetation in sustainable urban ecosystems and the environment (Hashim et al., 2019). Furthermore, there is a need for proper planning in the urban vegetation monitoring program. The urban vegetation monitoring program is a management process that determines the performance status of trees based on an inventory of the number of trees, their condition, structure, and other quantitative or qualitative characteristics (Hamzah et.al., 2020). With the advancement of high-tech remote sensing, this technique can be used as a tool for integrated spatial planning in order to address urban challenges (Gasparovic & Dobrinic, 2020).

Therefore, the mapping and monitoring of this urban vegetation is a major issue for planners towards sustainable development of an urban area. In this context, the objective of this work is to identify and classify urban vegetation from a very high resolution (VHR) optical image using conventional pixel-based classification approaches. This research focused on the extraction of vegetation and non-vegetation features in urban park areas. The methodology is developed, and its performance is evaluated on a dataset of the National Monument Park, Kuala Lumpur, and its surrounding area. This approach will provide relevant

information to support future conservation planning decision makers and researchers for urban green areas and urban vegetation areas. The structure of this research paper is divided into three sections, the introduction and literature review, the second section clarifies the methodology, and the third section presents the findings of this study.

LITERATURE REVIEW

Urban Park is a place with a natural environment located in the city area. This area contains various green vegetation species from low vegetation, medium and high vegetation such as grass, scrub and trees respectively. This area provides a place for various activities such as recreation, meditation, tourist attractions and a place to experience the beauty of nature (Razak et al., 2016). This space is ideal for a variety of activities such as recreation, meditation, tourist attractions, and experiencing nature's beauty (Razak et al., 2016). The quality of urban parks has been identified as being relevant to community life satisfaction, whereas health quality is correlated (Nurul Syakila et al., 2018). Therefore, the role of various types of urban green spaces (parks) in promoting active lifestyles has been studied and proven in several developed countries (Rosli et al., 2020). However, because the urban landscape is always changing, mapping and monitoring vegetation and green space is extremely challenging.

Remote sensing technology has shown to be a cost-effective method for classification and mapping for future planning. Remotely sensed data and imagery nowadays able to satisfy the mapping and monitoring requirement (Erasu, 2017). Furthermore, this high spatial resolution data has been used in multi-level applications worldwide to expand undeveloped areas towards developing nations (Maktav et al., 2005). Furthermore, the advancement of remote sensing data has enabled this valuable information to benefit a variety of users, including urban planners and authorities (Latif et al., 2012; Ibrahim et al., 2015). In recent years, advances in remote sensing technology have provided a useful solution for the monitoring and mapping of urban vegetation (Tooke et al., 2009; Tigges et al., 2013; Pu & Landry, 2012; Immitzer et al., 2012; Hashim et al., 2019). Traditional vegetation mapping methods rely on the interpretation of aerial photographs and field verification, this method is costly, time-consuming, and labor-intensive (Kamagata et al., 2006). However, the availability of very high-resolution (VHR) remote sensing imagery such as IKONOS, Quickbird, Worldview-3, and Pleiades, as well as advanced classification algorithms, allows for the extraction of detailed information on urban vegetation cover (Zylshal et al., 2016; Hashim et al., 2019). Furthermore, with the availability of very high-resolution imagery and a digital classification approach, urban vegetation monitoring and mapping can be done effectively. Some research has been conducted to classify land cover, and the results have been used to analyze the urban green area (Simarmata, 2012; Trisakti, 2016; Zylshal et al., 2016).

Recently, medium- and high-resolution remote sensing imaging has been used to monitor and map vegetation in urban areas (Trisakti, 2017). The remote sensing classification approach, such as automated or semi-automated classification, can eliminate subjectivity while also providing a reproducible procedure (Belgiu et al., 2014). Therefore, this study focuses on pixel-based classification of urban vegetation using Pleiades high-resolution remote sensing data.

The classification method was the most essential aspect of the processing of remotely sensed data (Roy & Giriraj, 2008). Traditional classification methods, such as pixel-based with maximum likelihood approaches, have been widely used in mapping of land use and land cover, and are based on multivariate probability density functions of classes (Lillesand et al., 2008; Hashim et al., 2019). However, advanced classification algorithms, such as support vector machine (SVM), have recently been developed to improve classification accuracy (Deilmai et al., 2014). SVM is a supervised classification with non-parametric learning algorithm that does not make assumptions about the frequency distribution of the data (Belgiu & Drăguţ, 2016; Mountrakis et al., 2011). SVM is a robust, accurate and effective classifier for extracting land cover information from multispectral imagery (Gao & Liu, 2014; Nurul Iman Saiful Bahari et al., 2014). Some research has shown that SVM algorithms are better at classifying than conventional methods (Szuster et al., 2011; Yu et al., 2012). For example, research conducted by Zylshal et al. (2016) and Hashim et al. (2019) that extract urban green space from Pléiades images using SVM classifier produce an acceptable result for the overall accuracy. Moreover, research conducted by Ouerghemmi et al. (2018) has proven that high resolution imagery is able to identify urban vegetation species with acceptable accuracy result and coherent distribution on the visual inspection. According to prior study, using a high-resolution data source and an advanced classification methodology will improve the accuracy of urban vegetation mapping in the future. Therefore, to provide accurate information for this natural resource, it is crucial to explore classification and an algorithm to enhance the result of urban vegetation extraction and classification. The finding of this research study can assist state authorities establish an effective urban vegetation information system for future conservation planning.

RESEARCH METHOD

Scope of the Study

This study focuses on the extraction of the vegetation and non-vegetation features in urban park, Tugu Park in Kuala Lumpur, and its surrounding area. Two features of the vegetation and non-vegetation area will be extracted and analyzed using high-resolution Pleiades satellite imagery. ENVI software will be used to process high-resolution satellite images, and a traditional pixel-based classification approach will be used for extraction and classification. The

statistical error matrices, overall accuracy, and kappa coefficient will be used to assess the accuracy of the classification of vegetation and non-vegetation areas. The highest overall accuracy indicates that urban vegetation can be successfully identified and classified.

Case Study

The selected study area is located in National Monument Park, Kuala Lumpur, Malaysia. The study area covers the coordinates of 3º 8' 51" N, 101º 41' 36" E. The National Monument Park is located to the north of Taman Botani Perdana, Padang Merbok in the south-east and Bank Negara's Lanai Kijang to the east of the site. The site is contiguous with Taman Botani Perdana separated only by Parliament road and can be seen as an expansion of that green spaces.

Figure 1. Pleiades imagery of National Monument Park, Kuala Lumpur
Source: Google earth

DATA COLLECTION

For this research study, secondary data was collected from two government agencies. The first one was tree inventory data from the Landscape department, City Hall Kuala Lumpur and the second primary data was the satellite imagery provided by Malaysia Agency of Remote Sensing ARSM). The specific satellite images used were Pleiades 1A Orthorectified Pansharpened for year of 2017 with less than 10% cloud cover. The detail of data used is shown in Table 1. Other

supporting data include the land use map that has been provided by the Town and Regional Planning department, City Hall, Kuala Lumpur for validation of the classification stage.

Table 1: Pleiades 1A satellite imagery data specification

Data	Date of Acquisition	Processing Level	Spectral Resolution	Spatial Resolution
Pleiades 1 A	3 Februari 2017	Orthorectified	Blue: 480 - 830 nm Green: 490 - 610 nm Red: 600 - 720 nm Near Infrared: 750 - 950 nm Panchromatic: 480 - 830 nm	2 m 0.5 m

Source: http://www.satimagigcorp.com/satellite-ssensors/pleiades-1/

Image Pre-processing and Analysis

The methodology flowchart is shown in Figure 2. The overall data processing can be divided into three main processes, as follows: 1) The pre-processing of the satellite images. 2) The classification stage, and 3) accessing the accuracy for classification method. Pleiades imagery is obtained as standard products that have been geometrically and radiometrically corrected by data providers, allowing it to be used directly and proceed to the second stage, which is the classification process. In the classification stage, urban vegetation and non-vegetation features were accurately identified and classified using satellite images with high resolution. A uniform supervised classification was applied to the images. All images were classified by creating accurate polygons as training areas for introducing ideal classes for each image separately. To create a closer correspondence between the maps that were produced, the classification was done by only considering two main classes: vegetation and non-vegetation area. Pixel based Support Vector Machine (SVM) algorithm were used for this classification process. The description of the main classes is presented in Table 2. Land use map was used to validate the classification result. The accuracy of the classification result was tested using a confusion matrix consisting of overall accuracy, user accuracy, producer accuracy and kappa coefficient. The final output from this study was the urban vegetation extraction with high resolution satellite imagery.

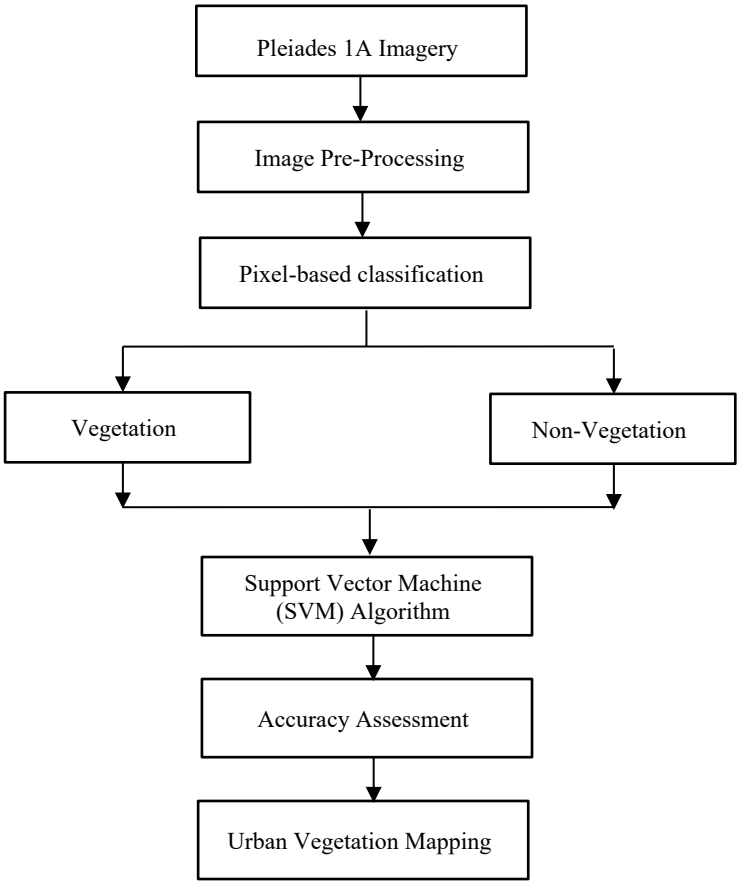

Figure 2. The methodology flow chart of urban vegetation mapping

Table 2: Description of land use/cover classes

Land use classes	**Description**
Vegetation	Shrub lands and semi natural vegetation, gardens, inner city tree areas, grass land and vegetable land, trees, coniferous forest and mixed forest
Non-Vegetation	Infrastructure, park and playground, building, car park and National Monument

RESULT AND DISCUSSION

Figure 3 shows the result of urban vegetation extraction and classification. The land use land cover was classified into vegetation and non-vegetation area. The

comparison of both techniques was based on a visual analysis of the respective land use maps outputs and on the evaluation of the corresponding accuracy assessment measures (overall, producer's and user's accuracies, kappa coefficient). Comparison of accuracy was made from the error matrices, overall accuracy, and kappa coefficient. The overall accuracy for the classification approach was 98.98% and a kappa value of 0.97. The findings show that a pixel-based classification system can distinguish between vegetation and non-vegetation in an urban environment. Table 3 describes in detail the accuracy assessment for urban vegetation mapping with support vector machine (SVM) classification approach. From Table 3, the extraction result of vegetation features was 97.79% and 100% for producer and user accuracy, respectively. While for non-vegetation the accuracy for producer and user was 100% and 98.14% respectively. The results demonstrate the ability of very high-resolution images to accurately extract urban vegetation despite the complex surface of an urban park area. Therefore, the results demonstrate the ability to extrait and classify urban vegetation moderately in the municipal park area with pixel-based image analysis with support vector machine (SVM).

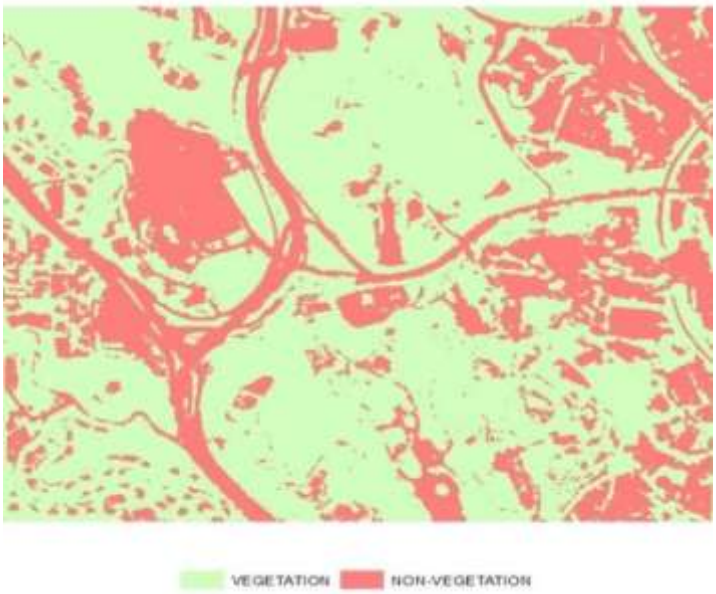

Figure 3. Urban vegetation classification with SVM classification algorithm

Table 3: Accuracy assessment result for urban vegetation classification

Year	2017	
Land Use/Land Cover	Producer's Accuracy (%)	User's Accuracy (%)
Non-Vegetation	100	98.14
Vegetation	97.79	100
Overall Accuracy	98.98%	
Kappa Coefficient	0.9795	

CONCLUSION

In conclusion, the results of this study show that the pixel-based image analysis approach with the use of the support vector machine (SVM) classification algorithm can provide accurate results and be useful for the generation of vegetation maps, with a kappa coefficient of 0.9795 and overall accuracy of vegetation and non-vegetation extraction of 98.98 percent. This shows that the pixel-based image analysis approach with the use of the SVM classification algorithm can provide accurate results and be useful for the generation of vegetation maps. This data will be useful in future conservation planning for urban green spaces. More importantly, the precise results of this study give policymakers and tree managers with correct data to make future decisions about the conservation of urban tree areas.

In addition, this research has shown that high-resolution Satellite Imaging with a suitable classification algorithm has a great potential for use when generating and updating vegetation data needed to manage urban landscapes appropriately. To properly manage urban vegetation for maintenance purposes, an updated and accurate tree information can be developed to assist the planning application for managing green spaces and vegetation in urban park areas in accordance with the Tree Preservation Order under the Town and Country Planning Act 1976. (Act 172). The systemic information system for urban vegetation and green areas will be able to efficiently manage large quantities of information and can be digitally visualized. The State authorities will benefit from this for future urban planning. With a new advanced classification methodology that combines acceptable high-resolution remote sensing data, classification accuracy can be enhanced even further in the future. To create a novel approach for urban vegetation detail categorization and mapping, more research is required.

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BROWNFIELD SITES AND PROPERTY MARKET SENSITIVITY

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Abstract

The existence of Brownfield sites is one of the main challenges that Malaysia must face due to financial, administrative and policy problems. The negative environmental and social impacts of Brownfield sites jeopardise residents' health and well-being, causing nearby areas to be less desirable for occupation and investment. These impacts result in price discounts. Hence, this research aims to establish the sensitivity of the property market towards Brownfield sites through a critical review. An overview of previous studies shows that property prices are sensitive towards Brownfield sites. This indicates that the proximity to a Brownfield site is considered when making property purchase decisions. Thus, property valuers, planners and developers should consider the Brownfield factor during property planning, development and valuation.

Keywords: Brownfield sites, house price, property market

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INTRODUCTION

Brownfields are often linked with disadvantaged metropolitan areas, especially core cities and inner-ring suburbs that were intensively industrialised in the past (Davis & Sherman, 2010). The rapid development of Malaysia has escalated the number of abandoned projects, including housing projects. It has been reported that there are 48 housing projects abandoned including 8,932 housing units in peninsular Malaysia (Ministry of Housing and Local Government, 2017). This issue becomes more severe due to the problems caused by Brownfields (Dahlan, 2011). Although the issue of Brownfield redevelopment has been raised since 2008, there are still many undeveloped areas (Nurlaila, 2014). To address Brownfield development, a guideline was published by the Town and Country Planning Department of Peninsular Malaysia to encourage the redevelopment of Brownfields. Several empirical studies on Brownfields show negative impact from Brownfield sites toward house prices with price discounts ranging from 2% to 8%. Nonetheless, issues regarding Brownfields are still unclear (Han, 2014), yet Brownfields may have a dramatic effect on the adjacent property prices (Green, 2018). Due to the scarcity of research about the influence of Brownfield sites on property prices, regional planners lacked a clear foundation for assessing the future effect and redevelopment plans of such places.

Thus, this research will examine the influence of Brownfield sites on the property market. This review article will quantify Brownfield sites effect on the local property market and close the information gap that currently exists. The article is organised into five parts to facilitate the review. Brownfield locations are discussed in Section 2. Section 3 examines Brownfield sites' effect on property values. Section 4 covers the findings, while Section 5 addresses the conclusions and implications.

BROWNFIELD SITES AND THE PROPERTY MARKET

Brownfield Sites

Brownfield sites are commercial or industrial assets that have been abandoned, deserted, dilapidated, or underutilised due to earlier acts that resulted in actual or perceived pollution and diminished redevelopment possibilities (National Round Table on the Environment and the Economy). In Malaysia, a Brownfield is an abandoned development area and obsolete development structure (JPBDSM, 2012) that may be contaminated (JPBDSM, 2012). Contaminated and derelict land in Malaysia can be found in abandoned rubber factories, automobile workshops, bus depots, fuel stations, industrial sites, landfills, oil depots, old mining sites, old railway yards and underground storage tanks sites (Yap, 2014). Industrial operations in the past have contaminated land areas with organic and inorganic toxins rendering them unsuitable for further growth, development, or reuse (US EPA). Brownfield sites are undesirable to developers owing to legislative uncertainty and high remediation expense (Wedding & Crawford-

Brown, 2006). They entail a lengthy period of redevelopment and have poor demand from buyers. Brownfields are indicative of various issues that contribute to neighbourhood degradation, thwart revitalization initiatives, and result in drug activities, eyesores, fire dangers, rodent infestation and vagrancy (Cohen, 2001). Abandoned projects may also affect an area in various aspects, such as views and economic aspects (Ferber & Grimski, 2002).

The Ministry of Housing and Local Government (MHLG) has highlighted that Peninsular Malaysia has a total of 281 private housing projects with 73,959 units abandoned for various reasons since 2009 to June 2020. As of December 2020, there was also a list of 187 blacklisted developers in Malaysia responsible for abandoned housing projects, which indirectly has jeopardised improvement efforts in the housing sector (MHLG, 2020). Besides this, a study by Arrifin and Abdul Razak (2019) inferred that the key factors leading to abandoned housing projects include the form of the contracts, bank funding, less engagement and subsequent project failure caused by lack of fairness in any business dealing or contract, and lack of an effective regulatory system. However, in 2019, fewer new launches and increased sales performance have resulted in a decline in residential overhangs and unsold, under-construction and not-yet-constructed units (Property Market Report, 2019). Residential overhang was reported to decline in 2019 after four consecutive years of growth, which indirectly led to decreased abandoned projects and avoiding accretion of vacant properties. In 2019, Malaysian property market performance improved slightly where there was a decrease of 5.1% in volume with 30,664 overhang units and 5.2% in value worth RM18.82 billion compared to 2018. Only a slight increment in the total number of overhang units (30,926) and value (RM19.99 billion) are observed for the year 2020 (PMR, Q3 2020).

For commercial properties in Malaysia, in particular shopping complexes, purpose-built offices and hotels were not spared from global market headwinds nor from the effects of the COVID-19 outbreak. Commercial property transactions decreased in volume by 10% and in value by 37.4% (PMR, Q3 2020). With the COVID-19 still taking place, it is expected that commercial properties will remain under pressure from 2021 onwards. As for future survival, older commercial buildings with high vacancy rate and low rental rate might need to opt for upgrading, refurbishment, repositioning or redevelopment instead of letting them be abandoned (PMR, 2019).

Brownfield Sites Impact on the Property Market

Property value is very sensitive to changes from the surrounding environment. Any changes in attributes may increase or decrease property value and changes in value are usually measured through the Hedonic Model (Adi Maimun, 2016). In general, property attributes can be grouped into locational, structural, and neighbourhood (Goodman, 1989; Williams, 1991). Structural attributes represent

the characteristics and conditions of the house. Structural attributes include age of building, floor area, kitchen cabinets, lot area, materials and finishing types, neighbourhood area, number of rooms, repair condition and structural condition (Adi Maimun, 2011). Structural conditions may affect house prices and rents positively or negatively. Meanwhile, neighbourhood attributes may include socio-economy, externalities, local authority services (Chin and Chau, 2003) and facilities (Roe et al., 2004). Residential areas with all facilities required will form a good property market (Nor Asmahan, 2012) as facilities provided enhanced economic activity of that area. The location factor lies in the bid-rent theory as theorised by Alonso (1964). Alonso's bid-rent theory puts forward that every agent is prepared to pay a certain amount of money, depending on the land's location. An attractively located property is highly sought after and pushes prices up through the bidding process. The location of a property mainly influences property purchase decisions and thus is reflected in property prices. Many people are ready to pay a premium for a desirable location (Prasad & Richards, 2008).

Properties located near the city centre, for instance, will fetch high prices since many economic and business activities take place within the city centre area. In contrast, houses located farther from the city centre will decrease in price (Chin & Chau, 2003). Brownfields also affect house prices. According to Accordino and Johnson (2000) and Doerle (2012), Brownfield sites cause economic, health, and environmental problems. A Brownfield imposes a significant externality on neighbouring property owners by lowering their properties' market value (Accordino & Johnson, 2000). Brownfield's effects are most acutely felt in the residential sector due to the large number of consumers (buyers and renters) within the residential market segment. As a result, most research within this field has concentrated on the residential sector. Table 1 summarises previous research on Brownfield sites influence on residential property prices/rents.

Table 1: Previous Research on the Effect of Brownfield on Residential Property Value

Author	Data	Variables	Analysis	Result
Anna (2007) United States	• 432 sites and 2,682 observations • 1980 – 2002 • Random sample of properties located in Brownfield area	• **Locational data:** distance to CBD (meter) and distance to nearest road of any kind (meter) • **Structural data:** size of parcel and building capital density.	• Hedonic Model	Price Discount: **Location** • 38% (located within enterprise zone)
Han (2014) United States	• 101,497 transactions (1991 - 2010) • House	• **Locational data:** distance from Brownfield sites (ft.) • **Structural data:** address, parcel identification (block and lot number), deed date, land use code, sales price, transaction date and transaction type.	• Hedonic Model	Price Discount: **Location** • 0.87% (within 250 ft.) • 0.14% (within 250 to 500 ft.) **Duration** • 0.17% (abandoned more than 3 years) • 0.04% (abandoned less than 3 years)
Yap (2014) Malaysia	• 557 sales • 2001- 2013 • House (low-cost terrace, terrace and detached)	• **Locational data:** distance to Kemayan City (meter) and distance to Kulai Centre Point (meter). • **Structural data:** types of title, types of property, number of floors, number of rooms, land area (square meter) and built-up area (square meter). • **Neighbourhood data:** distance to nearest school (meter).	• Hedonic Model	Price Premium: **Location** • 19.6% (1 km from Kemayan City) • 23% (1 km from Kulai Centre Point)
Gilderbloom, Meares and Riggs (2016) United States	• 169 sales • 2000- 2008	• **Locational data:** distance from city centre (miles) and distance from Brownfield sites (miles) • **Structural data:** number of housing units, household income and housing age • **Neighbourhood data:** total crimes per 100000 residents	• Hedonic Model	Price Discount: **Year 2002** • $10,342 (within 0.5 miles) • $6,995 (within 1.0 miles) **Year 2006** • $7,615 (within 0.5 miles) • $7,556 (within 1.0 miles) • $6,463 (within 1.5 miles)

				Year 2008 • $11,911 (within 0.5 miles) • $9,757 (within 1.0 miles) • $8,261 (within 1.5 miles)
Han (2017a) United States	• 101,497 sales • 1991-2010 • House	• **Abandoned property data:** address, parcel identification number (block and lot number), Vacant House Notice first issued and reissued dates, structure type, lot area and tax payment status (The Vacant House File, The Baltimore City Department of Housing and Community Development). • **Structural data:** address, parcel identification (block and lot number), deed date, land use code, sales price, transaction date and transaction type.	• Weighted Repeat Sales • Piecewise Linear Regression Model	Price Discount: **Location** • 1.5% (within 250 ft. on second sales) • 1.0% until 2.7% (more than two nearby abandoned properties between the first and second sale)
Han (2017b) United States	• House	• **Neighbourhood data:** level of social organisation, neighbourhood disadvantage, level of government intervention and neighbourhood housing market characteristics.	• Hedonic Model	Price Discount: 1.384%
Schwarz, Gill, Hanning and Cox (2017) United States	• 18,109 sales • 1997-2005 • House	• **Locational data**: Distance from the nearest Brownfield • **Structural data:** air condition, age of building, lot area, number of bathrooms and bedrooms and sale prices.		Price Discount: 3% (within 0.5 miles) 5% (within 1 miles)

The increment of foreclosures, empty, and abandoned homes in a nation resulted in a substantial amount of research and empirical studies estimating the negative spillover effects of distressed homes in a neighbourhood (Frame, 2010; Joice, 2011). Overall, the body of research used the Hedonic model to establish a relationship between Brownfields and house prices. This method is popularly used as it can quantify the effect of each characteristic on the overall house price

(Asmawi et al., 2018; Rahman et al., 2019). A study conducted in the United States by Anna (2007) uses 432 sites and 2,682 observations from 1980 to 2002. This research scope is focused on contaminated sites obtaining a random sample of properties in the Brownfield region with comparable land-use limitations. Anna (2007) concluded that parcel transactions in an enterprise zone are discounted by 38%.

Nonetheless, association is statistically insignificant. Properties that have been vacant for more than three years diminished nearby property values within 250 ft. by 1%, within 251 until 500 ft. by 0.27%, within 501 until 1000 ft., by 0.05% and within 1001 until 1500 ft., by 0.14% (Han, 2014). In 2017, research based in the United States by Han (2017a) observed that at the second sale, one abandoned property located within 250 ft. dropped surrounding property values by 1.5%. Between the first and second sales, more than two number of neighbouring abandoned properties would result in a fall in property prices of between 1.0% and 2.7%. In another research, Han (2017b) included the neighbourhood factor through neighbourhood level of social disorganisation, neighbourhood concentrated disadvantage, level of government intervention and neighbourhood housing characteristics. Through multiple regression analysis (MRA) and using 510 transaction sales in the United States, the research shows that there is a price discount of 1.384%. Gilderbloom et al. (2016) examined the impact of EPA Brownfield sites between 2000 and 2008 on house prices, foreclosures, and early death in Louisville, Kentucky. They observed that residences within a half-mile radius of Brownfield sites were worth $10,342 less in 2000. When the radius is enlarged to a mile, the value of homes inside the radius is $6,995 less than those outside. In 2006, homes situated within a half-mile of a Brownfield site were worth $7,615 less than those farther away. Within a mile, houses were valued $7,556 less than other residences. Within a mile and a half, houses were valued $6,463 less. In 2008, the trend persisted. Properties within a half-mile of the site were worth an average of $11,911, less than homes within a mile, which were worth an average of $9,757 less. The latter were valued less than properties located a mile and a half away. Homes inside this radius were $8,261 less valuable than those beyond it.

Meanwhile, Schwarz et al. (2017) found that properties located 0.5 miles from the nearest Brownfield experienced a 3% decline in sales value for a 10,000 square feet sized Brownfield. When discrete distances were considered, Brownfield size had a negative effect on property prices up to one mile (0.6% to 3.1%). In Malaysia, research on Brownfields was conducted by Yap (2014) where 557 transaction sales between 2001 to 2013 were analysed. Yap (2014) found an increasing house price of 19.6% for residential areas located 1 kilometre from Kemayan City, an abandoned shopping complex. For residential areas located 1 kilometre from Kulai Centre Point, house prices increased by 23%.

DISCUSSION

The majority of the literature centres on Brownfield redevelopment complexities. Only a few empirical studies examined Brownfields effect on residential property value. The scarcity of research on the Brownfields impact on residential property values may add to the difficulty of Brownfield redevelopment. Moreover, most studies were based in the United States. The lack of relevant empirical research in Malaysia raises the question whether Brownfield sites will impact the property market and, if so, what the magnitude of impact would be. The lack and uncertainty of market information affects the property market player's decision making such as valuers in valuing property prices and developers in developing areas. Therefore, there is a need for a study to establish Brownfield impacts on residential property value, particularly in Malaysia.

CONCLUSION

This paper established a few key findings related to the Brownfield sites impact on property prices. The study concluded that the impact of Brownfield sites on the property market varies depending on the situation. The various impacts of Brownfield sites on property prices highlights the need for a local based study, particularly in Malaysia given the quantity of abandoned properties that exist. The research findings contribute to the clarification of the Brownfield sites' impact on property market literature. Property market players such as valuers, planners and developers may find the findings beneficial in making various decisions related to property such as planning, developing and valuing properties.

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THE SHIFT IN TEACHING PEDAGOGY FOR INDEPENDENT LANDSCAPE DESIGN DURING THE PANDEMIC: AN ANALYSIS OF STUDENT PERFORMANCE IN ODL

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Abstract

The teaching and learning environment have subsequently expanded. For the Independent Landscape Design course offered at UiTM Perak Branch, the online distance learning (ODL) has demonstrated the changes of delivery approach in teaching landscape design process. This design-based syllabus is more acquainted with face to face or physical teaching learning environment. Aligned with the Educational 5.0 @ Universiti Teknologi MARA that embraces values and future progressive thinking, this course has adopted MOOCLAA350 to engage and equip these design students with significant understanding, graphic presentation skills as well as technical aspects related to design developments and constructions. This paper analyses student performance throughout the ODL implementation, adopting MOOC and other relevant online platforms during this Covid-19 pandemic outbreak. An online survey supported with a comparative analysis between semesters was conducted to evaluate the students' readiness, challenges and performance throughout the semester. Some tools and techniques to ensure the continuity of learning during the current pandemic are described. The findings revealed factors contributing to student performance and the reality behind the success of this new teaching strategy which is practical for landscape architecture programs and may also be relevant to other design-based programs or courses.

***Keywords**:* Independent landscape design, online distance learning, Landscape Architecture, MOOC

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INTRODUCTION

The outbreak of Covid-19 pandemic that hit Malaysia in February 2020 and continues today has indirectly transformed the world's educational learning environment, from face-to-face learning to massive online platforms. The transformation of teaching methodology from face-to-face classroom to online distance learning (ODL) has significantly determined the changes in the learning environment. With a single internet connection, Paul and Jefferson (2019) concluded that learning activities become more flexible through ODL implementation. Distance learning in education has significantly witnessed growth in changing the pedagogical conventional learning environment. Schneider and Council (2020) highlighted that open learning embellish the new educational norm and will continue to enfold teaching pedagogy this decade. Particularly, this pandemic has given impact not just to the community's health and economy, but also to the education sector. Therefore, when the Covid-19 pandemic struck and disconnected people physically, the open learning method was the only solution to keep people connected and continue working in distance (Gewin, 2020). On 18 March 2020, the Government of Malaysia has imposed the Movement Control Order (MCO) that restricts movement of its citizens over the fight of Covid-19. In order to make sure that MCO does not impact the educational sector, online learning has begun to expand within the current Malaysian educational system. In particular, educational institutions have to adapt, design appropriate and effective content, arrange an effective delivery system and provide digital literacy training to pursue current situations and achieve better learning outcomes. From another perspective, this pandemic has indirectly 'forced' digital online learning to commence rapidly and this synergizes with the education industrial revolution 4.0 (IR 4.0) as well as intertwines with the Malaysia education aspiration.

Regardless of the many challenges which have occurred during its early implementation, Adnan and Anwar (2020) emphasised that the educational institutions should promptly adapt to rapid educational transformation, thus engaging IR 4.0 manifestation as the new impetus to the Malaysia educational system (Ramu, Taib, & Aziz, 2020). Therefore, designing an effective content and delivery system that easily supports the current situation is indispensable for better learning outcomes especially to design-based programmes including architecture, town and regional planning, landscape architecture and interior architecture programmes (Alithamby, 2005; Mohamed Ali, Othman, Latif, Awang & Rostam, 2020). Agarwal and Kaushik (2020) noted that the online learning methods offer solutions to keep people connected and continue working in distance. Hence, the transformation of the conventional learning through face-to-face for design-based courses taught in landscape architecture program offered by the Universiti Teknologi MARA (UiTM) Malaysia has significantly challenged the academic in making sure that the syllabus are well delivered and at the same time, the students' learning outcomes are achieved. This

paper focuses on the shift of teaching pedagogy through ODL during the pandemic and looking into the performances of the final year students who are taking the Independent Landscape Design course, a compulsory design-based course offered in Landscape Architecture diploma programme at UiTM Perak Branch.

STUDENT READINESS FOR ODL

It is undeniable that the ODL approach in teaching the designed-based course is quite challenging and yet satisfying. With regards to the unique semester that began from April to August 2020, this primary Covid-19 semester portrayed its own path and achievement that opened a new gateway for educators to venture into fully e-learning methods while maintaining the quality of student's drawings, thus attaining the course learning outcomes. To understand the students' readiness before the commencement of ODL, an online survey was conducted in March 2020 to determine the students' willingness and challenges faced during MCO that may affect their studies if they continued to enrol in April. 102 respondents participated in this online survey. Since this survey was specifically conducted for students undertaking Independent Landscape Design (see Table 1); the Pearson Chi-Square result ($\chi 2 = 18.169$, $df = 2$, $p < 0.05$) highlighted in Table 2 illustrates a significant difference between the student readiness for ODL against the level of internet speed. This shows that students could still pursue online learning if they were equipped with high internet speed throughout the ODL implementation.

Table 1: Cross tabulation of student's readiness to participate in ODL

			INTERNET SPEED			
			Fast	Medium	Weak	**Total**
If online learning is carried out, are you ready to access from your residence?	Yes	Count	8	41	4	53
		Expected Count	4.2	37.4	11.4	53.0
		Standardized Residual	1.9	.6	-2.2	
	No	Count	0	31	18	49
		Expected Count	3.8	34.6	10.6	49.0
		Standardized Residual	-2.0	-.6	2.3	
Total		Count	8	72	22	102
		Expected Count	8.0	72.0	22.0	102.0

Table 2: The Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.169[a]	2	.000
Likelihood Ratio	21.963	2	.000
Linear-by-Linear Association	17.959	1	.000
N of Valid Cases	102		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 3.84.

Furthermore, the majority of the respondents (84%), informed that they owned laptops, while 72.5% claimed to have smart phones that enabled them to actively participate in ODL processes (see Figure 1). Equipped with personal electronic devices, this finding further denotes that the students are in 'ready mode' to enter the fully e-learning platforms from home for this semester. Moreover, the students were also asked to highlight their online learning platform that suits them throughout this ODL implementation. The students were provided with multiple choice answers and majority of the respondents preferred WhatsApp application as their main ODL platform. As this application is easy to use and mostly accessible through their smartphones, this further allows prompt responses to any queries. This is in line with Gewin's (2020) study that highlights students' engagement that correlates with effective online learning platforms.

Other than WhatsApp application, 52.9% of the respondents nominated Telegram and i-Learn v3 UiTM, 49% preferred for MOOC Open Learning platform while 44.1% selected Google Classroom as their preference (see Figure 2). Taking into account the respondents' selections, these findings have further guided educators teaching Independent Landscape Design to structure the conditional e-learning platform that would benefit both parties thus uplifting the students' e-learning experiences for this semester. Taking into account the situation and challenges faced due to Covid-19 pandemic that limits the access to traditional classroom/studio method, the e-learning platforms that are used in teaching the Independent Landscape Design students are able to enrich their learning skills and prepare them to adapt to the new normal lifestyle and the change in educational landscape. This is perhaps what Cornain (2020) emphasized in her article that described the new normal as 'different' in the way we live and socialize and 'change' in the way we use to work or study.

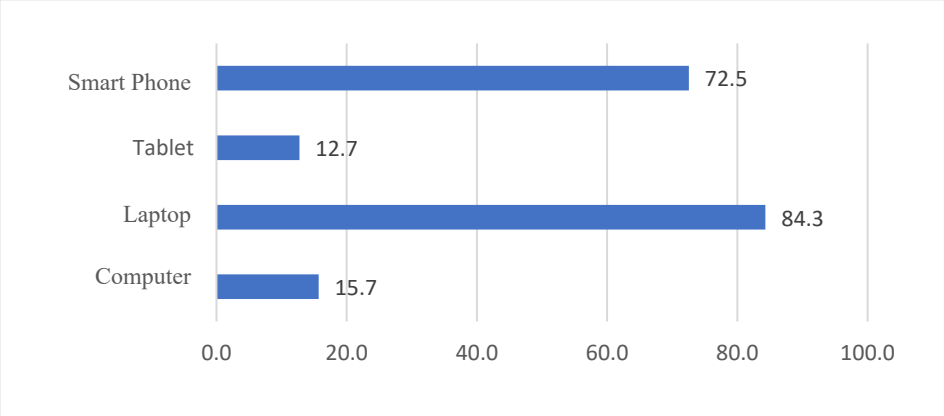

Figure 1: Electronic devices own by the students
Source: Author, 2020

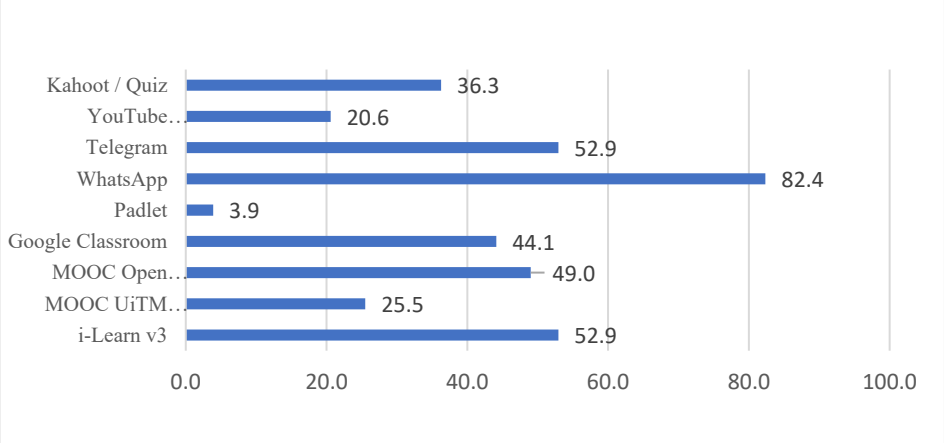

Figure 2: Student preferences for online learning platforms
Source: Author, 2020

Apart from recognizing the students' preference for the online learning platform, the respondents were also asked about the constraints that limit them from accomplishing ODL in April 2020. 55.9% highlighted that limited internet access could be the major deficiencies to online learning since studio critique sessions may prolong 6-8 hours weekly. Other than that, 15.7% of the respondents highlighted financial constraints for additional internet quota since the majority of them were using prepaid plans. It is shocking to discover that 9.8% of the respondents were currently under financial pressure due to lack of

parents' income which was affected by the MCO (with some parents losing their jobs) and apparently the respondents and their other siblings had to commit to part time jobs to ease their families' financial struggles.

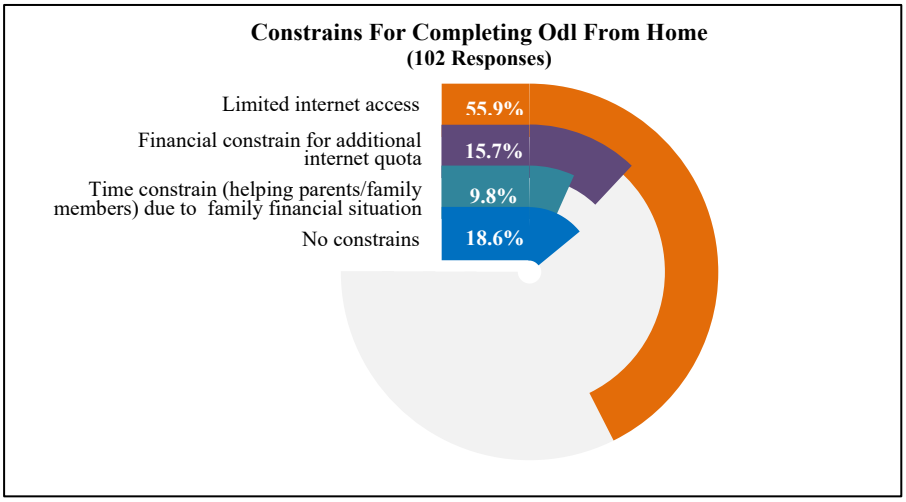

Figure 3: Constraints that limit student to ODL

ANALYSIS OF STUDENT PERFORMANCE DURING ODL

In measuring the effectiveness of ODL during the Covid-19 pandemic, Paul and Jefferson (2019) emphasized that a study conducted for a specific event should include an analysis of student performance for several semesters. Therefore, this study analyses students' performance within three recent semesters; Semester March – July 2019, Semester September 2019 – January 2020, and Semester March – July 2020. Based on the analyses, it is surprising to discover that the result for this semester depicted an increasement/increment of students getting Grade A for this course (see Figure 4). Despite the limitations or challenges faced by both academics and students throughout this ODL implementation, the students' results for this semester have been excellent. With 102 students, each one of them varied in their landscape site selections and design approaches, construction drawings and technical report documentation, delivery through this e-learning platform has somehow been challenging. Knowing the subjective demands of landscape design, their processes and the assigned tasks that require students to produce functional yet aesthetic masterpiece designs, MOOC Independent Landscape Design was chosen as the major platform that guided students' understanding through uploaded samples of portfolios and additional lecture notes for their convenient reading. With various design strands (this

include waterfront landscape design; parks and community landscape design; high rise and high-density urban landscape; institutional landscape; cultural landscape; urban heritage and landscape; etc.), it is remarkable to witness that the outstanding results for this semester have surpassed the percentage of students getting grade A cluster (grade A+, grade A and grade A-). An increase of 11% of students manage to obtain this excellent result (the grade A cluster).

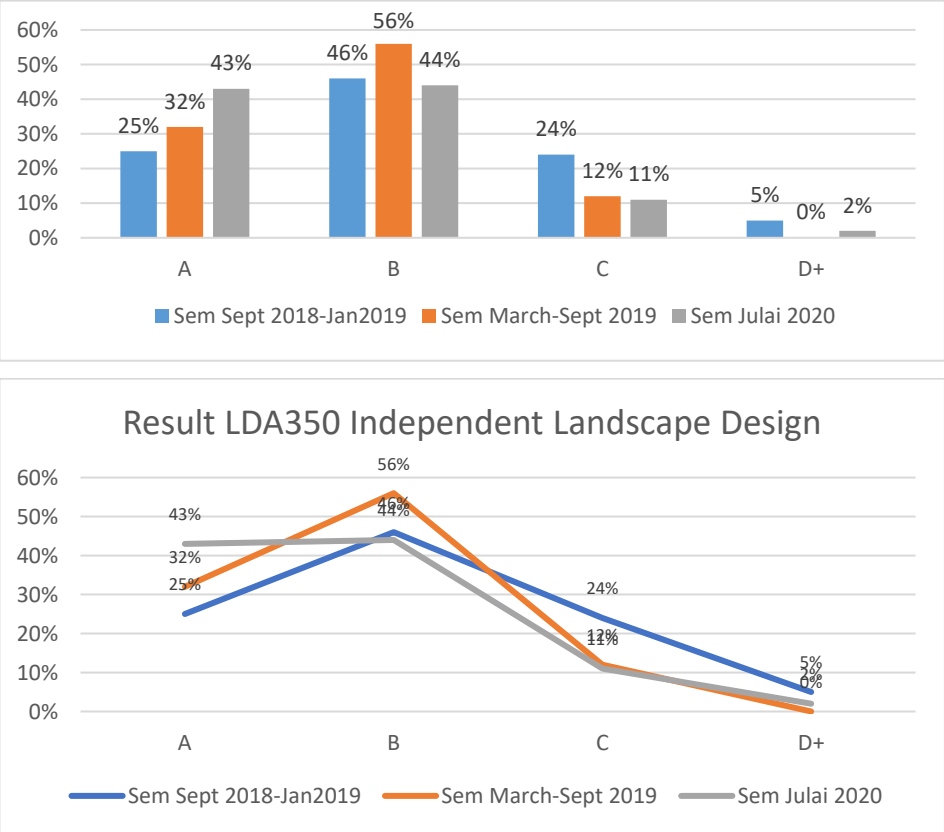

Figure 4: Result by percentage for Three Semester for Independent Landscape Design course

Source: Author, 2020

Furthermore, with the increased percentage of students who obtained grade A clusters, there is also evidence in the decreasing percentage of students getting grade B (11%) and grade C (1%) in comparison with the results from the previous semesters. Hence, these results significantly reveal the successful implementation of the online learning for students undertaking Diploma in

Landscape Architecture in UiTM Perak Branch. Besides MOOC Independent Landscape Design, it is evident that i-Learn v3 together with UFuture UiTM platform have sufficiently aided the students' e-learning process for this semester supported by consistent weekly online critique sessions by the educators (monitoring work progress weekly). Given WhatsApp, Telegram and Google Meet applications as the intermediate communication platforms that sufficiently connect students and their educators this semester, MOOC Independent Landscape Design served as the core reference platform. Developed with four significant modules: Module 1 (Introduction of Independent Study); Module 2 (Site Planning & Design Development); Module 3 (Construction & Documentation); and Module 4 (Portfolio and Design Samples), this massive open online course not only has proven to be beneficial to students in their final year taking Independent Landscape Design studio, but also to students undertaking park and community design studio as well as urban design studio. Besides weekly online critique sessions with their educators, module 4 that was loaded with previous students' portfolios and board samples of various strands stands as the core focus and the most 'favourable' module that inspires and supports the new students' cohort throughout their progressive design development Furthermore, through consistent online critique session that was established through Google Classroom and Padlet, supported with additional references uploaded through i_Learn v3 and UFuture UiTM, challenges faced throughout the ODL implementation had been successfully tackled. In particular, students' motivation[1] improved and this 'change' proved to be beneficial as it had been depicted through students' results, as illustrated in Figure 4 above.

As the most compelling evidence, these excellent results have indeed portrayed the successful participation of students in distance learning platforms, indicating the students' high motivation and ability to absorb knowledge and information independently. In particular, the excellent results depicted in Figure 4 above have significantly verified the new normal of teaching and learning pedagogy for landscape architecture students.

CONCLUSION

Over the past few months, the whole world has been experiencing the unprecedented fundamental shift in our daily life due to COVID-19 pandemic. Due to restrictions to our way of life, the new normal that emerged from this alarming situation has opened doors to another - perspective and this includes the educational landscape worldwide. One thing that is certain is the commonly

[1] Motivation from this perspective is the student willingness to change and adapt to the new normal, considering the changes of learning environment from traditional face to face for weekly critique session to present e-learning platform.

known fact that adjusting to changes can be very challenging despite the opportunities that may unfold all difficulties towards the end. It is important to realize that this study does not challenge the needs and importance of face-to-face through traditional methods of learning; in fact, it offers another perspective of teaching landscape architecture design courses through online distance learning.

From the e-survey result and student performance analysis, this online learning for design-based students evidences a desired finding, where the majority of students are still able to achieve good grades although they are facing various challenges and difficulties. The findings have demonstrated that distance learning is significant in the continuation of teaching and learning for the Diploma in Landscape Architecture program offered by UiTM Perak Branch. The comparative results depict the overwhelming contribution of ODL compared to conventional teaching methods that were previously adopted for Independent Landscape Design. The findings also reveal the students' capability and - survival strategies to conquer the 'changing' situation as part of their lifelong learning experience. This uncertain scene has indirectly given rise to new teaching approaches, enabling the online learning evaluation that permits comparison of different modalities besides proposing a methodological shift for the future in education. Furthermore, the educators' efforts in exploring various teaching strategies, together with the students' initiatives and motivation, are the self-driven factors that have made this online teaching and learning successful. Therefore, this paper highlighted the reliability of teaching strategy, learning initiatives, online platforms and electronic devices are important factors assisting the effectiveness of these pedagogical changes.

In conclusion, this paper evidences that the practicality and reliability in conducting distance learning to design-based courses are no more in doubt and sufficiently competent towards enhancing the teaching methodology during pandemic and accommodating the trends of Education IR 4.0 as well as the progressive thinking of Education 5.0 @ UiTM.

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DOES RAIL TRANSPORT IMPACT HOUSE PRICES AND RENTS?

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Abstract

Rail transport is one of the factors that boost economic growth. Increased accessibility while saving travel costs and time offered by rail transport attracts foreign and local investments, which lead to increased house prices and rents. Nonetheless, it is argued that noise pollution coming from rail transport may also reduce house prices and rents because these areas are less desirable for occupation and investment. Hence, this research aims to establish rail transport's impact on house prices and rents through a critical review of the literature. An overview of previous studies shows that house prices and rents are significantly influenced by proximity to rail transports. This indicates that proximity to rail transports is accounted for when making house purchase and rent decisions. Thus, property valuers, planners, and developers should consider rail transport location in planning, developing, and valuing properties.

***Keywords**:* Rail transports; House prices; House rents

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INTRODUCTION

By 2050, 68% of the world's population will be urban, adding nearly 2.5 billion individuals to the existing metropolitan population (UN-DESA, 2018). Cities worldwide are increasing their investment in metros, to meet the rising demand for urban travel (Anupriya et al., 2020). The International Association of Public Transportation claimed that about 45 metro lines have operated during the previous decade. Over the next five years, an additional 200 new metro lines are projected. Rail transports are critical in addressing the population's urban mobility requirements to satisfy employment, retail, and recreation activities (Diaz, 1999; Hess & Almeida, 2007). These activities eventually accelerate a nation's economy, making transportation infrastructure critical to growth. When a region adds train service, expectations regarding the project's effects on the surrounding area, particularly on housing prices and rentals, often arise. Although substantial studies on the rail transportation effect on property values and rentals have existed, the evidence is inconsistent and ambiguous, since conclusions are contingent on the local characteristics of the rail transit systems analysed. These many instances often emerge as individual anecdotes in studies examining the effect of rail transport on house prices and rentals. Existing research on the effect of rail on house prices and rentals is insufficient and based on anecdotal information, leaving regional planning for rail investments without a clear empirical foundation for assessing the investment's future effect. Additionally, this lack of accurate information constrains the ability of rail transportation authorities to devise plans that maximise the benefits of favourable home prices and rentals.

Thus, this study attempts to establish the rail transportation effect on the housing market. This review paper will determine if rail transportation has a beneficial or detrimental effect on the local housing market, hence filling a knowledge gap on rail transportation's effect on home prices and rentals. This paper begins with a general discussion on rail transportation in the second section. The third section examines the effect of rail transportation on housing prices and rentals. Section four discusses the results, followed by Section five's conclusions and implications.

RAIL TRANSPORT AND THE HOUSING MARKET

Rail Transport

Rail transport is a mode of transporting people and commodities through wheeled vehicles that operate on tracks. It is a safe, quick, and cost-effective form of transportation for both long and short distances. Maximum efficiency can be attained especially for transferring mass numbers of people and commodities (Lin & Ponrahono, 2019). Rail transport, which started in ancient Greece as human-hauling contraptions, has grown into a contemporary, complex, and sophisticated system that is utilized in both urban and cross-country networks. Rail transport is

more organised than automobile travel owing to its established routes and timetables, and it enables economic advancement. Rail transport increases investment and attracts foreign investors due to efficient and fast service, cost savings, improved traffic safety and reduced pollution. Nowadays, rail travels include airport rail connections, funicular railway line, heavy rail, Light Rapid Transit, Mass Rapid Transit and monorails. It is also known by the term metro, subway, mass transit and underground.

Rail Transport Impact on House Price and Rent

House prices and rents are susceptible to changes surrounding them. Any changes in attributes may increase or decrease house prices and rents. In general, house attributes can be grouped into locational, structural, and neighbourhood (Goodman, 1989; Williams, 1991). Structural attributes represent the characteristics and conditions of the house. Structural attributes include age of building, floor area, kitchen cabinets, lot area, materials and finishing types, neighbourhood area, number of rooms, repair condition and structural condition (Adi Maimun, 2011). Structural conditions may affect house prices and rents positively or negatively. Meanwhile, neighbourhood attributes may include socio-economy, externalities, local authority services (Chin and Chau, 2003) and facilities (Roe et al., 2004). A housing area that has all facilities required will form a good market (Nor Asmahan, 2012) because facilities provided enhance the economic activity of that area. The location factor lies in the bid-rent theory as posited by Alonso (1964). According to Alonso's bid-rent hypothesis, people are willing to spend a portion of money for location. An attractively located house is highly sought after and pushes prices up through the bidding process, whilst an unattractive location will bring down prices. The location of a property mainly influences purchase decisions and thus is reflected in house prices and rents. Numerous individuals are ready to pay a premium for an enviable location. (Prasad & Richards, 2008).

Houses located near the city centre, for instance, will likely fetch high prices since many economic and business activities mainly take place within the city centre area. In contrast, houses located farther from the city centre will decrease in price (Chin & Chau, 2003). It has been reported that good access to a transportation system such as rail transport will enhance the price and rent of houses nearby. This is possible due to strong demand for houses located close to the rail transport system (Pan et al., 2014). Houses located close to railway stations are highly sought after because of their strategic location and easy access to public utilities (Alan Tong, 2010). In addition, the effects of rail transport are also acutely felt in the residential sector due to the large number of consumers (buyers and renters) within the property market segment. As a result, most research within this field has concentrated on the residential sector. Table 1 summarises prior research on rail transport effects on house prices and rents.

Table 1: Summary of Previous Studies: Rail Transport Effects on House Prices and Rents

Author (Year)	Types of Rail Transport	Approach	Findings
Benjamin and Sirmans (1996) Washington, D.C.	Metro	Hedonic model	Rent decreased by 2.4 to 2.6% per 100m away from Metro station.
Lewis-Workman and Brod (1997a) New York	Rapid rail: New York City MTA	Hedonic model	Price decreased by $2,300 per 100ft away from the station areas.
Lewis-Workman and Brod (1997b) San Francisco	Rapid rail: BART	Hedonic model	Price decreased by $1,578 per 100ft away from the station.
Henneberry (1998) Sheffield, England	Supertram (Light Rail)	Hedonic model	No effect.
Delmelle and Duncan (2012) Charlotte, North Carolina	Light Rail	Hedonic model	Price increased by 0.1% per mile (1609m) closer to the LRT station.
Dziauddin et al. (2013) Klang Valley, Malaysia	Light Rail Transit (LRT)	Hedonic model	Price increased by RM10,560 (straight-line-distance model) and RM6,610 (network-distance model) for houses located within 1,000m from LRT station.
Pan et al. (2014) Houston, Texas and Shanghai, China	METRO Rail	Hedonic model	Price increased by 1% per 100m closer to METRO Rail.
Mulley, Tsai and Ma (2018) Sydney	Light Rail Line	Geographically Weighted Regression (GWR)	Price increased by over 0.5% per 100m closer to the LRT station.
Pilgram and West (2018) Minneapolis, Minnesota	METRO Blue Line	Hedonic model	Price increased by 3% for houses located within a half-mile of METRO station (compared to other houses in South Minneapolis).
Dziauddin (2019) Kuala Lumpur, Malaysia	Light Rail Transport	Hedonic model	Prices increased by 30% for houses located within 800m to LRT station.
Pan (2019) Houston, Texas	METRO Rail	Hedonic model	Price increased up to 39% for houses located ¼ mile closer to METRO Rail.

Overall, the body of research used the Hedonic model to establish the relationship between rail transport and house prices and rents. This method is popularly used

as it can measure the impact of each quality on the total price and rent of houses (Asmawi et al., 2018; Rahman et al., 2019). Using the Hedonic model, previous studies examining the relationship between rail transport and house prices and rents tend to vary in findings. Early research demonstrated a positive relationship between rail transport and house prices and rents. These include works by Boyce et al. (1972), Dewees (1976), Lerman et al. (1978), Dvett et al. (1979), Damm et al. (1980), Bajic (1983), Voith (1991), Al-Mosaind et al. (1993), Gatzlaff and Smith (1993), Benjamin and Sirmans, (1996), Lewis-Workman and Brod (1997a; b). Recently, researchers have also found positive effects of rail transports on house prices with between 0.1% to 39% increase in values for homes located near rail stations (Delmelle & Duncan, 2012; Pan et al. 2014; Mulley et al., 2018; Dziauddin, 2019; Pan, 2019). Nonetheless, some studies have found rail transport's adverse effects on house prices. In other words, house prices tend to decline the farther away from rail transportation from where the housing is located. Discounts that vary in strength were reported for studies based in the United States, such as in Philadelphia (Slater, 1974), Atlanta (Nelson & McCleskey, 1990; Baum-Snow & Kahn, 2000; Bowes & Inlanfeldt, 2001), Portland (Al-Mosaind et al., 1993; Dueker & Bianco, 1999; Chen et al., 1998), Boston, Chicago, Portland, and Washington (Baum-Snow and Kahn, 2000), Dallas (Clower and Weinstein, 2002), San Francisco (Weinberger, 2001), Buffalo (Hess & Almeida, 2007), San Diego (Duncan, 2008) and in Asian countries such as Seoul, Korea (Bae et al., 2003), Bangkok, Thailand (Chalermpong, 2007) and Shanghai (Pan & Zhang, 2008). This negative effect is attributed to noise pollution (Bowes & Ihlanfeldt, 2001), visual intrusion, and rail right-of-way's association with industrial uses (Diaz, 1999). Meanwhile, there are cases where findings are less conclusive due to mixed results. Rail transportations was reported to impact house prices positively and negatively in Atlanta (Nelson, 1992), San Diego, San Francisco, Sacramento, and San Jose (Landis et al., 1995), San Diego (Ryan, 2005) and Bogotá (Munoz-Raskin, 2010).

DISCUSSION

Different findings established by previous studies showed that rail transport might impact housing in various ways, either positive, negative or mixed, based on the type of externalities produced by rail transport. Although there is a long history of literature examining rail transport's effects on house price and rent, most studies were based in the United States. Only two research projects were based in Malaysia, occurring only in 2013 and 2019. Most studies also analysed the impacts of LRT on the local property market. Very few have attempted to investigate whether MRT will affect the housing market. This includes Malaysia. The lack of Malaysian empirical research, particularly on MRT station impacts on house prices and rents, raises a question on whether MRT will impact the housing market, and if so, what is the magnitude of impact? The lack and

uncertainty of market information affect the property market player's decision-making, such as valuing houses and developers in developing areas. Thus, there is a crucial need for a study investigating the impact of MRT on the local Malaysian housing market.

CONCLUSION

This paper established several key findings related to rail transport's impact on house prices and rents. The study concluded that the effect of rail transport on the housing market is situation-dependent. Positive impacts from rail transport were expected if the accessibility and attractiveness of the surrounding area are improved. In contrast, an area may experience a decline in values if rail transport produces negative externalities such as noise, visual intrusion, and the rail right-of-way's association with industrial uses. The various price and rent impacts of rail transport highlights the necessity for a locally based study, particularly in Malaysia. The findings of the study contribute to the clarification of the rail transport impact on housing market literature. Property market players such as valuers, planners and developers may find the study findings beneficial in making various property-based decisions, such as planning, developing and valuing properties.

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INVESTIGATION OF IMPEDIMENT FACTORS IN PROPERTY TAX REVALUATION PRACTICES

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Abstract

Property tax is a form of taxation payable by real estate owners on their holdings because of their ownership or possession of the property. In Malaysia, a property tax revaluation is done once every five years or within an extended period as determined by the state government. However, the Ministry of Housing and Local Government Malaysia has recorded that most local authorities have not revalued their property for almost 35 years. Thus, the researchers conducted a focus group interview to identify the impediments in a revaluation of property tax among local authorities. The participants consisted of forty-three (43) officers from twenty-two (22) local authorities in the West of Malaysia. Data from focus groups identified were transcribed and analyzed using thematic analysis. Findings from the focus group revealed four (4) main impediment factors, namely (1) lack of knowledge in property tax revaluation paperwork, (2) lack of workforce, (3) cost constraints, and (4) time-consuming.

***Keywords**:* Property tax, rating, property tax revaluation, local authorities, Malaysia

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INTRODUCTION

The increasing rate of urban development in developing countries is driven by population growth, mechanization of the agricultural sector, and exogenous shocks such as climate change (Awasthi et al., 2020). The enforcement of property tax is vital to support urban growth, especially in developing countries. Property tax became the primary source of the municipalities besides rents, license fees, dues, and other sums or charges. A strong financial background associated with their revenue sources, particularly the property tax collection, is needed for local authorities to function sufficiently and efficiently (Ashmat, 2016; Jashari, 2020), thus providing essential services for urbanization expansion needs.

Property tax is considered a fair tax where many countries advise to increase their property taxes. Unfortunately, it has proved to be challenging to carry out successfully (Kuusaana, 2015). One of the significant hurdles in property tax is the revaluation process (Bustamin et al., 2018; Kuusaana, 2015; Piracha, 2016), requiring all holdings to be revalued their current market value within a specific cycle. Therefore, this paper seeks to determine the impediment factors on property tax revaluation practices.

Property Tax: Definition and Concept

In general, property tax is a tax levy issued by a government on a person's real or personal property. The local authorities use the tax to generate revenue required to provide public services such as waste disposal, road repairs, street lighting, and maintaining public buildings like schools, libraries, recreational parks, etc.

Referring to the 6th Edition of Malaysian Valuation Standard (MVS) 2019, property tax is one of the statutory purposes in property valuation. Property tax, known as a rating, is a local government tax imposed on holdings within a local authority area. The power to impose rate was stipulated under section 127 of Local Government Act 1976 (As amended) (Act 171), which granted local authority to impose rate within its boundary with the state government's approval.

According to section 130 of Act 171, annual value or improved value used to measure property tax value based on its current market value. Each local authority may-propose their valuation list consisting of the list's tone to indicate the valuation's base year. The amount taxed on a given property may change over time based on a revaluation of its value.

Property tax Revaluation: The implementation and issues

In Malaysia, a revaluation of property tax is done once every five years or within an extended period as determined by the state government (Section 137, Act 171). The old valuation list shall remain in use until a new valuation list supersedes it. Unfortunately, most local authorities practice property tax revaluation exercises for more than five years and in a much longer time.

The Ministry of Housing and Local Government has recorded that most local authorities haven't revalued the property for almost 35 years. Figure 1 shows that only 11 local authorities in West Malaysia practice the latest tone of the list (within five years) for their holdings in which Seberang Perai City Council topped the list. Of 99 local authorities in west Malaysia, 49 local authorities have used the valuation list for more than five years, even up to 30 years. The remaining 39 local authorities have used the valuation list for more than 30 years. Though the act allows for an extension of the revaluation period to more than five years, that does not mean that the old valuation list will last as there is no official extension.

Figure 1. The Practice of Tone of the List by West Malaysian Local Authorities
Source: Local Government Department, Ministry of Housing and Local Government Malaysia

A postponement of property tax revaluation practices will lead to various financial issues since the primary source of the municipalities' revenue comes from property tax collection (Awasthi et al., 2020; Kuusaana, 2015; Pawi et al., 2011). Local authorities will be facing a higher budget deficit as the cost continues to increase from year to year. The situation has indirectly resulted in lower performance by local authorities giving basic needs to their jurisdiction area.

On the other hand, hanging on the list's tone will also lead to drastic changes in the property price. During the revaluation exercise undertaken by Kuala Lumpur City Hall (DBKL), they highlighted reasons to increase the rates because the last increase was more than 20 years ago (Chang, 2013). The property price has an increase in value, and it's hard for the taxpayers to bear the rate, especially retirees and pensioners. This situation is against the Government's inspiration to help the public.

The outdated practice of tone of the list in Malaysia is not because of no application submitted to the state government. Some local authorities like Kajang Municipal Council submitted the proposal of property tax revaluation to the Selangor State Government. Then it was rejected and dragged to the court (Local Government Department, Ministry of Housing and Local Government Malaysia). Hence, this research seeks to identify the main reasons behind these issues from the local authorities' perspective.

One of the impediment factors in property tax revaluation practices is political interference (Kuusaana, 2015; McCluskey & Franzsen, 2005). According to Muhammad et al. (2012), political reasons become the main reasons for the hung on the tone of the list of 1982 from Ipoh City Council (MBI), Perak. The act empowered the state governments to approve local authorities' submissions on revaluation of property tax but not to satisfy personal interest and later the national interest. As a consequence, the application by MBI was rejected because of the fear of losing votes. However, this deductive factor is the external variable that can't be controlled.

Human resources become one factor that impedes property tax revaluation (Kuusaana, 2015; McCluskey & Franzsen, 2005; Muhammad & Ishak, 2012; Raja Abdullah, 2009). Some researchers suggest that outsourcing the service to the private sector could help implement the revaluation (Awasthi et al., 2020; Raja Abdullah, 2009). Moreover, Bahardin et al,. (2019) suggested enhancing workforce competency by increasing the number of valuer and field technician capacity. Also, the need for an experienced valuer in property tax valuation will produce less property assessment variance (Atilola et al., 2019). Therefore, these factors need to be considered when practising property tax revaluation.

The budgetary manner is other property tax revaluation issues that need to be prioritized (Kuusaana, 2015; Raja Abdullah, 2009). A strong financial is required to reassess property tax due to a massive number of the property needing to be valued. On the other hand, cost issues are also associated with information technology (IT). Most of the researchers suggested local authority to have an IT-based approach to produce a quality property tax system (Awasthi et al., 2020; Grover et al., 2017; Kuusaana, 2015). Referring to Mian (2019), IT's investment will reduce the risk in local authority business. The problem is the authority needs to allocate some budget to this matter.

Even though many impediment factors have been discussed in the literature, it involves external and internal elements from the local authorities. Therefore, this research will look up the internal issues in local authorities focusing on the management aspect. Moreover, this exploratory research will identify the other factors lacking from the literature that impede property tax revaluation practices in the Malaysian context.

METHODS

Study Design

Focus groups conducted with the local authorities' officers to elicit their views regarding the property tax revaluation impediments. The characteristics of focused group interviews focus on the respondent's experiences regarding the research topic. It takes place with respondents known to have involved in particular expertise (Onwuegbuzie et al., 2012).

Setting and Participants

The focus group discussion was held at the Housing and Local Government Training Institute (I-KPKT), Pahang, Malaysia, from 18 to 20 February 2020. A total of forty-three (43) officers from twenty-two (22) local authorities in the West of Malaysia were invited using purposeful sampling to participate in the focus group discussion. Eligibility criteria include ages 21 years and older, have at least two years of working experience, and working in the valuation department. All participants invited to the focus group sessions were eligible, consented to, and enrolled in the study. The number of respondents, according to the department, are listed in Table 1.

Hierarchy	Participants	Percentage
Town Hall	1	2%
Municipal Hall	18	42%
District Hall	24	56%
Total	**43**	**100%**

Table 1. Number of respondents according to government hierarchy
Source: Authors' Research (2020)

Data Collection

The questions used to guide the focus group sessions were developed from Liamputting (2015) guidelines for developing and asking effective focus group questions. The questions guide for focus group discussion are as the following:

Table 2. Questions Guide: The questions guide served to achieve the aim of the study

Questions guide	
Introductory question	Can you please tell us about your experience of property tax revaluation practice?
Focus questions	Can you tell us briefly about what stops the local authority from conducting a revaluation in your area? What are the most significant barriers faced by your department to practice the revaluation process?

Summarising question	As you know, we will be implementing a programme to prepare the property tax revaluation proposal. Think back on your experience and our discussions today and tell us what we can provide for assistance.
Concluding question	Is there anything else that anyone feels that we should have talked about but did not?

Source: Authors' Research (2020)

Analysis

The thematic analysis used to code the identified transcript data in a descriptive preliminary framework for later analysis. In Brinkmann and Kvale (2015), there are three stages involved in focus group data analysis. The first stage begins with a discussion session facilitation. Next is information generation, and lastly, transcribing the generated information into electronic format. After the data transcription, their responses were coded by determining keywords and phrases common amongst the participants that involved indexing, highlighting, and sorting out quotes and rearranging to develop thematic content (Creswell, 2015). As it builds directly from the raw data, the process itself ensures the work's validity (Bryman, 2012). The steps involved in the thematic analysis summarized in Figure 2.

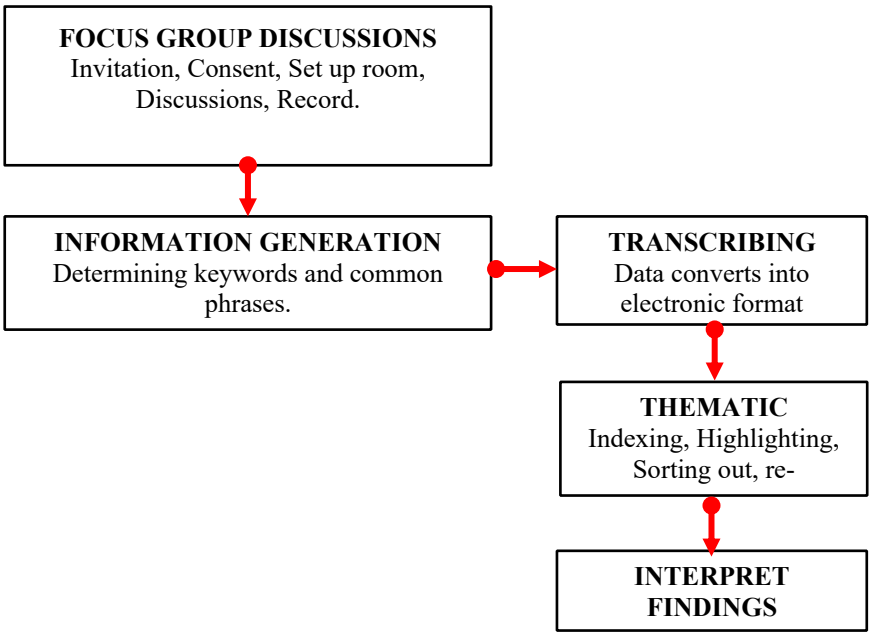

Figure 2. Focus Group Discussions Procedures
Source: Brinkmann & Kvale (2015)

RESULTS

A successful focus group discussion conducted with 43 participants assigned into six groups, namely G=1 is group one, G=2 is group two and so on. The mean age was 35 years old, and over half were male (60%), and 56% of participants were from district local authorities. There were six to seven participants assigned in a group. Analysis of the focus group discussions on the barriers in property tax revaluation practices revealed four codes or themes: lack of knowledge in property tax revaluation paperwork, lack of workforce, cost constraints and time-consuming.

Lack of knowledge in property tax revaluation paperwork

According to the law in West Malaysia, a property tax revaluation must take place every five years. But due to lack of knowledge in drafting the property tax revaluation paperwork resulted in revaluation postponement.

"Given the basis of the property tax system, it is obvious that frequent revaluations are necessary. However, my department (has) decided to postpone the revaluation" (G=2)

"It is because we have yet been involved in the preparation of revaluation proposal (paperwork)." (G=3)

"It is a very, very important thing (paperwork), and I don't think I can draft a good proposal (paperwork) without an explanatory or a guide listing specific criteria for drafting revaluation paper proposal." (G=6)

Lack of Workforce

Subsequently, many local authorities in West Malaysia have encountered a shortage of human resources to conduct revaluation purposes.

"Whatever the reason (revaluation postponement), the majority of the local authorities at district level have manpower crunch." (G=1)

"Lack of manpower could result in revaluation postponement. Hiring temporary staff will increase the operational cost." (G=4)

Cost Constraints

From the discussions, cost constraints still topped the list. All participants agreed that one of the reasons for revaluation postponement is cost constraints.

"It is the precise purpose of having a revaluation to reflect changes in values upwards. Yet the cost involved in revaluation is too costly." (G=1)

"...too costly (revaluation)." (G=3)

"It is not economical for the district hall level to conduct the revaluation every five years as the local authorities at district level have a small budget and small revenue." (G=5)

Time-consuming
Another key is that the process of revaluation takes years to complete.

"Kajang Municipal Hall calculates approximately ten years to complete the revaluation involving 320,000 ratable holdings." (G=2)

"I estimate the revaluation to complete in two years (involving 40,000 ratable holdings." (G=5)

"Approximately two years is needed to conduct such purpose (involving about 80,000 ratable holdings". (G=6)

CONCLUSION AND RECOMMENDATION

The Ministry of Housing and Local Government has recorded that only some local authorities in West Malaysia have practised the latest tone of the list for their holdings. Even though the policy granted the powers of extending the property tax period beyond five years, it does not mean an extension to be in perpetuity. There was never a specific official extension from this time to a definite future date. Therefore, to avoid drastic changes in property tax value in the future, each local authority needs to do a revaluation close to 5 years' period. The property tax revaluation is significant in making the local authority's functions narrow and efficient for the development within its territory in the future. The result will then bring a better quality of the built environment to provide buildings and infrastructure for the surroundings.

The key findings revealed four impediments in property tax revaluation: lack of knowledge in property tax revaluation paperwork, lack of workforce, cost constraints, and time-consuming. From the focus group findings, cost and workforce prove to impede property tax revaluation implementation as support the literature from other countries. The process needs many staff to exercise the valuation of all holdings located within local authorities' boundaries. Hence, this will drive an additional labour force's engagement, which is undeniably higher in cost. On the other hand, the time factor revealed from the analysis due revaluation work requires a lengthy procedure starting the paperwork preparation, valuation process and later approval. Knowledge workers in preparing the paperwork also became the prominent bone of contention in this

practice. In aid of this, future research may continue to see the result quantitatively on the relationship between all themes from our findings and test them via a more rigorous research design.

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THE SIGNIFICANCE OF NATURAL AND SERENE ENVIRONMENT TO IMPROVE THE QUALITY OF LIVING IN TINY HOMES

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Abstract

Tiny homes are defined as a small dwelling in the form of a moveable unit, cabin or detached house which is sized to meet its occupants' needs. Besides affordability, sustainability and minimalist lifestyle, the occupants' demand for a cosy environment with a window or porch overlooking a garden. The objectives of the study are to investigate the benefits of utilising nature and serenity in promoting a supportive environment to achieve user well-being. Quantitative methodology was applied in this study using three case studies (CS1 at Urban area: Prototype Model of Microhouse, CS2 at Sub urban area: The Cabin Boutique Resort and SC3 at Outskirts area: Meraki Tiny House). The tool, ``Perceived Sensory Dimensions "(PSDs)" was used for respondents to evaluate the surrounding environment of the case studies by showing photos of two sensory dimension models (PSDs Nature and Serene). Close-ended questionnaires were distributed to the 21 respondents from the millennials group, to rate each perception for each case study. The results have shown that a natural and serene environment for CS3 is most preferred because of the aspirational quality of its PSDs, followed by CS2 and CS1.

Keywords: Nature, serenity, Perceived Sensory Dimensions (PSDs)

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INTRODUCTION

Kuala Lumpur dwellers spend 48% of monthly income equivalent to RM1970 on renting the accommodation (Kuala Lumpur City Hall, 2004). Facing this high accommodation rental in the city, the young graduates with salary between RM1,949 -RM2,836 are found to struggle socially and economically. One popular solution is to rent a tiny home as the "rental cost is 10 times lower than renting a flat in Kuala Lumpur" because less construction cost, less energy consumption and less maintenance (Property Guru, 2021).

The size of "tiny home" is approximately between 160 to 480 square feet (Schatz & Sidhu, 2015) and "in terms of size and instead advocates for a new approach to housing, one that values quality, not quantity" (Susanka, 2019). It is like a monk's cell, highlighting the simplicity, frugality and environmentally friendly living.

How to live in a tiny home without feeling cramped? The environment of the tiny home needs to be considered with some green plants or garden, to ensure the quality of the space and to add to a calming ambience. Porch and window are important design elements that provide physical and visual access to the woods and part of the garden (Wilson et al., 2020). Studies indicate that contact with Green Outdoor Environments (GOE) can increase attention (Tennessen & Cimprich, 1995) and window view to nature is positively related to a low level of acute stress (Pati et al., 2008). On top of that, a garden with plants has important roles as a restorative environment "that provides opportunities to reduce direct attention fatigue" (Kaplan, 1995).

STRESS DUE TO LACK OF GREEN SPACE AND HIGHER HOUSE RENTAL IN THE CITY

City lifestyle with hectic schedule and unpleasant environments, such as concrete jungle, lack of green space, urban heat island's effect, noise and slump, will lead to stress and may trigger mental disorder. Moreover, open spaces are slowly replaced by highways, thoroughfares, and parking bays which are considered as predominant types of open spaces in the modern urban planning perspectives (Khalid et al., 2018). The scientists found that residents who grew up with the least green space within the neighbourhood, had as much as a 55 percent increased risk of developing psychiatric disorders (NASA, 2019).

In addition, Malaysia's housing market is considered unaffordable, where the median house price is 4.4 times median annual household income and rental would likely follow suit (Khazanah Research Institute, 2015). The average house rental at the city centre of Kuala Lumpur is RM4,338.97 a month (Lee, 2017) and residual household income is merely RM76 per month for those earning less than RM2,000 (Khazanah Research Institute, 2016). Stress induced by persistent financial constraints and housing instability, then reduces people's

ability to make good decisions, and finally can harm physical and emotional health (Schuetz, 2017).

Thus, one out of ten Malaysian employees are either anxious or depressed, with most of them being the "B40 Millennials" group, aged between 24 to 39 in 2020 (The Edge Markets, 2020) and four out of every ten Malaysians were recorded to suffer mental health issues (The Star, 2017).

TINY HOMES AS A SOLUTION?

Living in a cosy environment with physical and visual accessibility to a green space with the price of an affordable house rental are the dreams of the working "B40 Millennials" group. DBKL is planning to launch 200 tiny homes at city centre, located at Jalan Tuanku Abdul Rahman, catering to young working adults in the B40 category (News Straits Time, 2019). This initiative isn't about profit but about helping the "B40 Millennials" group find their footing.

The design solution focuses on a mere two (2) parking plots with size of 5-meter length and 5-meter width on a car park site owned by DBKL. The excessive car park plots will slowly be replaced by tiny homes, the driveways gradually turned into open and green spaces integrating with green belts and bike lanes, the unused car park plot in between tiny homes can be utilised into gardens and social space as shown in Figure 1. This group of tiny homes, in time, will grow into an urban micro village (Tetawowe Atelier, 2018)

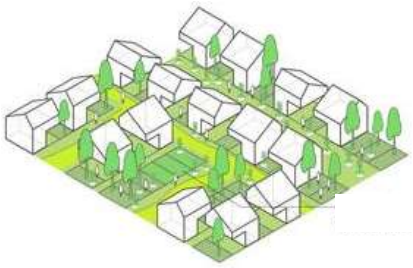


Figure 1: Tiny homes with shared green spaces
Source: Tetawowe Atelier (2018)

The design of each tiny home emphasises on the adaptability of it to various programmes and usages (Tetawowe Atelier, 2018). The ground floor consists of an open plan with kitchen or dining or porch and laundry facilities with physical and visual access to the green spaces as shown in Figure 2.

Figure 2: Open plan accessible to green spaces
Source: Tetawowe Atelier (2018)

The significance of green spaces or garden to a tiny home as daily lifestyle are, i) greenery can promote mental and physical health, also decrease morbidity and mortality in urban residents by providing psychological relaxation and stress alleviation, stimulating social cohesion, supporting physical activity, and reducing exposure to air pollutants, noise and excessive heat (Braubach, 2017), ii) human microbiome associated with natural environmental, may improve mental health (Logan, 2015), and iii) area with better access to green space characterized as "serene" has been linked to improved mental health (van den Bosch et al., 2015).

OBJECTIVES

The objectives of this research are as follows: -

i) To investigate the benefits of natural and serene environments and how it functions to promote supportive environments which contribute to the user's well-being.
ii) To investigate the quality of PSDs Nature and Serene in tiny home and its Green Outdoor Environment (GOE) at different settings

LITERATURE REVIEW

Green Space and Benefits of Natural and Serene Environments

Green space is considered as open space, defined as any land either gated or not, which had been specifically and fully reserved or a part of it, to be used as a garden, public park, field, public recreation area or as a public place. The availability of green space in the living environment can be measured as an important environmental factor that moderates the relationship between stressful life (Berg et al., 2010). Health policy in the United Kingdom has been increasingly advocating the use of outdoor green space to improve health, where there were benefits showing the health improvements connected to the natural environment (Kessel & Green, 2009).

An empirical study showed that natural environments are generally more restorative than built environments (Hernandez et al., 2001, Puecell et al., 2001). According to the attention restoration theory, spending time in nature relieves the stress and mental fatigue caused by "directed attention" that works, and city life require (Williams, F. 2016). It has been proven, since the 16th century's facts by Paracelsus, "The art of healing comes from nature, not from the physician". Research indicates a relationship between sensory perception of natural environments and human health. Urban green spaces can be viewed as elements of importance to public mental health (Grahn & Stigsdotter, 2009).

Environmental psychology studies have demonstrated that experienced qualities in green spaces can be subdivided into different "perceived sensory dimensions" (Grahn & Stigsdotter, 2009). The classification system has been developed by researchers at the Swedish University of Agricultural Sciences to experience qualities in green spaces, the two from eight of perceived sensory dimensions (PSDs) are as listed below: -

i) Nature: A fascination with wild nature. A sense of quietness and stability. Plants seem self-sown, lichen and moss-grown rocks, old paths. Something which is not created by humans, but by the power of the mightier.
ii) Serene: Peace, silence and signs of care. It is private, inviting and natural with the sounds of wind, existence of water elements and birds chipping. No rubbish, no weeds, no disturbing people, safe and secure. In its most distinct form, this can be described as having the character of a restful interior.

Green outdoor environment (GOE) is defined as the exterior of a tiny home either man made gardens (designed with soft and hard landscape features) or existing landscape ("matured" landscape like forest), can be accessed, used and enjoyed by the residents. In PSDs Nature and Serene are important to measure the quality of GOE.

There are many benefits of a natural and serene environment to humans, where basically nature can improve creativity by up to 50% and some activities like forest walks can decrease one's stress hormone by as much as 16%. Moreover, research suggests interacting with nature makes prisoners less violent (Williams, 2016).

Tiny Home

An architect, Sarah Susanka published the book "The Not So Big House", portrays a backlash against supersized homes and challenges Americans to think about housing as a sanctuary that simplifies daily lives, rather than taxing the energies in maintaining it (Schatz & Sidhu, 2015). Then, in 1999, Jay Shafer built a 110 square feet home on wheels in Iowa and lived in it for 5 years with his wife and a son. His decision became instrumental in propelling the tiny home movement into the realm of possibility for thousands of North Americans and he would go on to become the first tiny home builder and designer, as well as an

author of several books (Schatz & Sidhu, 2015). The benefits of living in tiny home are as follows:

i) Simpler facilities and more sustainable lifestyles due to smaller footprint and lesser consumption.
ii) Affordable housing option.
iii) Value for money and cost savings in space can be allocated for better finishing (furniture etc.), garden (green roofs, vertical landscape & etc.) and selection of the site (urban, suburban or outskirts.

Living Big in a Tiny Home

The trend of simplicity and modest proportions of living has evolved. In early 2000, the inspiring private project called "Sunset Cabin" nestled into a slope on the southern shore of Lake Simcoe, Ontario, Canada, designed by Taylor Smyth Architects. The floor area is only 275 square feet surrounded by "mature" landscape and constructed in the wilderness (Taylor Smyth Architects, 2004).

Figure 3: Sun set cabin by Taylor Smyth Architects
Source: Taylor & Smyth Architects (2004)

METHOLOGY

Case Studies

Three case studies were selected and presented in Table 1. They were selected based on three development settings namely urban, suburban and outskirts area for researchers to differentiate the quality of the natural and serene environment.

Table 1: Description of the three cases

Tiny Homes	Settings	Built Up Area	Type of Green Outdoor Environment (GOE)
CS1: Prototype Model of Micro house	Center of Urban Area	538 square feet for 2 storeys	Modern urban gardens with facilities of shared recreational space and other

			areas designed as communal kitchens
CS2: The Cabin Boutique Resort	Sub urban, near to the beach	Between 300 to 450 square feet for each cabin	Modern contemporary gardens, big lawns with resort facilities
CS3: Meraki Tiny House	Outskirts, in the jungle	520 square feet	Natural forest landscape

Source: Zainal (2020)

Data Collection

Each photo of PSDs Nature and Serene in each case study was collected and compiled into the questionnaire. Close-ended questionnaires were distributed to the potential users (aged between 24 to 39 in 2020). 21 respondents answered the questionnaires. The questionnaire consists of four parts, as follows:

i) The first part of the questionnaire asked about the respondent's personal data, such as gender, age, city of living, educational level and profession.
ii) The second part of the questionnaire asked about respondent's perceived sensory dimensions for PSDs Nature and Serene to each case study. The respondents had to mark and rate their perceptions on the PSDs photos attached.
iii) The third part of the questionnaire asked about respondent's level of satisfaction with the Green Outdoor Environments (GOE). The respondents had to mark and rate their satisfactions based on PSDs photos attached.
iv) The fourth part of questionnaire asked about respondent's opinions and comments

RESULT AND FINDINGS

The following section summarizes the results according to the four parts of research questions.

Respondent's characteristics

A total of 21 respondents participates in the survey and among them, 12 are males and 9 are females. The selected respondents are among the millennials group (aged 24 to 39 in 2020). Most respondents are in their 30s. 57% of respondents are living in urban areas, 24% living in the outskirts area and only 19% living in sub urban areas. Most of them are professionals and only 5% are non-professionals.

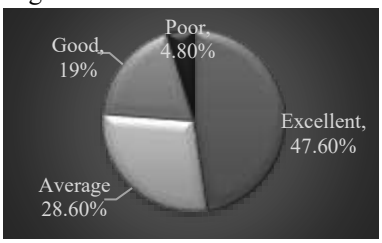
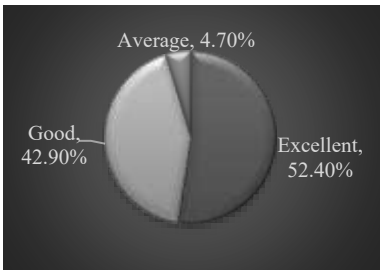
Quality of PSDs Nature and Serene

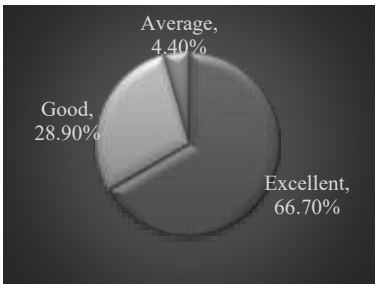
From the pie charts of quality PSDs Nature (Table 2) and Serene (Table 3), with reference to questionnaires, the ratings from good to excellent are considered as

positive factors while the ratings from poor to average are considered as negative factors.

Quality of PSDs Nature for CS3 is 96% positive factors, followed by CS2 is 95% positive factors and CS1 is only 67% positive factors.

Table 2: Quality of PSDs nature

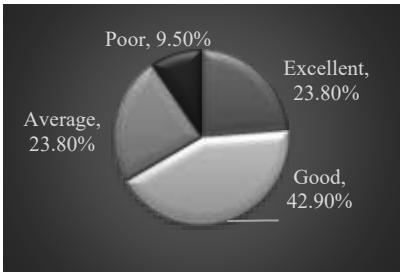
Photos of PSDs Nature	Results (good to excellent are positive factors, poor to average are negative factors)
CS1: Prototype Model of Microhouse at Medan Pasar, KL. (Urban area)  Prototype Model of Microhouse *Source: Tetawowe Atelier (2018)*	Positive factors= 67%. Negative factors= 33%  Result PSDs Nature on CS1
CS2: The Cabin Boutique Resort at Pantai Remis, Kuala Selangor. (sub urban area)  The Cabin Boutique Resort	Positive factors= 95%. Negative factors= 5%  Result PSDs Nature on CS2

CS3: Meraki Tiny House at Kg. Serigala, Hulu Selangor (outskirts area).	Positive factors= 96%. Negative factors= 4%
 Meraki Tiny House *Source: Atiqah Nadiah (2018)*	 Result PSDs Nature on CS3

Source: Zainal (2020)

The quality of PSDs Serene for CS3 is 95% positive factors, followed by CS2 is 90% positive factors and CS1 is only 67% positive factors.

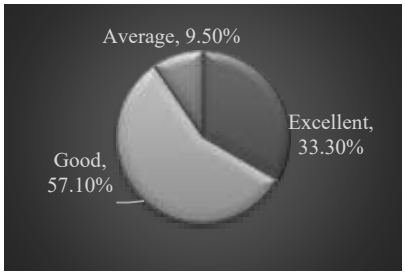
Table 3: Quality of PSDs Serene

Photos of PSDs Serene	Results (good to excellent are positive factors, poor to average are negative factors)
CS1: Prototype Model of Microhouse at Medan Pasar, KL. (Urban area)	Positive factors= 67%. Negative factors= 33%
 Prototype Model of Microhouse *Source: Tetawowe Atelier (2018)*	 Result PSDs Serene on CS1

CS2: The Cabin Boutique Resort at Pantai Remis, Kuala Selangor. (sub urban area)

The Cabin Boutique Resort

Positive factors= 90%.
Negative factors= 10%

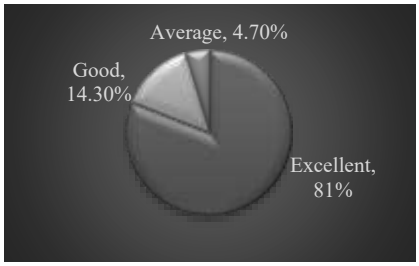


Result PSDs Serene on CS2

CS3: Meraki Tiny House at Kg. Serigala, Hulu Selangor. (outskirts area)

Meraki Tiny House
Source: Atiqah Nadiah (2018)

Positive factors= 95%.
Negative factors= 5%



Result PSDs Serene on CS3

Source: Zainal (2020)

The comparison of both PSDs in three case studies (Table 4). CS3 perceived aspirational quality with the total of 96% positive factors, followed by CS2 with the total of 93% positive factors and CS1 perceived appropriate quality with the total of 67% positive factors.

Table 4: Comparison of satisfaction levels of the PSDs

PSDs	CS1	CS2	CS3
Nature	67% +ve	95% +ve	96% +ve
Serene	67% +ve	90% +ve	95% +ve
Total for both PSDs	**67% +ve**	**93% +ve**	**96% +ve**

n= 21 respondents *Source: Zainal (2020)*

Satisfaction towards GOE at Three Different Settings

From the bar charts, satisfaction levels of GOE at three different settings (Figure 14) with reference to questionnaire, the ratings from very satisfied to satisfied are considered as positive factors and the ratings from dissatisfied to not sure are considered as negative factors.

CS2 and CS3 are the most satisfied, both are 18 respondents' positive factors and followed by CS1 is 16 respondents' positive factors.

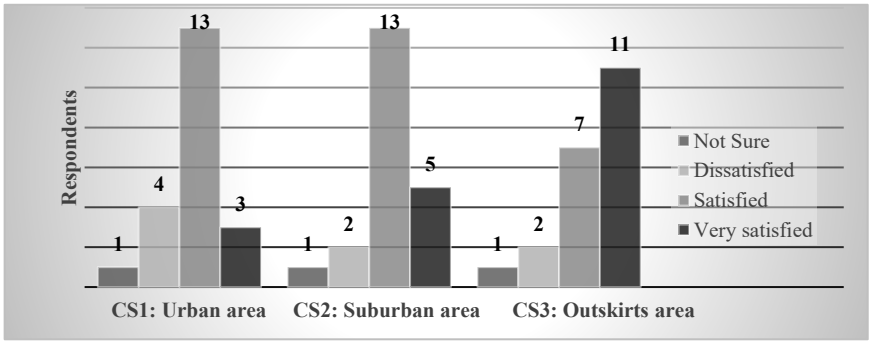


Figure 16: Level of satisfaction of GOE at three different settings
n= 21 respondents
Source: Zainal (2020)

CS3 and CS2 were perceived as providing significance for both sensory dimensions more than CS1. CS3 was identified as a place with relatively untouched nature (existing forest landscapes) experiences. CS2 was identified as a place with a relatively blended natural environment (man-made gardens and existing beach landscape) experiences. CS1 was identified as a place with relatively natural man-made garden experiences.

CONCLUSION

The sites were significantly associated with perception of the two analysed sensory dimensions. Better qualities and features of PSDs are related to the GOE settings. As a result, satisfaction levels of natural and serene environments are related to the setting of its green and open space. Outskirts and suburban areas promise better quality of natural and serene environments as compared to urban areas, which offer better impact to reduce stress and to enhance mental health. Therefore, living in a tiny home doesn't mean that there would be a feeling of cramp if the design of openings are fit for visual and physical access to the restorative green and open spaces.

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STRESSED ADULT'S PREFERENCES FOR OUTDOOR RECREATIONAL ACTIVITY IN URBAN PARKS

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Abstract

Albeit the importance of the urban parks to serve as physical, physiological, and health relief platforms, little attention has been paid to the study of the adult's preferences of outdoor recreational activity that is based on the human stress level. Therefore, the aim of this paper is to unveil the preference for outdoor recreational activity according to the human stress levels. Accordingly, this paper adopts a quantitative method through a web-based questionnaire survey that rests upon Kuala Lumpur's urban population as the representative sample. The questionnaire consists of three parts- personal data, the preference of outdoor recreational activity, and a self-reported health status. This paper reveals from a pilot study of 62 respondents only, as the actual questionnaires' survey and data analysis are still in progress. The data was analysed using factor and descriptive statistics in order to identify the most preferred outdoor recreational activity by a stressed adult. The result showed that the 20 items of outdoor recreational activities load into two dimensions, i.e., passive activity and active activity. The preferred passive activities by the adult who is reporting stress are enjoying the peace, resting and relaxation, enjoying the fresh air, releasing stress, enjoying nature, enjoying the sun and the sound of birds. For active activities, most of the adults who are reporting stress prefer to jog and do brisk walking. Significantly, the study's findings enlighten the urban park planners - including the landscape architects, to design parks for outdoor recreation that could correspond and accommodate the different levels of stress.

***Keywords**:* Outdoor recreational activity, stress level, urban park, preference

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INTRODUCTION

By 2019, the total population of Malaysia is 32.6 million, of which its urban population has been recorded at 76.2% as compared to 75.6 % in 2018 (DOS, 2019, p.6). This steady increase of the urban population put an overwhelming pressure on urban life, which consequently leads to significant demands for functional urban facilities and amenities, including urban parks, that could relieve the people's stress as suggested by Zhang et al. (2019). It is also revealed that Malaysian urban workers are facing work-stress that is related to heavy workload, understaffing, overtime, and looming deadlines (Mallow, 2016; Taap Manshor et al., 2003); stress may be considered a risk factor for the development of diseases such as coronary heart disease, type II diabetes, and depression (Memari et al., 2017).

Relevant studies in several fields, ranging from medicine to environmental psychology and to landscape architecture, have highlighted the urban park as a restorative experience, which covers many perspectives such as mental health (refer to Kaplan, 1989), and stress (refer to Ulrich, 1983). The urban park plays a significant role in the restorative experience in urban areas as it provides a unique setting for daily activities, to enjoy nature, and to engage in social interactions for the urban dwellers (Arifwidodo & Chandrasiri, 2020).

Moreover, the factor such as performing outdoor recreational activities in the urban parks (Karlsson & Grahn, 2011) also contributes to the restorative experience and encourages more people to conduct physical activities to overcome the noncommunicable diseases (NCD) (Malek & Nashar, 2018). A study by Anuar and Muhamadan (2018), reveals that people who perform outdoor recreational activities expect certain outcomes and experiences through the provision of facilities that suit their preferred activities. However, there is inadequate research attention on the preference of outdoor recreational activities that examines people who are stressed (Karlsson & Grahn, 2011).

By examining the preferred outdoor recreational activities of people who are stressed, this study intends to enlighten the local administrators, planners, and landscape architects on factors that need to be taken into account in designing urban parks that correspond to stressed people's expectations and needs.

LITERATURE REVIEW

Some of the pioneering works in leisure and recreational activities had studied the type of specific outdoor recreation in the different activities that were performed between children and adults (see Jansen & von Sadovszky, 2004; Nilsson et al., 2006; King et al., 2007). These activities include taking advantage of all the little opportunities for adults to be active, such as using the stairs and doing routine tasks, home repairs, and gardening, as well as more traditional leisure activities such as taking longer walks, cycling, and swimming (WHO, 2006). The influential work of the outdoor recreational activities give rise to a

renewed interest in environmental psychology of certain activities that are connected to the restorative experience such as mental fatigue (Cimprich, 1990) and stress reduction (Gao et al., 2019).

The existing study reveals that walking activities in natural environments have shown some effects on stress release (Gidlow et al., 2016). It is also proven that outdoor walking has been perceived to have more mental restoration effects than walking indoors (Bailey et al., 2018). In addition, it has been reported that walking in a natural environment has significantly better restorative effects than walking in urban surroundings (Hartig et al., 1991, 2003). Instead of walking, running also induces the relaxation of the mind and increases alpha brain waves as has been studied by Schneider et al. (2009). Also, Harte and Eifert (1995) supported that the health benefits of outdoor physical activity on campus reduced negative emotions instead of running on a lab treadmill. Apart from that, experiencing restorative effects from nature and pursuing various activities in the natural environment such as observing nature, walking in a natural environment, hiking, gathering berries and chestnuts, gardening, fishing and hunting, and working in the forest, have a positive correlation with the well-being of Estonians (Raudsepp, 2005).

Consistent with that, a study by Hansmann et al. (2007) have furthered the study of activities from the different stress levels they present, the result in which the length of visit and sports activities such as jogging, cycling, and playing balls give positive effects on restoration and stress release. Sports activities have shown significantly greater improvements than those engaged in less strenuous activities for example walking or relaxation. The work of Karlsson and Grahn (2011) found that the most preferred activities among the most stressed informants were ‘rest activities’, followed by ‘animal activities’ and ‘walking activities.

Notably, the research has different drawbacks of results pertaining to the outdoor recreational activities that are performed for restoration and stress relief. This might be due to the impact of gender, age, culture or ethnicity interests or expertise (Berto, 2014), expected restoration benefit (Herzog et al., 2003; Staats et al., 2003), and general preference (Purcell et al., 2001) from different individuals. This research is inspired by a similar work from the previous study. Although some progress has been made in outdoor recreational activities for people's health, further research is needed on the various types of outdoor recreational activities that are associated with the different levels of stress. This present study compares the various kinds of outdoor recreation activities from a previous research that is based on the following research question, what is the preferred outdoor recreational activity of people who are reporting stress? Thus, the objectives of this study are (1) to access the stress level and preference of outdoor recreation activities by the adult’s urban population, and (2) to analyse the most preferred outdoor recreational activities by stressed adults who are urban

dwellers, in the urban parks The result of this study is to offer a recommendation that can be used as the grounds for guidance and empiricism, in order to improve the work of the local administrators and urban planners so that their planning and design for activities in the urban park area are relevant to the preferences and demands of stressed individuals.

METHODS

A quantitative survey was conducted in this study in the form of a web-based questionnaire using Google Forms and was posted in social media platforms such as Facebook and WhatsApp's application. The convenience sampling approach with uncontrolled instrument distribution was used in this study for those who met the criteria, to fill up the questionnaire (Schonlau et al., 2002). Screening question was implemented to ensure that the respondents are from Kuala Lumpur city centre and who are eighteen years old and above. Correspondingly, the strength in using the Google Forms was that it can be set to prevent multiple access by the same people with the same email.

The data were conducted for adults in Kuala Lumpur by obtaining their information which include personal data (gender, age, socioeconomic status), preferences for outdoor recreational activities in urban parks, and health status. For this study, a study was conducted between 1st. of July to the 31st. of July 2020. This pilot study was conducted to improve and was revised for the final questionnaire survey.

The questionnaire consisted of four parts. The first part obtained the respondent's profile data such as gender, age and social-economic status. The second part focused on the self-rated respondent's health status by using a developed instrument named DASS 42. The DASS 42 is a reliable instrument that is used widely in Malaysia to measure psychological parameters (Imam, 2008), with the Malay language that has been translated by Ramli et al. (2012). DASS 42 was divided into three dimensions- depression, anxiety, and stress scale. Each of the dimensions was divided into five levels: normal, mild, moderate, severe, and extreme. The answer was listed on four scales from 0 = did not apply to me, 1=apply to me some degree, 2 = apply to me in a considerable degree, to 3= apply to me most of the time. To achieve the second objective of this study, the discussion will only focus on the stress dimension of people with severe and extreme stress levels. In the third part, the respondent was given the multiple-choice answer on outdoor activities that they preferred to do in the urban park. 20 types of outdoor activities were listed referring to the previous research (see Karlsson & Grahn, 2011; Ngesan et al., 2013; Ratcliffe et al., 2013; Sreetheran, 2017; Zainol & Au-Yong, 2016; Ni et al., 2019). The criteria have been listed in Table 1. The fourth part is the preference for park characteristics in the urban parks. However, the fourth part will not be discussed in this study as this study only focuses on the preference type of outdoor recreational activities.

The statistical analyses in terms of factor analysis, reliability, and descriptive analysis such as frequency and percentage score were conducted using the statistical software package IBM SPSS 23 in order to meet the objective.

Table 1: Type of outdoor recreation activities

Items	(Zainol & Au-Yong, 2016)	(Sreetheran, 2017)	(Karlsson & Grahn, 2011)	(Ratcliffe et al., 2013)	(Ni et al., 2019)	(Ngesan et al., 2013)
Enjoy or nature	/	/	/			
Exercising facilities			/			
Enjoy sports	/	/	/			/
Picnic	/		/			/
Jogging and brisk walking			/		/	/
Cycling			/			
Meet up with people	/	/				
Socialise with family		/				/
Socialise with others		/				/
To get fresh air		/	/		/	
Release stress		/			/	
Rest and relaxation		/				
Exercise to stay healthy	/	/				
To obtain peace and quiet		/				/
Watch others			/			
Accompany children at the playground			/			
Play remote controlled			/			
Sound of birds				/		
Enjoy the sun					/	
Photography						/

Source: Author, 2021

RESULT AND DISCUSSION

Demographic Characteristics

A total number of 62 (N) respondents took part in the survey. The demographic characteristics such as gender, age, race, education level, occupation and income status have been listed in Table 2.

Table 2: Socio-demographics characteristics of respondents

Description	Item	Frequency	Percent
Gender	male	18	29.0
	female	44	71.0
Age	18-25	12	19.4
	26 – 35	28	45.2
	36 – 50	22	35.5
Race	Malay	60	96.8
	Indian	1	1.6
	Others	1	1.6
Education level	Secondary School	4	6.5
	Certificate	3	4.8
	Diploma	14	22.6
	Degree	27	43.5
	Masters	12	19.4
	Doctorate	2	3.2
Occupation	Government sector	22	35.5
	Private sector	19	30.6
	Self-employed	7	11.3
	Retiree	11	17.7
	Student	3	4.8
Monthly income	No income	28	45.2
	Below RM2000	34	54.8

Factor Analysis

The 20 items of outdoor recreational activities were subjected to a principal components analysis (PCA) using SPSS version 23. Prior to performing PCA, the suitability of data for factor analysis was assessed. Inspection of the correlation matrix revealed the presence of many coefficients of .3 and above. The Kaiser-Meyer-Olkin value was .76, exceeding the recommended value of .6 (Kaiser 1970, 1974) and Bartlett's Test of Sphericity (Bartlett 1954) reached statistical significance, supporting the factorability of the correlation matrix (refer Table 3). The principal components analysis revealed the presence of six components with

eigenvalues exceeding 1, explaining 20.2%, 14.35, 10.9%, 10.3%, 6.2% and 6.1% of the variance respectively. An inspection of the scree plot revealed a clear break after the second component. Using the Catell's (1966) scree test, it was decided that two components for further investigation were to be retained. This was further supported by the results of the Parallel Analysis, which showed only two components with eigenvalues exceeding the corresponding criterion values for a randomly generated data matrix of the same size (20 variables × 62 respondents). The two-component solution explained a total of 41.7% of the variance, with Component 1 contributing 24% and Component 2 contributing 17.6%. To aid in the interpretation of these two components, an oblimin rotation was performed. The rotated solution revealed the presence of a simple structure (Thurstone 1947), with both components showing a number of strong loadings and all variables loading substantially in one component. The interpretation of the two components was consistent with the previous research (see Malek et al., 2015) on outdoor recreational activity with the passive activity items loading strongly on Component 1, while the active activity items loading strongly on Component 2 (refer to Table 4). Accordingly, one variable (accompany children at the playground) has been omitted because it cannot be loaded onto any factor.

Table 3: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	504.633
	df	190
	Sig.	.000

Table 4: Factor analysis

Factor	**Item**	**Theme**
1	Enjoy the peace	These items appear to be passive activity
	Enjoy fresh air	
	Sound of birds	
	Enjoy nature	
	Photography	
	Enjoy the sun	
	Rest and relaxation	
	Picnic	
	Watch others	
	Release stress	
2	Play remote controlled	These items appear to be active activity
	Socialise with family	

Meet up with people
Exercise to stay healthy
Exercising facilities
Enjoy sports
Jogging and brisk walking
Socialise with others
Cycling

Reliability Test

The two factors that were produced by the PCA were tested for reliability, using Cronbach's alpha (a). Factor 1 (passive activity) shows a very high internal consistency with an overall of .861. Item-total correlations were generally at least moderate, the squared multiple regression generally confirmed that variance was moderately explained throughout. The Cronbach's alpha would not benefit from the removal of any item. This level of internal consistency was also seen for Factor 2 (active activity; a = .766).

Stress level reporting by the respondents

From the questionnaire survey, the respondents choose which outdoor activities they prefer in the multiple-choice answer. From the five groups of stress level, eleven percent of the respondents belong to the group with severe and extreme stress (Stress level >26), while eighty-eight percent belong to the group that is known to have medium stress or less (Stress level <26) (refer to Table 5).

Table 5: Different stress level by the respondents

	Frequency (n)	Percent (%)
No to medium	55	88.7
Severe to extreme	7	11.3

Type of passive activities people reporting stress prefer

To discover which of the outdoor recreational activities that people who were reporting stress preferred when they visited the urban park, a frequency analysis was conducted. Figure 1 shows that more than fifty percent of severe to the extreme stress level respondents choose 'enjoying the peace', 'resting and relaxation', 'enjoying the fresh air', 'releasing stress', 'enjoying the nature', 'enjoying the sun' and 'the sound of birds' as their preferences.

Referring to this result, the activities that are preferred by people who are reporting stress are not particularly physically demanding. The result was in line with the study by Stigsdotter et al. (2010) regarding individuals who had

reported stress and who visited green spaces for reducing stress and to relax, in order to achieve peace and quiet without noise. The most recent study by Gao et al. (2019), found that the people with the most stress were more likely to prefer quiet activities. Quiet activities do not require total silence, but can be secured through bird songs or sounds from a natural element that can bring recovery for stressed people (Ratcliffe et al., 2013).

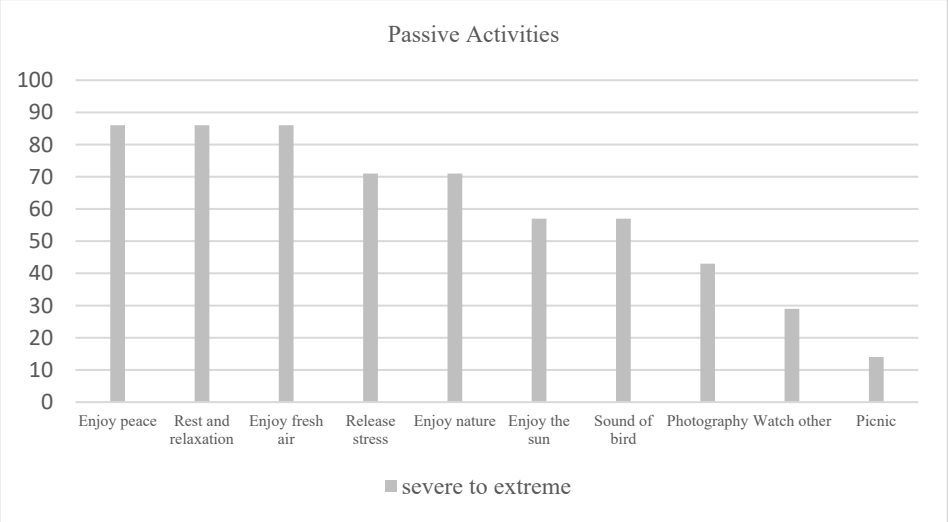

Figure 1: Preferences of passive activities by severe to the extreme stress level of respondents

Type of active activities people reporting stress prefer

Figure 2 shows the active activities such as jogging and brisk walking which are the most preferred by people who are reporting stress. Activities such as walking and jogging are common activities that are performed in open space, and have been researched by Pietilä et al. (2015), Wooller et al. (2018), and Zuniga-Teran et al. (2019); it has been proven that those activities have restorative effect on health, emotion and feeling. Moreover, the research by Bailey et al. (2018) has reported that walking in an area of greenery provides peace and calm to the people who are reporting stress. This suggests that people who are reporting stress are more positively oriented towards walking in an area of greenery or routes.

Meanwhile, activities that were related to social demand such as meeting up with people, socialising with others or family, playing remote-controlled items, cycling, enjoying sports, were found to be the least preferred by people who were reporting stress. This finding is expected since gathering activities should be avoided for people who are experiencing stress as has been stated in Karlsson and Grahn's (2011). This argument is also consistent with the

recent findings from Hadavi et al. (2015) where the rest and restoration activities need a place where people can be alone.

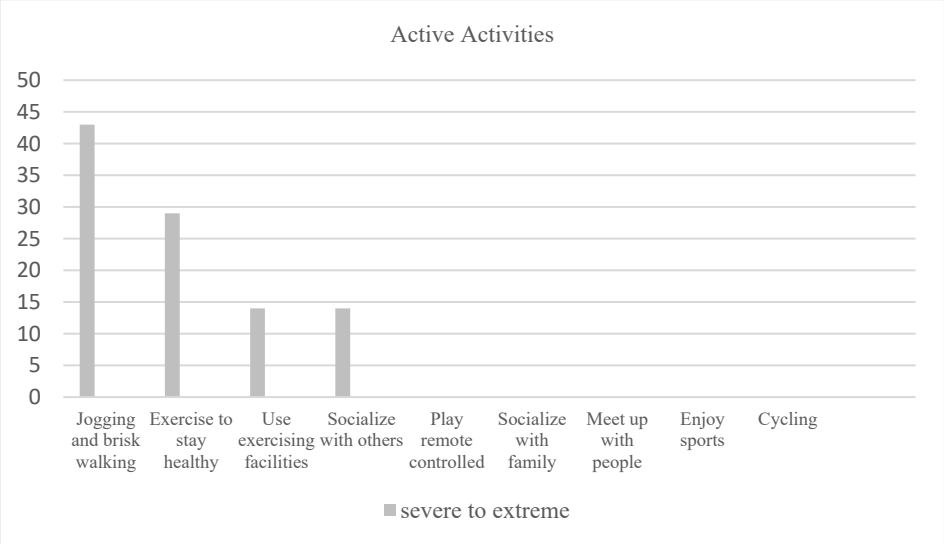

Figure 2: Preferences of active activities by severe to the extreme stress level of respondents

CONCLUSION

The findings from this study reveal that the physical characteristics that need to be incorporated in the planning and designing of urban green spaces have been specially tailored to the needs of people who are reporting stress. Another noticeable finding is that individuals with high levels of stress prefer to enjoy the nature, sun, peace, fresh air, and the sound of birds, to go jogging, brisk walking, rest and engage in relaxation activity, and release stress in the urban park. Thus, the physical characteristics that need to be incorporated in the planning and designing of the urban park have been specially tailored to the needs of people who are reporting stress. Under this circumstance, if the objective of the society is to promote the health and well-being of its citizens, increasing the use of the urban parks by enhancing their characteristics and qualities is probably a good way to achieve the objective. These findings have suggested that the urban parks need to be a public health promotion resource, particularly to reduce socio-economic inequalities, which usually have a strong impact on health (Mitchell &` Popham, 2008). As a consequence, there may be a need to analyse and partially redesign open green spaces with regard to the urban context and the needs, preferences, and health problems of modern citizens. One method of doing this

could be to provide a park design with space for outdoor activities. Within the field of landscape and local planning, both fields will benefit from this study.

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THE CROSSFIRE OF CORPORATE REAL ESTATE SUSTAINABLE MANAGEMENT WITH CORPORATE SUSTAINABLE OBJECTIVES IN MALAYSIA

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Abstract

The emergence of corporations dabbling in sustainable development has caused a shift from the conventional way of managing office building to a more systematic approach involving high technology. Various discussions espouse the positive impact of sustainable office buildings on business. However, previous studies only discussed the elements involved, but most of these discussions did not specify which element that significantly contributed to business objectives. Thus, this research attempts to discover the relationship between corporate real estate sustainable management (CRESM) and corporate sustainability (CS) objectives to determine the most significant element of CRESM influencing overall CS objectives. A questionnaire survey was carried out involving 117 combinations of corporate real estate managers who are directly involved in managing sustainable offices in Malaysia. Data was then analyzed using IBM SPSS Smart PLS. Results indicate six elements of CRESM significantly affect CS objectives that hope to assist corporate real estate managers to well manage their sustainable office buildings as well as contributing to achieve their business objectives.

***Keywords**:* Sustainable office building management, corporate real estate sustainable management, corporate sustainable objective, relationship, structural equation modeling

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INTRODUCTION

The growing number of sustainable buildings, especially office buildings, in Malaysia since 2009 presents itself as a new strategic planning approach which is employed worldwide (Rasoolimanesh et al., 2011). The tabulation of sustainable office building developments in Malaysia commonly owned by the corporate companies as they realize that sustainable office building developments contribute positively to their business image. Hence, good and effective management is crucial to achieve sustainable development in the cities (Samzadeh et al., 2016). The sustainable office building management of the corporations is called corporate real estate sustainable management (CRESM).

Previous research reveals a resounding lack of discussion on CRESM and its practices particularly on the elements involved that are directly related to the triple bottom line theory (Fauzi et al., 2018). Similarly, there is a noticeable void in literature on their relationships as well as their contributions towards overall corporate sustainability's (CS) objectives. Numerous elements were identified as conferred on sustainable practices of corporate real estate management but they were mostly found outside Malaysia; that was found in Masalskyte et al. (2014) and Lützkendorf and Lorenz (2014). Unfortunately, the data recorded was highly heterogeneous (Fauzi et al., 2016), requiring careful scrutiny on specific areas to make it more discernible and relevant. Different types of property and business industries involved offer different opinions and provide different views and findings. These are because they have redundant or opposing opinions. Appel–Meulenbroek and Haynes (2014) mention that the companies adopt many different corporate strategies as a result of various models and approaches being developed by the companies and hence, too difficult to practice.

Thus, this research aims to investigate the relationship between CRESM and corporate sustainability (CS) objectives and to identify the significant element that will influence the success of the whole corporation's business performance. The research focuses on sustainable office buildings that are certified with GBI to ensure the relevance of the practice to be shared by the same sector in future. The sustainable office buildings were selected as the nature of business from the building might have various discrepancies, especially on their building management.

LITERATURE REVIEW

Many definitions for sustainable building exist, but none are entirely satisfactory (Sayce et al., 2007). Sustainable buildings are often equated to 'green buildings', and vice versa (Sayce et al., 2007). Muniandy (2019) found that sustainable building features a number of terminologies such as "green building" adopted by

the US, "sustainable building" adopted by the UK and Australia, "sustainable architecture", and "sustainable construction". These buildings are often termed interchangeably as green buildings, high performance buildings, sustainable buildings, and sustainable construction (Shaikh et al., 2019). Nevertheless, for this research the term sustainable building was adopted. Where it is also a part of a sustainable development, it is a process to encourage people to preserve and protect Earth's life support system (Tjenggoro & Prasetyo, 2018).

CRE is initially known as land and buildings owned by corporations, not primarily in the real estate business. However, the CRE in Malaysia is defined as corporate assets owned or leased by non-real estate companies including developers' properties in which the properties are used for investment purposes and not as stock for trade. CRE also involves properties owned by government agencies, especially by profit-oriented agencies. (Fauzi et al., 2020). CRESM used in this research is defined by the UNEP FI as the integrated management of all economic, environmental, and social aspects of an organization's property activities and associated investment decision-making (Lowe & Ponce, 2014). Sometimes the management of sustainable building is also referred to as sustainable corporate real estate management (Ziemba, Ramian, & Kania, 2015), CRESM (Fauzi et al., 2021; Sinke, 2015), or CRE sustainability management (Lützkendorf & Lorenz, 2014).

Whereas, CS objectives represent the organization's willingness to be involved in environmental programs to engage with both internal and external sustainable factors (Janda et al., 2016). Isaksson (2019) defined corporate sustainability as how the organization describes how economic, environmental, and social issues relate to its long-term strategy, risks, opportunities, and goals. The CS objectives are based on the TBL that was developed by Brundtland, 1987 which encompassed the three sustainable criteria of environment, economic, and social criteria (Jenkins, 2009). The TBL was adopted to cover more comprehensive sustainability coverage for the CS objectives as well as the CRESM elements.

RESEARCH METHODOLOGY

The questionnaire survey was distributed to 117 of corporate real estate managers, property managers, facility managers, operation managers, building managers, and financial managers that are directly involved in managing sustainable office buildings that are certified with green building index (GBI) in Malaysia. 100 returns were finalized. The research adopts purposive sampling to fulfill the minimum required numbers projected by Raosoft (90 samples) and G*Power (98 samples). The instrument covers three parts namely the backgrounds of the respondents, CS objectives, and CRESM elements. A five-point likert scale was

adopted: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4) and strongly agree (5) (Fauzi et al., 2012).
The questionnaire developed has gone through the pre-test with six experts from the real estate field, statistics and language to ensure the validity and reliability of the instrument's contents. This was due to the small sample available for the research, similar to Hunt et al. (1982), who stated that pre-testing the use of a questionnaire in a small pilot study. Pre-testing was also conducted by Lo et al., (2016) to check whether the questions were clearly understood by the respondents and to determine if any further modification of the items and format was necessary.

The descriptive analysis of frequency analysis was conducted to analyze the backgrounds of the respondents while SEM-PLS analyzed the relationship between CRESM and CS objectives. PLS-SEM is a common analysis approach used to show the relationships that exist among variables of interest (Hair et al., 2017) as also agreed by Ramayah et al. (2018) that mentioned, it is suitable for research that aims to explain the relationship between dependence and independence variables.

RESULTS AND DISCUSSIONS

The result in Table 1 indicates 53% of the respondents are from the property management department while 38% are from the facility management department and another 9% are from other departments. These other departments include the building management department, operation and technical department, maintenance department, operations department, property investment department, building control system department, and energy department. In fact, many departments are involved in managing the sustainable office buildings with the most common being the property management department and facilities management department.

Table 1: Working Departments

Department	Percent
Property Management Department	53.0
Facility Management Department	38.0
Others	9.0
Total	100.0

Based on Table 2, 51% of them have less than five years' experience managing sustainable buildings, while 49% of them have more than five years' experience. The short years of experience are because the sustainable office buildings in Malaysia are still at the early stage of development, thus less numbers were

available in the market. A T-test was carried out in order to determine the statistically significant differences between these two categories. The T-test result shows that the difference in number of years' experience varies considerably, but no clear pattern is discerned. Overall, the differences between <5 years and >5 years towards corporate goals and CRESM elements are relatively small and explain the non- significant differences.

Table 2: Years of experience managing sustainable buildings

Year	Percent
< 5 years	51.0
>5 years	49.0
Total	100.0

Table 3 indicates the results from SEM-PLS analysis. Two types of validity are examined, which are the convergent validity and discriminant validity (Gholami et al., 2013). Eleven out of nineteen results recorded fulfilled requirements. The other eight results were rejected due to numerous reasons that do not fulfill the requirement of the model fit. This shows eleven relationships were accepted. The accepted results are denoted with YES marks. In contrast, the rejected results are denoted with NO marks.

Table 3: Summary results of SEM-PLS

	STAND-BETA	T-VALUE >1.645	P-VALUE <0.05	BCILL	BCIUL	F2	VIF <5	ADJ R2 =>0.10	Q2 >0	RESULT
ENM -> ENV	0.380	3.750	0.000	0.210	0.540	0.100	2.890	0.49	0.25	YES
INN -> ENV	0.280	1.652	0.050	0.030	0.530	0.180	2.620			YES
IGM -> ENV	0.090	0.420	0.340	-0.330	0.360	0.000	4.210			NO
WAS-> ENV	-0.030	0.180	0.430	-0.260	0.330	0.000	3.780			NO
WTM -> ENV	0.140	1.350	0.090	-0.030	0.300	0.020	2.330			NO
WPM -> ENV	-0.020	0.130	0.450	-0.260	0.260	0.000	2.060			NO
HSM -> SOC	0.430	2.560	0.010	0.080	0.650	0.120	3.520	0.55	0.32	YES
INN -> SOC	0.320	2.660	0.000	0.100	0.480	0.100	2.400			YES
IGM -> SOC	0.230	1.490	0.070	-0.030	0.440	0.030	4.660			NO
WPM -> SOC	0.270	2.090	0.020	0.080	0.480	0.070	2.390			YES
WSM -> SOC	-0.470	3.640	0.000	-0.740	-0.300	0.120	4.300			YES
HSM -> ECOMAX	0.310	2.120	0.020	0.080	0.530	0.060	3.120	0.51	0.23	YES
INN -> ECOMAX	0.150	1.650	0.050	0.000	0.320	0.020	2.330			YES
OGM-> ECOMAX	-0.120	1.430	0.080	-0.310	-0.020	0.020	2.060			NO
WPM-> ECOMAX	0.430	3.240	0.000	0.200	0.630	0.190	2.060			YES
ENM -> ECOMIN	-0.350	1.790	0.040	-0.580	-0.040	0.070	2.490	0.24	0.12	YES
INN -> ECOMIN	0.160	1.090	0.140	-0.080	0.390	0.020	2.210			NO
IGM -> ECOMIN	0.660	4.130	0.000	0.360	0.880	0.180	3.240			YES
WTM -> ECOMIN	-0.170	1.040	0.150	-0.450	0.090	0.020	2.240			NO

Notes {

Enm-Energy Management; INN-Innovation Management; IGM-Internal Green Management; WAS-Waste Management; WTM-Water Management; WPM-Workplace Management; WSM-Workspace Management; HSM-Human Satisfaction Management; OGM- Organization Management; ENV-Environment Objective; SOC-Social Objective; ECOMAX-Economic Value Maximization; ECOMIN-Economic Cost Minimization

Energy Management -> Environment

Corporate environment sustainability objectives showed a positive relationship with the element of energy management. This is in accordance with Kamaruzzamana et al., 2019; Shurrab et al., 2019; Støre-Valen and Buser, 2019, who found that a reduction of energy use contributed to environmental sustainability. Ajayi et al. (2019), Chang and Devine (2019), and Ilhan and Banu Yobas (2019) also found that energy efficiency implementation reduces the impact on the environment, as well as producing local and global environmental benefits (Omer, 2014).

Innovation -> Environment

Corporate environment sustainability has had a positive relationship with innovation. This corresponds with Kamaruzzamana et al. (2020) and Attiya, Shebl, and Nasser (2020) who mentioned innovation is able to provide environmental benefits, especially towards any new approaches and designs adopted to improve sustainability. The concept of innovation in sustainability has grown rapidly, in line with the evolution of current demand and practices across the world. Research into this has increased since 2008 (Maier et al., 2019).

Human Satisfaction Management -> Social

Human satisfaction management in this research shows a positive relationship with social sustainability objectives of the corporation. This is similar to Abel (2013), who mentioned that human satisfaction may cause positive worker performance. Human satisfaction can also result in reducing absenteeism, complaints, and staff turnover (Abel, 2013). Human satisfaction can create opportunities for organizational improvements that can capitalize on human abilities and encourage employees to become more committed and loyal to the organization (Abel, 2013).

Innovation -> Social

In the real estate sector, growing innovation indicates improvement for better social life because innovation has been counter contributing to positive social benefits (Ma et al., 2017). Different innovation practices lead to different kinds of benefit (Ma et al., 2017). Innovation is able to increase employee's wellbeing, engagement, and satisfaction. (Gibler and Lindholm, 2012: UK Green Building Council, 2018)

Workplace Management -> Social
Workplace management showed a positive relationship with social sustainability objectives. The results are consistent with the findings from research that stated sustainable buildings provide a positive impact on occupants (Agarwal, 2016). Similarly, Newsham et al. (2018) identified a positive relationship between physical office environment and occupants' comfort and satisfaction.

Workspace Management -> Social
Workspace management was found to have a negative link to the social sustainability objective, meaning that the better the workspace management, the less social sustainability objective could be achieved. Afshari et al. (2016) and Lee et al. (2018) found that workspace management in sustainable building is less preferable for employees and causes dissatisfaction among them due to the design of the workspace in sustainable building which could differ greatly from conventional styles. The design needs to fulfil the requirements of green certification, while at the same time reducing costs and the impact on the environment.

Human Satisfaction Management -> Economic Max Value
Human satisfaction management recorded a positive relationship with the economic sustainability objective in relation to maximizing value. HSM contributes to the success of the corporation's sustainable objectives where they aim for value maximization (Zhang, 2015). Goldberger (2010) stated that employee satisfaction, training and education are correlated to productivity, which directly affects business performance. Abel (2013) also found that employee satisfaction is an essential element of the overall success and efficient operation of a business and encourages an organization to achieve high productivity.

Innovation -> Economic Max Value
Innovation management showed a positive association with the economic sustainability objective of value maximization. Amr (2017) mentioned advanced technology can be managed and improved to make way for a new era of economic growth. similar to The UK Green Building Council (2018) that found new innovation practices for production and delivery and new technology can increase productivity.

Workplace Management -> Economic Max Value
Workplace management has a positive relationship with the economic sustainability objectives of the corporation. This finding corresponds with an

earlier study by Perrett (2011), who found that strategic locations for sustainable building are in greater demand compared to other locations. In addition, demand for buildings is influenced more by the location than green features (Dixon et al., 2008; Fiandrino et al., 2018; Wedding, 2008), especially locations in close proximity to convenient transportation facilities (Shen et al., 2014). Locations close to public transportation facilities are in high demand by companies and prospective tenants, including local and international.

Energy Management -> Economic Min Cost

Energy management was found to be negatively related to cost minimization, meaning that costs are incurred for greater energy efficiency and savings that supported by Ohueri et al. (2018) that mentioned energy consumed by green office buildings in Malaysia is higher than the predicted energy. Further, energy management fails to reduce costs due the lack of an integrated and long-term vision, lack of planning for required maintenance, and lack of quality control (Desmarais et al., 2010).

Internal Green Management -> Economic Cost Minimization

Internal green management recorded a positive link with economic sustainability objectives of cost minimization. Internal green management is usually associated with indoor environmental quality, which is used to achieve good indoor air quality performance, acoustics, visual comfort, and thermal comfort (Kassim et al., 2013). This is consistent with the results found in the United States Environmental Protection Agency (2000).

CONCLUSIONS

This research discovered only six out of nine CRESM elements were related to corporate sustainability goals: energy management, workspace management, innovation management, internal green management, workplace management and human satisfaction management. Corporations that aim to achieve environmental sustainability are required to pay more attention to energy management and innovation management. To realize the social sustainability objective, more focus should be given to workspace management, innovation management, workplace management, and human satisfaction management. Further, corporations need to seriously consider energy management and internal green management to reduce expenses and achieve economic cost minimization. CRESM elements of innovation management, workplace management, and human satisfaction management are required to strategically develop economic value maximization.

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AGENCIES' MANAGEMENT PREPARATIONS AND PROPOSED EVACUATION ROUTES FOR FLOOD DISASTER: A CASE STUDY OF MELAKA

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Abstract

The research focuses on the flooding event in Melaka. Flooding has been occurring so frequently in Melaka that assessing the management and preparation for flooding needs to be undertaken. Alor Gajah, Melaka has been selected as a case study because frequent flooding events in the district affected many people. Using FGD as a data collection method, the result showed there is no management structure of flooding events beyond the district level and a proper training for the community is required before the structure can be developed. The original hierarchy and functions under Directive 20 should be maintained. This research suggested a proper institutionalisation of flood management and flood rehabilitation structure for Alor Gajah's district.

Keywords: Agencies, flood disaster, Melaka, preparation

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INTRODUCTION

Natural disasters such as floods threaten the lives and valuable assets of thousands of people every year (Liu & Lim, 2016; McEntire & Myers, 2004) and widespread destruction, economic loss, and loss of life. The National Disaster Management and Relief Committee (NDMRC) of Malaysia is responsible for regulating all relief activities before, during, and after the disaster (Chong & Kamarudin, 2018; Muda et al., 2020). Meanwhile, policies and directives were set by the Prime Minister's Department, known as the National Security Council (Majlis Keselamatan Negara, MKN) and executed by the National Disaster Management Agency (NADMA) (Mohd et al., 2018; Zahari et al., 2020).

The concerns regarding flooding or other disasters are the search and rescue activities, coordinating the assembly of crowds and relocating victims, and ensuring the well-being, welfare and revival of the population following the calamity's impacts. Preparing for disaster is currently responsible for agencies with designation and roles under the law (McEntire & Myers, 2004). However, the public or local community's participation would minimise coordination effort and increase relocation effectiveness (Mohd et al., 2018; Zahari et al., 2020). Identification of access points and rescue centres is essential for the routes or pathways connecting these places. Roads, pathways, or any transportation channels must not be disrupted. Intersections or junctions must not be obstructed. The paving conditions must not be degraded so much that movement or flow cannot pass smoothly. Assistance must be transported and timely rendered so that victims receive the help and necessities to increase probabilities of revival lives as expected, just like before the disaster struck. Mitigation measures must be appropriately strategies to improve and protect the areas from the recurring and extended negative impacts of the disaster (Handmer & Dovers, 1996; Zeithaml et al., 1996). Thus, this present paper aims to assess the management and preparation for flooding in Melaka and identify the alternative routes for the evacuation of the victims.

RESEARCH BACKGROUND

Melaka is located above the state of Johor, the most southern tip of the Asian continent. Melaka is the second smallest state in Peninsular Malaysia, with an area size of 1658 km^2. The estimated (2020) population of nearly 932,000 is governed under three district authorities: Melaka Tengah, Alor Gajah, and Jasin. They are further divided into 81 administrations divisions known as *mukims*. It is strategically located, an hour and a half travel time south from Kuala Lumpur and three hours north from Singapore. The state is accessible by the North-South PLUS highway through three major exits, namely Simpang Ampat, Ayer Keroh and Jasin interchanges.

Alor Gajah is 660 km^2 (Sukor, 2017). Among the primary public facilities and infrastructure provided in the district are stated as follows; a government hospital, ten health clinics, ninety-seven schools, one district police headquarter, twelve police stations and five police huts, and two fire stations). Additionally, forty flood evacuation centres are identified under the state gazette consisting of twenty-seven schools, twelve neighbourhood halls and a large community hall.

Flooding in Melaka is the result of two possibilities. First, the heavy and high-volume rain pouring over a long period. While Melaka is generally located in the Peninsular lowland areas, it has two water dams, with the primary purposes of water retention and domestic supplies. However, the bordering areas in the neighbouring states are generally hilly areas nearing the backbone of Malaysian peninsular, known as *Banjaran Titiwangsa*. Water flows into Alor Gajah district from the southern part of the state. Many villages are in this area and new neighbourhoods and small townships are rapidly developing. Second, the straits' massive tidal flow into Melaka River and its tributaries where these villages are situated along it may occur outside regular intervals. Jus and Durian Tunggal dams rarely overflow, except when these two phenomena are coinciding. Figure 1 depicts the flood-prone areas in Melaka. The list of villages (kampung) under these state legislative areas is tabulated in Table 1 below:

Table 1: List of villages prone to floods

No	State Legislative Areas	Village (Kampung)
1.	Kuala Linggi	1. Kampung Nelayan 2. Kampung Man Lok
2.	Tanjung Bidara	1. Kampung Pulau 2. Kampung Sri Jeram 3. Taman Bidara Emas
3.	Taboh Naning	1. Kampung Cherana Puteh 2. Kampung Taboh Naning 3. Kampung Orang Asli
4.	Rembia	1. Pekan Alor Gajah 2. Kampung Pengkalan 3. Taman Sri Bayu 4. Pekan Rembia
5.	Gadek	1. Kampung Gadek Dalam 2. Sungai Batang Melaka
6.	Machap	1. Kampung Baru Menggong Gen2 2. Kampung Tebong Stesyen
7.	Durian Tunggal	1. Kampung Belimbing Dalam

2.	Taman Angkasa Nuri
3.	Kampung Pulau
4.	Kampung Gangsa

Source: Land and District office of Alor Gajah

National Agency for Disaster Management (Figures 2 and 3), working under the purview of Directive 20 of a National Security Council, is the agency responsible for all disaster management at the Federal level. It has a branch in all Malaysian states. Various disasters require specialised organisational institutions to manage the respective disaster. Pertaining to health issues, for example, National Crisis Preparedness and Emergency Response Centre (CPRC), the lead agency is the Health Ministry. Similarly, the state and district committees for flood management are set up in the event of flooding.

The district committee for flood management is chaired by the District Officer (Figure 4). The secretariat is the district Civil Defence Force. The members of the district disaster management committee included the district police chief, head (YDP) of the municipal council, head of district fire and rescue department, district medical officer, director of the district hospital, district engineer of public works department, district community welfare department, district education department, director of district meteorological department, assistant engineer of district irrigation and drainage department and RELA district officer. The community is also part of this committee (nine penghulu or village leaders in Alor Gajah state assembly, ninety-seven Majlis Pengurusan Komuniti Kampung (MPKK) and six Majlis Pengurusan Komuniti Kampung Baru (MPKKB) leaders).

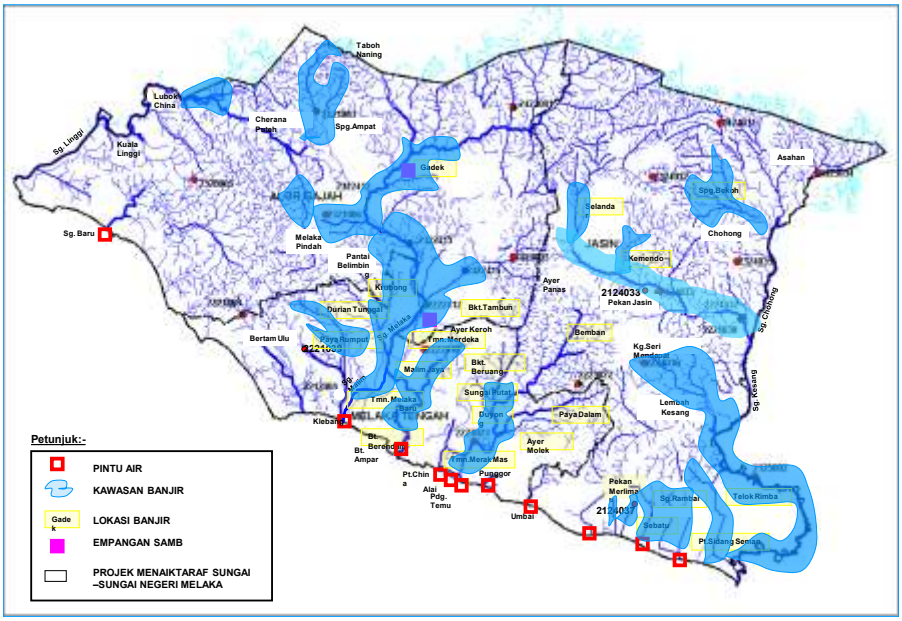

Figure 1: Map of high flood risk areas in Alor Gajah district
Source: Land and District office of Alor Gajah

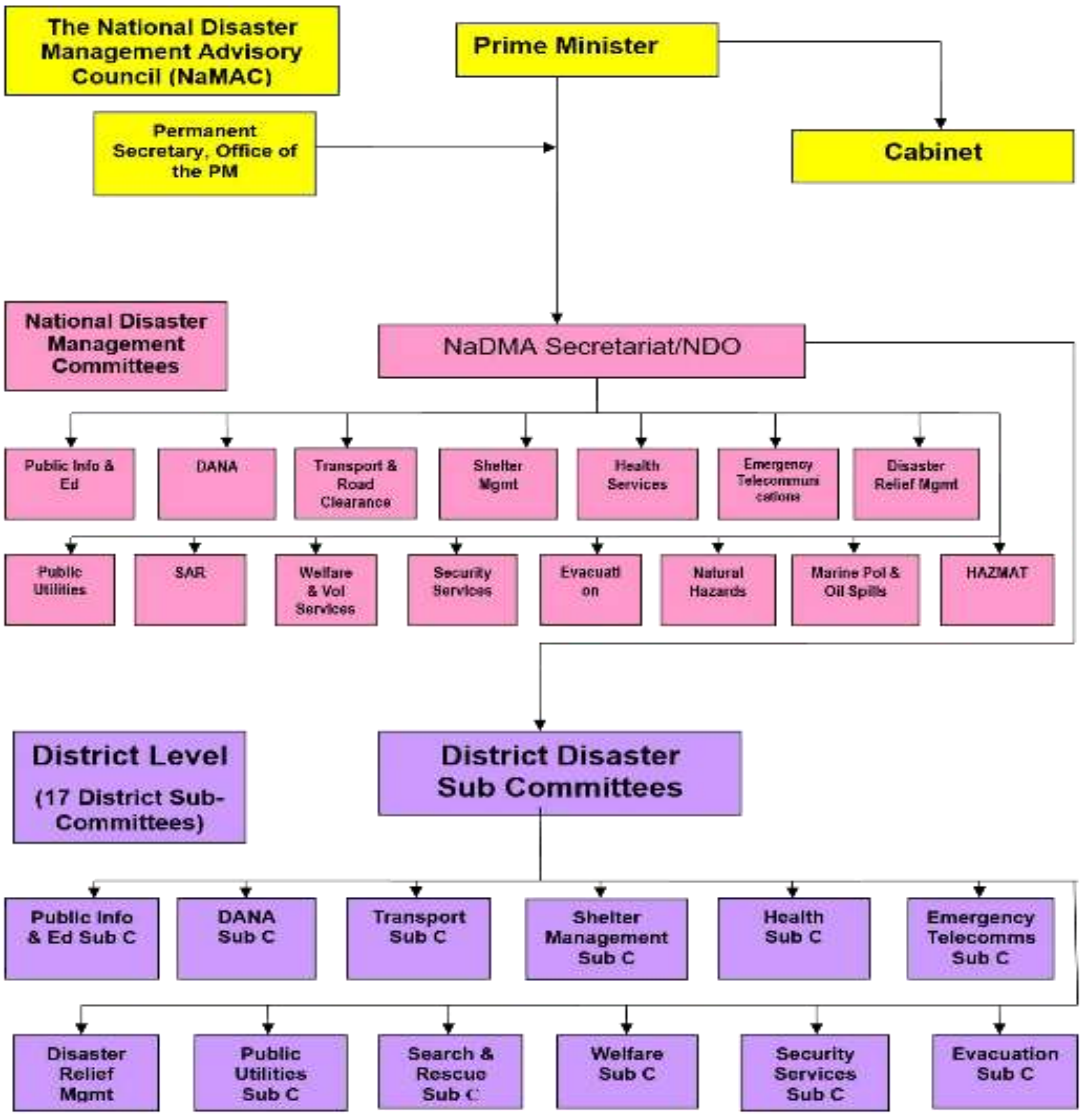

Figure 2: National Agency for Disaster Management (NADMA) council structure
Source: NADMA Website

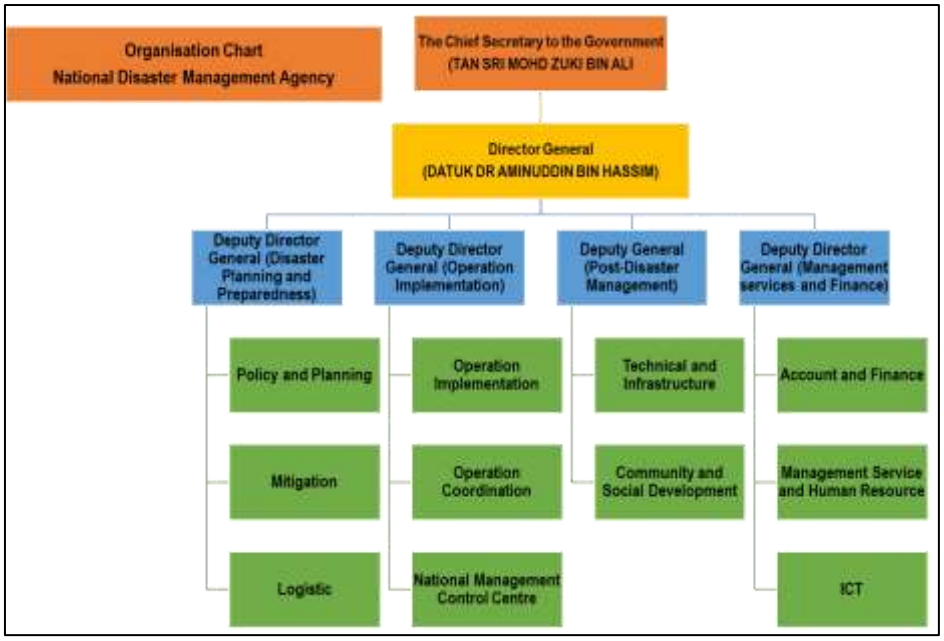

Figure 3: The executive memberships of the national agency for disaster management for 2019
Source: NADMA Website

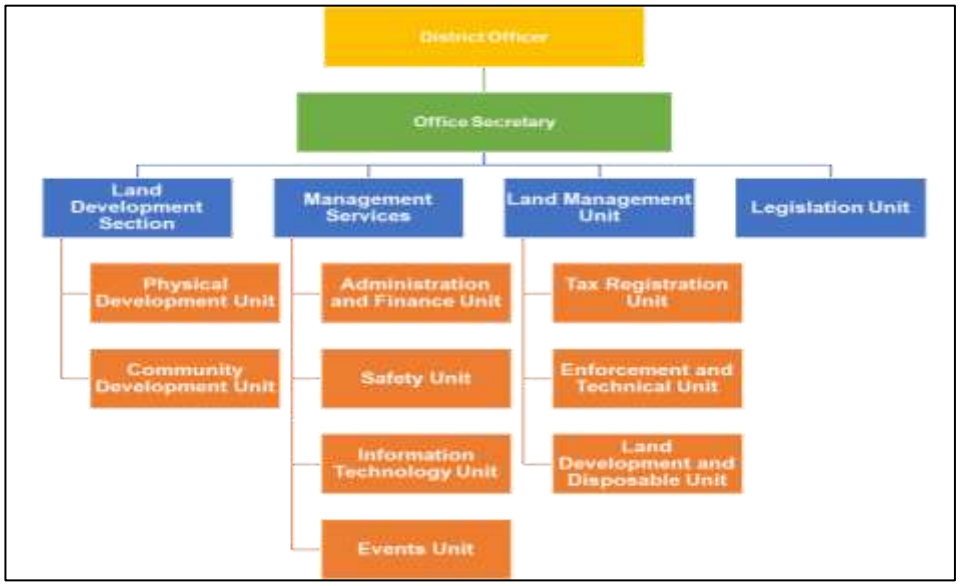

Figure 4: Typical organisational structure at the District Office level.
Source: Land and District Office of Alor Gajah Website

METHODOLOGY

This study adopted qualitative methodologies of research. It has employed the focus group discussion to capture primary data. The instruments utilised were audio and visual recordings of conversation based on focus group discussion conducted on the flood disaster preparation, first-hand experience dealing with flood and mitigation measures following the events. Data was collected between July and December of 2019. Focus group discussion topics were focused on significant flooding events up to December 2018, which fall under Level 1 based on MKN's definition. Flooding on a smaller scale, such as flash flood due to a clogged drainage system, does not carry the weightage required for MKN's Level 1 disaster. Any recurring event beyond this date has not been considered during the focus group discussion sessions. The focus group discussion intends to discuss the readiness of the community in facing a disaster and also to identify if there is a formal or informal set up at the community level. The proposed options for disaster management at the community level also provided to get the opinion from the agencies. Likewise, any preparation, search and rescue actions, as well as mitigation and revival activities beyond December 2018, are not included in the scope of this paper.

In July 2019, a significant flooding event occurred in Alor Gajah. Several policies, strategies and programmes were scheduled, implemented, and enforced by the state and district committees before the event. Following this event, physical and structural rehabilitation have been scheduled as recovery actions. Data collection on these initiatives is conducted through focus group discussion. Invitation to 20 agencies was made, the session carried out in October 2019. The agencies invited are as follows; Alor Gajah Chief Assistant District Officer, District and Land Officer of Alor Gajah; Malaysia Civil Defense Force, Alor Gajah; Fire and Rescue Department, Melaka; Public Work Department, Alor Gajah; Department of Town and Country Planning, Melaka; District Police Officer of Alor Gajah, Melaka; Alor Gajah Municipal Council; Civil Aviation Association of Malaysia; Indah Water Consortium, Melaka; Meteorology Department of Malaysia; Department of Mineral and Geoscience, Melaka and Negeri Sembilan, Malaysia; Department of Survey and Mapping, Melaka Malaysia; Department of Irrigation and Drainage, Alor Gajah, Melaka; Department of Orang Asli Development, Melaka; Department of Environment, Melaka; Department of Social Welfare, Alor Gajah, Melaka; Health District Office of Alor Gajah, Melaka; Syarikat Air Melaka Berhad (Water Supply Agency/Company) in Melaka; Tenaga Nasional Berhad, Melaka (Electricity Supply Agency) and National Disaster Management Agency (NADMA). However, only 11 of the agencies granted the invitation and attended the focus group discussion session. All these agencies invited are according to the Directive 20 of a National Security Council as lead and responsible agencies in disaster

management. Therefore, all agencies were invited to explain their specific roles in disaster management and get their opinion for any improvement and needs to strengthen the current disaster management chain.

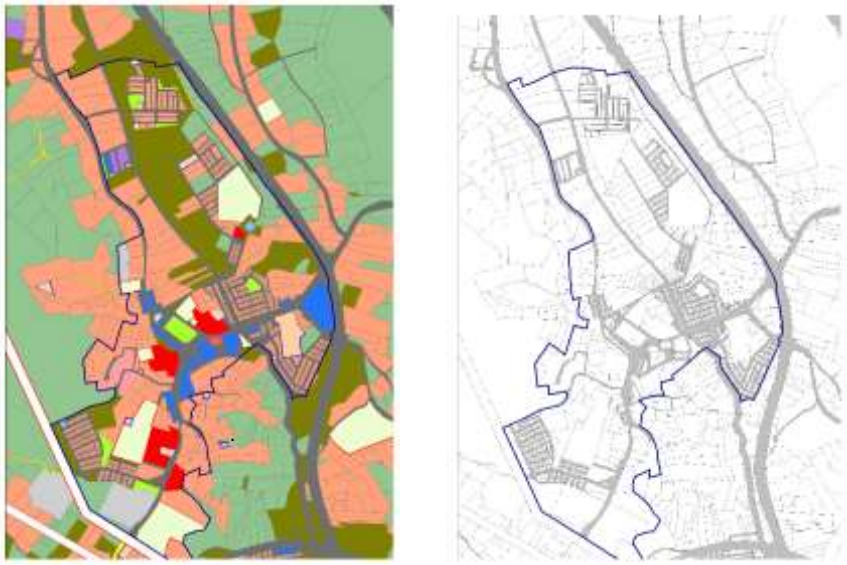

Figure 5: Landuse and road network maps as part of prop used during the data collection session.

Photo 1: Focus group discussion sessions held in Melaka state (2019)


Unit Alam Sekitar
Penyelidikan dan Inovasi
NADMA sub-daerah
Pangkalan Data
Pelan Risiko
Pelan Bahaya
Sistem Amaran Awal
Hebahan Awam
Agensi Multi-disiplin
Audit Bangunan, Laluan Pengangkutan
Insuran
PKOB
Unit Cerun/Pengairan
Data Raya
NADMA sub-daerah
Pangkalan Data
Pelan Risiko
Pelan Bahaya
Sistem Amaran Awal
Hebahan Awam
Agensi Multi-disiplin
Audit Bangunan, Laluan Pengangkutan
Insuran
PKOB
Unit Penguatkuasaan
Skuad Pantas
NADMA sub-daerah
Pangkalan Data
Pelan Risiko
Pelan Bahaya
Sistem Amaran Awal
Hebahan Awam
Agensi Multi-disiplin
Audit Bangunan, Laluan Pengangkutan
Insuran
PKOB

Figure 6: Proposed organisational structure for Climate Change Division for local authorities, each option headed by a different unit such as Environmental Unit or Slope/Drainage Unit or Enforcement Unit.

Figure 5 and Photo 1 illustrate the materials, members and sessions that were conducted during the focus group discussion (FGD) in Alor Gajah. The unstructured questions raised were the effectiveness level of the current organisational set up at the local hierarchy, whether the communities are prepared to independently in the event of total network inaccessibility, which were the primary and alternative evacuation routes during flooding and which alternative structure was preferred as a new establishment of local disaster management structure. Figures 6 through 7 were presented during the FGD. Members were divided into two groups to discuss their experience and actions during the flood, select their preferred alternatives and present their findings in 20 minutes.

(a) Alternative 1

(b) Alternative 2

(c) Alternative 3

(d) Alternative 4

Figure 7: (a), (b), (c), (d): A set of 4 choices of sub-district disaster management organisation for selection by focus group members

FINDINGS AND DISCUSSION

Results from the discussion differed from one group to another. Group A members informed the FGD session that the flood victims were not immediately transferred to evacuation centers directly from their flooded housing area. Two factors would influence such a decision: the severity of the flood and the accessible road network allowing transfers to happen. In some events, the flood may not reach more than 60cm deep, not even reaching the front door, and sometimes roads are blocked due to severe flooding. The members agreed that saving lives was the ultimate objective. Health personnel would prioritise people with a disability or bedridden or pregnant ladies in terms of the hierarchy of transfer facilities and decision-making. They selected alternative 4 (Alor Gajah Municipal Council leading their new establishment) to choose a localised independent community flood management establishment. In their view, community inputs were helpful, especially in mapping and simulating primary or alternative rescue and evacuation routes and evacuation guide leaders.

Nevertheless, they insisted that the original hierarchy and functions under Directive 20 should be maintained. Front liners would be the security and rescue personnel such as the Police, the Fire and Rescue Department, the Civil Defense Force, and the Armed Forces. The second liners, such as the Health Department and Social Welfare. Department will be responsible only when the evacuation centres are activated. Mapping and simulation of flooding scenarios should be analysed using data provided by the technical departments, such as water level early warning (Department of Irrigation and Drainage), Unlike the previous group, Group B perceived differently in several matters. This second group argued that the community members were not equipped with the knowledge and experience to manage a localised flood management committee. They do not have the skills and technical know-how in or legal jurisdiction to execute any rescue or transporting activities. The communities should be adequately trained and be categorised into stages of professionalism (20% or 40% or 80% capability to carry out flood management functions). This group selected alternative 2 (the Police and Social Welfare Department to lead their new establishment) to choose a sub-district level flood management committee. The group insisted that the District Office should still lead the flood operation control centre. The group argued that generally, flooding in Alor Gajah was mostly flash flood in nature and seldom would require direct community involvement in planning, management, and recovery.

CONCLUSION AND RECOMMENDATION

According to the focus group discussion input, in the preparation and planning for the disaster, the agencies that participated in the FGD have outlined and proposed several Standard Operating Procedures (SOP) to be strictly followed:

1. The secretariat will be providing administrative services to state/district disaster management committees and other workgroups related to disaster management.
2. Coordinate the management and simulations of comprehensive disaster management, education strategy, training, and awareness to the community.
3. Provide efficient training for the officers and staff at district offices and agencies involved in operating rooms during a disaster.
4. Strengthen and coordinate communication networks between the district and management agencies' rescue zone using existing facilities or technologies.
5. Make sure the practice, understanding and implementation of State Disaster Management mechanisms.
6. Arrange the duties schedule for department relations officers in the state/district movement room.
7. Monitor and coordinate the implementation of disaster risk reduction to prevent or reduce disasters by government agencies.
8. Update the state and district disaster management profile.
9. Prepare and deliver briefing of state/district disaster preparation and management to the Working Secretary (SUK) or District Officer (DO).

Besides that, among the strategies that have been outlined during the disasters are partially operating the State Movement Room and performing monitoring when a disaster situation reaches level 1. The secretariat also outlined the need to advise the Chairman of the State Disaster Management Committee for the state movement room's complete operation when the disaster situation (flood) reaches level 2. Furthermore, the secretariat will be directing all agencies involved and government departments to assign each officer in the state movement room for ease of commands and controls over the situations. Additionally, the secretariat will be coordinating the agencies under the State's Disaster Management Department (JPBN) while updating the status. Report either to be submitted to NADMA (NDCC) or JPAM's Operational Control Center (PKOP). Lastly, the secretariat will be coordinating the up-to-date mission of disaster assistance and reporting from state to state in a systematic network.

Finally, the secretariat will hold a disaster control post-mortem meeting right after a disaster for the post-natural disasters and coordinate the state and district's grant money for financial assistance from KWABBN to fund the vulnerable victims. Therefore, based on this research it can be concluded that, there is no formal or informal set up at the community level and there is a need to form a set up with proper training at the community level. The alternative has been selected by the group based on their experience and consideration. The readiness of the community is one of the main important elements to be considered before the set up in community level can be realized.

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DETERMINING THE FEATURES OF AGE FRIENDLY FOR CITY DEVELOPMENT

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Abstract

Malaysia is projected to become an aging nation in the year 2035. As a significant fraction of the elderly is anticipated to be residing in urban areas, therefore it is critically important for local and relevant government agencies to prepare the city environment for the increasing aging population. Age-friendly city is a concept emerged to address the urban aged population through various strategies. Although a significant number of studies were conducted on age-friendly cities, nevertheless, city features that are important to achieve the state of an age-friendly city environment remain a subject for exploration. Therefore, this study primarily aims to document the development of the age-friendly features in various countries, in understanding common features that underlie its implementation. The research applies the deductive research approach that includes descriptive and content analyses. A total of 60 important features were commonly used across the report. The findings of the study provide significance as a key input for developing embedding age-friendly city development in Malaysia.

***Keywords**:* Age-friendly city, aging population, content analysis

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INTRODUCTION

Malaysia's population has quadrupled over the past five decades, growing from a population of 7.4 million in 1957 to 32.5 million in 2019 with an annual growth rate of 0.4 percent (Mahidin, 2020). Malaysia's population in 2019 increased by 0.2 million from 32.4 million as compared to 2018. The annual population growth rate decreased to 0.6% in 2019 as compared to 1.1% in 2018. According to medium projections by the UN, Malaysia's elderly population will reach 9.7 million in 2050. At present, the number of Malaysians aged 65 years and above is estimated to be 2.2 million and is projected to increase in the year 2020 to over 7% (Mahidin, 2020). The percentage of the population that is 65 years and over has also increased over the years from only 5% in 2010 to 5.9% in the year 2015, and 6.7% in the year 2019. This trend is mainly contributed by longer life expectancy due to better health conditions and resistance to diseases.

The growing need of care for the aging population is met through adequate government policies. Reflecting the policy discourse, scholarly research that examined the policy implications of changing demographic structure (Chui, 2007; Mehta, 2006), concludes that government intervention in the forms of policy should be considered to address aging population (Chui, 2007; Mehta, 2006; Yuen & Soh, 2017).

Spatial planning, a mechanism to coordinate city features, was identified by many scholars as important to accommodate the needs of the aging population (Hamid, Momtaz, & Ibrahim, 2012; Metz, 2000). A comprehensive framework for developing an age-friendly city where conglomerate spaces between inner and outer communal space at city centers are only recently available. 'Healthy cities', 'livable cities', lifetime neighborhoods, age-friendly cities and age friendly communities carry similar connotations as age-friendly cities. These concepts place great interest in planning an inclusive environment for the aged population by providing accessible design and adaptive housing, safe outdoor environment, available and reachable services and facilities, and mobility opportunities are considered (Horner, Duncan, Wood, Valdez-torres, & Stansbury et al., 2015; Justine, 2015).

In developing or adapting cities to accommodate an aging population, development guides in the forms of best practices, measures and principles were developed by local councils, state and central governments (Plouffe & Kalache, 2011). Most of these are focused on the urban setting in the developed world (Steels, 2015) as these cities were much earlier considered as aged population cities (Hamid, 2015). Exploring the development guides, particularly examining city features in detail, certainly provide a clear understanding of the challenges that shall be faced by the governments and local authorities in the developing world. Considering this, the primary aim of the study is to document the development of age-friendly cities in various countries, with a view to

understanding common features that underlie its implementation. Also, the study focuses on the initiatives developed by government agencies as primary drivers of the age-friendly city.

LITERATURE REVIEW

Since the introduction of Global Age-Friendly City: A Guide (World Health Organization, 2007a), the guide has received overwhelming responses and translated by city councils across the globe into forms of program, development project, initiatives and measures (Buffel, Phillipson, & Scharf, 2012; Plouffe & Kalache, 2011). Although the application of the guide saw various strategies adopted by city councils, the main idea of the guide - to promote active and inclusive aging - remains intact (World Health Organization, 2003).

The Age-Friendly City Guide consists of two main components which are themes or discussion topics and city features, which was developed by engaging with the elderly from 35 cities in the world (World Health Organization, 2007b). A total of eight themes were explored during the focus group sessions to develop a comprehensive understanding on the city features that are important for the elderly. The first three themes are outdoor spaces and buildings, transportation, and housing which are considered major due to having a strong influence on personal mobility, safety from injury, security from crime, health behavior and social participation. Looking into the details, building and outdoor space need to be designed with the objective to create suitable housing for all ages, particularly for elderly aging in place (Plouffe & Kalache, 2010; Tobi, Fathi, & Amaratunga, 2018). This could be achieved by implementing good access into buildings, increasing the ability to walk and move safely to facilities (Aini et al., 2016; Plouffe & Kalache, 2010).

Regular, safe, affordable and accessible transportation is a critical element to engage the elderly in physically active and socially connected activities (Rashid & Yigitcanlar, 2015). Transport intervention is essential to support the elderly to live independently. Transportation systems that cover private and public modes, need to provide a sufficient degree of mobility and accessibility to essential service destinations such as sundry shops, medical and health facilities, in addition to other destinations for recreation and leisure opportunities. Similarly, improvement of current road condition through regular maintenance on roadside - verge clearing and grass cutting, cleaning of silted ditches and culverts, patching, and pothole repair - will certainly provide safer driving for the elderly (Morris, 2016; Rashid et al., 2020).

Housings for the elderly require attention on design, supply and support that allows the elderly to age comfortably and safely within the community to which they belong (Aini et al., 2017; Khalid et al., 2020; Knopf et al., 2015; Tobi et al., 2018). Thus, several works documented that to age in place, the elderly

require house design that is easy to maintain, adaptive and equipped with in-home assistive technology (Morris, 2016). Since housing ownership is a demanding issue, the elderly need to be provided with better housing options and flexibility in financing a housing unit. The housing elements should be accompanied by the provision of suitable facilities in the housing areas that include daycare centers and day hospitals, social clubs, rehabilitation, counselling and advice centers, volunteer schemes and community home nursing (Yusof, 2019).

Respect and social inclusion, social participation and civic participation and employment are three topics that resonate with the social environment, culture, participation and mental wellbeing (World Health Organization, 2007b). Features that could instill respect towards the elderly in the form of mechanism or practical approaches include opening opportunities for older adults to participate in decision making bodies, campaigning to stop stereotype on ageism (Ronzi et al., 2020) and portraying positive image of the elderly in various components of cityscape, especially billboards (Morris, 2016). Past researchers identified the elderly face great challenges due to generation gaps, therefore intergenerational activities within neighborhoods need to be promoted (Bloomberg & Quinn, 2011; Morris, 2016)

Social participation and social support are strongly connected to good health and well-being. Participation in the society allows the elderly to continue to exercise their competency, enjoy respect and esteem, and maintain supportive and caring relationships. In a broader sense, literature suggests the elderly's participation is likely determined by the access, affordability and availability of opportunities (Plouffe & Kalache, 2010; Ronzi et al., 2020). Opportunities should be provided for elderly to contribute to their communities after retirement through unpaid and voluntary work (Bloomberg & Quinn, 2011).

Meanwhile, communication and information, community support and health services consider both social environments and health and social service factors. Staying connected with events and people, getting practical information to manage life and getting the support and services they need for themselves and those they care for, are main features in an age-friendly city (Hickman et al., 2017; World Health Organization, 2007a). Health and support services are vital to maintaining health and independence in the community (Aini et al., 2016; Plouffe & Kalache, 2010; Tobi et al., 2018). Currently, health services funded by locals are gaining numbers in cities to offset the shortfalls of government-funded services. Not limited to health-related services, community services should be extended to include services for crime prevention and disaster management (Orpana et al., 2016; World Health Organization, 2007b).

However, a clear mechanism to achieve the state of an age-friendly city through practical and pragmatic features remains a subject for exploration. Outside of the World Health Organization's Age-Friendly Guide and research

protocol, there are no universally-agreed features to develop an age-friendly city (Steels, 2015). Localized strategies, guidelines and standards for age-friendly city application continue to grow, reflecting the variation of community aspirations and need towards age-friendly features.

METHODOLOGY

This research employed two stages of a qualitative approach to determine city features of age-friendly city as follows.

Resources

In the initial stage, relevant literature sources were mainly derived from Google as the main resource. A search on the World Wide Web using the search engine Google was used instead of scholarly databases such as Scopus or web of science; mainly to capture development guides that are commonly non peer-reviewed materials or indexed by scholarly databases. Boolean operator techniques were applied using the string search of "Age-Friendly" AND "Framework" OR "Best Practices" OR "Guidelines" for more focused results. Materials retrieved were then filtered using inclusion criteria (see Table 1) to determine the relevancy of the materials prior to the review (Kasmuri, 2020; Moher et al., 2009).

Table 1: Inclusion and exclusion criteria

Criteria	Inclusion Criteria	Exclusion Criteria
Types of Document	Development Guides, Best Practices or other similar types	Other forms of publication
Publisher	City Council	Other publisher
Timeline	2002-2020	Before 2002
Language	English	Non- English
Document Format	Pdf	Html, word or ppt

Content Analysis

The ultimate goal of content analysis is to examine text in the reports as main data in order to explore features that were implemented by city councils to achieve the state of an age-friendly city. Content analysis offers a robust analytical approach to form and extend knowledge via observation, theory, and keywords from the review of existing literature. Cross-sectional content analyses consist of six (6) steps which are i) transcribe, ii) coding, iii) cluster, iv) integrate and v) develop themes of features (Tobi et al., 2018). In the initial stage, 302 quotations representing age-friendly city features were identified in the selected reports. Quotations were read thoroughly and main descriptions were extracted from each and transformed into code. These codes were then compared to generate features that represent all codes.

By the end of the content analysis process, 103 features were formed. Next, all features were then assessed based on the number of occurrences, with two occurrences used as cut-off points to determine the importance of the features. This assessment identified a total of 60 suitable features, arranged based on age-friendly themes as key features for an age-friendly city. Following this, frequency analyses were performed to determine the occurrences of features across reports with two occurrences of features considered as important in the age-friendly city framework.

FINDINGS

Sampled Reports

The selected samples were mainly derived from reports on age-friendly city features, namely from England, United States, Australia, New Zealand and Taiwan (see Table 2). The reports capture age-friendly implementation in various levels that include district, city, state and federal government. As for themes applied, most of the reports implement eight (8) themes, with only two reports which are Age-Friendly DC and New Zealand Positive Ageing were identified to have 10 themes.

Content Analyses

The following section gives the explanation on analyses performed to determine city features. For building and outdoor space's theme, 11 features were identified across the reports with inclusive public space identified as the highest frequency (refer Table 3). The features with the lowest frequency were localized services, recreation facilities as well as safety and security. However, since safety and security were widely accepted in literature, thus having a great impact towards the elderly, the study believes the inclusion of these features in any development guides should be highly valued.

For transportation, 14 features were identified across the reports, with public transportation level of service were identified with the highest frequency, licensed drivers and vehicle with GPS with both were identified to be the least mention.

There is a significant number of features pertaining to the housing dimension, thus this dimension had the highest number or 13 features across dimensions. Of these features, only seven had frequencies of more than two. This includes Modification, Housing and Residential Design, Housing Assist, Housing Fund, Housing Option and Housing Purchasing Guidance. Among these features, housing options related to various housing schemes for the elderly were considered the most prudent of all housing features. Conversely, features with the lowest frequency were related to after sales elements such as adaptation, repair and maintenance.

For social participation, 10 features were identified across the reports, with the number of occurrences being between 1 to 6, suggesting less variation across features. Features that relate to events and activities and participation were commonly identified across reports. Of these, the range of events and activities and social participation and partnership were identified the highest frequency. The findings suggest the range of events and activities are the key elements to engage the elderly in the community. However, the guide to participating social activities was least mentioned across the reports understudied.

Table 2: Selected report profiles

Document	Age-Friendly New York City	Taiwan Age-Friendly City	Age-Friendly DC.	New Zealand Positive Ageing Indicator	Liverpool Ageing Strategy and Action Plan	Age-Friendly South Australia Guidelines	UK Age-Friendly Strategy	Age-Friendly London
Country	United State	Taiwan	United State	New Zealand	Australia	Australia	United Kingdom	England
Year Published	2009	2014	2018-2023	2007	2015-2017	2012	2017-2020	2012
Level	City	Country	City/ District	Country	City	State	Country	City
Total Themes	8	8	10	10	8	8	8	8

For respect and inclusion, the analyses identified less variation between frequency across features, with the frequency between 2 and 4. From seven features identified in the reports, community inclusion, intergenerational and family interaction and respect and training, received the highest frequency. While age-friendliness assessments, age-friendly principle design, employment support, health and social care facilities and life satisfaction were only mentioned once, they were considered the least important feature for the dimension.

In Civic Participation and Employment, volunteering options or opportunities to take part in volunteering activities were communal features across reports, therefore with highest frequency. Features with the least frequency were age-friendly advertising, internship/fellowship program and valued contributions. The frequency trends also showed little variation with minimum frequency being 2 while the highest was 5, suggesting high agreement on features for this dimension across understudied reports.

Communication and Information, on the other hand, displays ten features across. Among the features were information offer and the delivery that

received the highest frequency, while communication guide, education on universal design guideline, knowledge exchange program and resident privacy were features with the least frequency.

Features in the Community Supports and Health Services show significant frequency values, ranging from 2 to 18, had been classified within ten features. Of these features, Health and Support Social Services and Caregiver and Support Program had the most frequency, while features with the lowest frequency were disability allowance, provision of burial sites and trust in others. The trends suggesting tangible features were more highly accepted than the management or awareness programs for Community Supports and Health Services.

Table 3: frequency analyses results

Dimension 1: Buildings and Outdoor Spaces		**Frequency**
1.	Accessible Buildings	4
2.	Age-Friendly Business Environment	2
3.	Age-Friendly Pedestrian System	5
4.	Community Space Availability	2
5.	Inclusive Public Spaces	11
6.	Outdoor Spaces Seating	3
7.	Sign and Way-finding	2
8.	Sufficient and Accessible Public Toilet	3
	Total	32
Dimension 2: Transportation		**Frequency**
1.	Bicycle Strategy	3
2.	Facilities and Amenities at Stop and Station	3
3.	Priority Parking	5
4.	Public Transport to key destinations	2
5.	Public Transportation Level of Service	6
6.	Specialized Transportation Services	3
7.	Taxi Program	2
8.	Traffic Management	3
9.	Training for Transportation Staff	2
10.	Transportation Option	2
11.	Transportation Services and Supports	2
12.	Well-maintained Roads	3
	Total	36
Dimension 3: Housing		**Frequency**
1.	Home Modification	4
2.	Housing and Residential Design	3
3.	Housing Assist	4
4.	Housing Fund	2

5.	Housing Option	11
6.	Housing Purchasing Guidance	2
7.	Housing Training	2
	Total	28
Dimension 4: Social Participation		**Frequency**
1.	Access of Internet	3
2.	Access to Facilities	3
3.	Accessibility of events and activities	2
4.	Range of Events and Activities	6
5.	Social Participation and Partnership	5
6.	Social Participation Guide	2
7.	Volunteerism Option	3
	Total	24
Dimension 5: Respect and Inclusion		**Frequency**
1.	Age-Friendly Business Best Practice	3
2.	Community Inclusion	4
3.	Intergenerational and Family Interaction	4
4.	Marketing and Outreach Plan	2
5.	Recognition and Acknowledgement	3
6.	Respectful and Training	4
7.	Stop Stereotype and Ageism	3
	Total	23
Dimension 6: Civic Participation and Employment		**Frequency**
1.	Civic Participation	3
2.	Employment Option	3
3.	Employment Services	4
4.	Paid Employment	3
5.	Staff Training	3
6.	Volunteering Options	5
	Total	21
Dimension 7: Communication and Information		**Frequency**
1.	Access to Communication System	5
2.	Age-Friendly Website	2
3.	Communication Option	4
4.	Hotline Communication Database and Record	2
5.	Information Offer and Deliver	7
6.	Networking Program	2
	Total	22
Dimension 8: Community Supports and Health Services		**Frequency**
1.	Caregiver and Support Program	12
2.	Crime Free	2
3.	Emergency Planning	2

4.	Falls Prevention Initiative	3
5.	Health and Support Social Services	18
6.	Training for Aged People	4
7.	Training of Trainers	2
	Total	43

DISCUSSION AND CONCLUSION

The issue of elderly in the community was raised in the year 1999 through the United Nations' Year of Elderly in 1999. To date, there are two main frameworks developed by World Health Organization to address the issue; the active aging framework in 2002 followed by Age-Friendly Cities (World Health Organization, 2007a), have widely accepted and overwhelming replicate in cities across the globe with variation of scale, locality, actors involved and strategies. Considering the notion, the study aims to understand the common features underlying the age-friendly city's implementation in various localities.

Application of the framework was apparent in developing guidelines and best practices to guide development in the city, district or state, especially in the selected reports. Although the study noticed some changes made to the themes of age-friendly city framework, however, philosophical paradigms founded by the World Health Organization were noticed intact. The study also noticed local interpretations were centered as the main interest.

Variation in features was more noticeable in transportation where there were 12 features that can be congregated into three main components which are road or traffic, public transportation and services. This suggests the dimensions carry greater importance in the formation of an age-friendly city. This is mainly due to well-being being entailed with a significant degree of accessibility and mobility of an individual to essential activities such as consumption, saving, production, politics, socializing or activities (Litman, 2014). Thus, affordable and accessible public transportations is an important factor in encouraging and enabling older persons to be socially included (Steels, 2015). Therefore, the dramatic changes in the population composition resulting in new challenges for transportation service provision (Abdullah et al., 2020; Wood et al., 2016), to provide greater mobility and access as a proxy to social inclusion.

By examining features across dimensions, two features which are inclusive Public Spaces and Housing Option had the highest frequency, therefore indicating the importance of both features in forming the age-friendly city in various localities. Essential access, facilities availability and maintenance are critically important in improving public space quality to accommodate the needs of the elderly (Plouffe & Kalache, 2010; Southway Housing Trust, 2017). Housing options are regarded as the most alarming issues for the elderly by many (Hamid, 2015; Knopf et al., 2015) stimulate the needs to permit elderly to age

comfortably and safely (World Health Organization, 2007b; World Health Organization, 2003) in the immediate locality of the elderly. The findings suggest policy makers and facilities providers should be mindful of the elderly's needs during planning for affordable housing, better housing options and provision of support services and facilities. Interestingly, sufficient information pertaining to housing options offered by government, private and community are also considered pivotal to address negligence or displacement (World Health Organization, 2003).

It is endeavored that the findings of the study, mainly the outlines, are able to offer better understanding on the common features of age-friendly city and become a stepping-stone to further develop age-friendly cities for the aging population especially in Malaysia.

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APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS) AND ANALYTIC HIERARCHY PROCESS (AHP) TECHNIQUE TO STUDY LAND USE CHANGES IN PENDANG, KEDAH

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Abstract

Urbanization process has a significant impact on land use planning. It not only affects major cities but also extends to small towns in rural areas where it has a significant role in providing urban services to rural communities. The expansion of urban areas also resulted in the loss of many agricultural lands as well as forests that are rich in natural resources. In both instances, the land use composition is substantially affected. This study uses a "mixed method approach" combining GIS spatial analysis and AHP technique to study land use changes, identify land use growth parameters, determine land use growth suitability areas and identify the direction of urban land use development. The study area is the town of Pendang, which is the main administrative centre for Pendang District, Kedah. The main findings of the study show that changes were not that significant during the period between 2005 to 2012. However, significant land use changes occurred during the period of 2012 to 2020, especially in agricultural land use, vacant land and even water bodies. These land use changes have contributed to the increase in built-up areas. The direction of development is seen heading north, south and southwest of the study area. Accessibility is a major factor influencing the growth of land use and development direction in the study area.

***Keywords**:* Urbanization, land use change, land use suitability, GIS and AHP

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INTRODUCTION

Urbanization is a global phenomenon that can be observed in many countries. Worldwide urbanization has recorded rapid growth in urban population from 751 million in 1950 to 7.7 billion in 2019 and is projected to continue to increase to 9.7 billion by 2050 (United Nations, 2019). Rural areas located in the suburbs are also evolving in terms of development as a result of the urbanization process. Small towns which can be found within a short distance of many metropolitan areas are important because of the functions they play in providing access to rural communities in obtaining urban services (Rostam et al., 2010; Saleh et al., 2012). They are the drivers of economic growth and to ensure balanced economic growth, regional development strategies were employed to address the imbalanced development between urban and rural areas (Saleh et al., 2014). Through good infrastructures, access to basic facilities and amenities in rural areas can be upgraded to provide better access to health, education, water, and electricity. In addition, good road networks, cheaper land prices, and peaceful living areas are among the major factors that drive new developments, especially housing and commercial areas, into the neighboring regions and smaller towns (Samat et al., 2019).).

This paper aims to study land use changes for the period of 15 years, from 2005 to 2020, in Pendang; which is the administrative centre for the Pendang district in the state of Kedah. The results of this land use change study will be used to identify the suitability of land use for development and the direction of urban land use development in Pendang.

URBANIZATION AND LAND USE GROWTH

PLANMalaysia (2016) defines urbanization as a process of change and application of urban characteristics to an area. This process involves the migration of rural populations to urban areas that generates changes in social and economic activities, values and lifestyles. Urbanization also impacted physical development which can be clearly seen in terms of land use change that occurs in rural areas (Saleh et al., 2014). This process of urbanization often results in sporadic development beyond the city boundaries and into the fringes of urban areas and smaller towns creating pressure on natural resources, environment as well as the communities (Malik et.al, 2018). According to Amir (2004), urbanization has a direct impact on rural areas where existing agricultural land use is preferred for urban development purposes and is increasingly experiencing the development pressure of changing land use activities due to its low-price. Thus, developmental pressures faced by rural land uses where traditional growth patterns used to change organically have now become more systematic (Salleh et al., 2013).

A study conducted by Yaakup et al. (2008) found that some of the main factors that can contribute to urban growth are physical, social, economic and land use factors. The study also found that extensive transportation systems and road networks, such as highway development and transit transportation systems, were major factors influencing the overflow of rapid urban growth. García et al. (2007) meanwhile found that proximity to the road transport system and existing built-up areas determine the factors in shaping the structure of a city and the direction of future growth. Mahamud et al. (2016) on the other hand, identified three main factors that stimulate urban development: physical, socio-economic and environmental factors. More specifically, distance to the workplace, cheap housing and distance to public facilities.

Factors and sub-factors influencing the growth of urban land use, which have been discussed above, will be adapted to the context of the study area and used as parameters in the analysis of this study. The four main factors to be adapted are environmental, economic, social and physical, while a total of seven sub-factors have been identified. They are topography, distance from the river, distance from the commercial centre, distance from the industrial area, distance from institutional & public facilities, distance from infrastructure & utility and distance from transportation networks. The restructuring of these parameters is in line with the context of the study area, where environmental factors need to be taken into account to ensure urban land use can be developed more sustainably. A weighting value is assigned to each of the sub-factors above so that it can be measured and given priority. This will help produce a dynamic urban land use growth model for the study area.

GIS and AHP

The integration between geographic information system (GIS) and multi-criteria decision-making (MCDM) method is capable of creating a dynamic land use modelling. Rad & Haghyghy (2014) implied that the application of GIS alone cannot overcome the problem of balancing expert opinions in evaluating and assigning relative importance to each criterion considered in land use suitability analysis. MCDM techniques should be used in conjunction with GIS tools to obtain concrete research findings. Rusydiana & Devi (2013) describe MCDM as a method of decision making by determining the best alternative from a number of existing alternatives based on several criteria set in accordance with the context of the study. The stated criteria are usually in the form of parameters or standards that can be measured in decision making. Analysis and evaluation of the criteria is done to obtain a set of measurements and then used as a tool to compare the best criteria in the study.

The Analytic Hierarchy Process (AHP), one of the techniques in MCDM, is utilized in this study over other techniques as it requires accurate

numerical values to express the strength of expert choice in decision-making for land use analysis findings. A study by Mosadeghi et.al (2015) that compared the results of two techniques namely AHP and Fuzzy found out that when identifying future land use suitability and development direction, the simple AHP method is already sufficient in conducting the analysis.

STUDY AREA

Pendang (N5.99237, E100.47770) is a rural town located in Pendang District, Kedah, Malaysia (Figure 1) and is the administrative centre for this district. It is divided into two town sections with a total area of approximately 3,791 acres. Pendang has good accessibility to major towns and cities in the state of Kedah. It is connected to a good road network, namely the state road K128 towards City of Alor Star, the towns of Pokok Sena and Kuala Nerang, and K147 towards Gurun. It is also close to the North-South Expressway interchange (4km) and the Kobah train station (4.7km), located southwest of the town. The opening of the Pendang Toll Plaza in 2006 has made it easier for North-South Expressway users from the south going through Pendang to Pokok Sena and Kuala Nerang without having to go through the City of Alor Star.

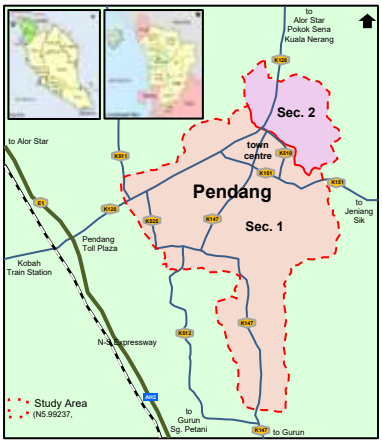

Figure 1: Location of Pendang, Kedah

METHODOLOGY

This study utilizes land use data from three time periods to analyze changes from 2005 to 2012 and 2012 to 2020. The 2005 land use data was obtained from the Pendang District Council while the 2012 data was extracted from satellite images dated 2012. The 2020 land use data was derived from fieldwork. Land use changes are analyzed using ArcGIS 10.4, by applying overlay technique and interpreted through matrix tables. The AHP technique is applied to analyze and

produce a land suitability map for development in the study area. Each sub-factor identified in the literature above is weighted based on its suitability in influencing land use growth by using a pairwise comparison method. Pairwise Comparison is a comparative matrix assessment that estimates the weighting values of parameters used in AHP technique based on probability measurements. For each stage in the hierarchy, it is important to know whether 'Pairwise Comparison' is consistent in receiving weighting results. This study follows the procedure outlined by Saaty (1987) and Wind & Saaty (1980) using the scale of importance of each sub-factor. The Pairwise Comparison method generates weight and compares each sub-factor to distinguish the level of importance in influencing the land use growth in Pendang. The first step is to compare the sub-factors based on the scale of importance. The next step is to do a "Normalize Pairwise Matrix," which produces a matrix shown in Table 1 below.

	1	2	3	4	5	6	7	Total / No. of Sub-Factor	Weightage of Sub-Factor
1	0.0345	0.0108	0.0339	0.0141	0.0213	0.0213	0.0651	0.20098/7	0.0287
2	0.1379	0.0430	0.0339	0.0429	0.0213	0.0213	0.0651	0.36541/7	0.0522
3	0.2069	0.2581	0.1996	0.2572	0.3404	0.3404	0.1535	1.75608/7	0.2509
4	0.1034	0.0430	0.0339	0.0429	0.0213	0.0213	0.0651	0.33092/7	0.0473
5	0.1379	0.1720	0.0499	0.1715	0.0851	0.0851	0.0930	0.79456/7	0.1135
6	0.1379	0.1720	0.0499	0.1715	0.0851	0.0851	0.0930	0.79456/7	0.1135
7	0.2414	0.3011	0.5988	0.3000	0.4255	0.4255	0.4651	2.75748/7	0.3939

Table 1: Calculating Weightage of Sub-Factor based on Normalize Pairwise Matrix
1=Topography condition 2=Distance from river 3=Distance from commercial center 4=Distance from industrial area 5=Distance from institution & public facilities 6=Distance from infrastructure & utility 7= Distance from transportation network

To ensure that the weightage of each sub-factor generated in Table 1 above is relevant, the 'Consistency Ratio' (CR) should be calculated and not exceed the value of 0.10. The CR calculated in this study is 0.077 and all evaluations made on the sub-factors are acceptable. The seven sub-factors are further analyzed using the Euclidean distance method in GIS to produce a suitability level map in raster format for each sub-factor. The generation of this suitability level map is based on the distance/aspect that has been adjusted accordingly, in line with the guidelines and planning standards from PLANMalaysia. To rank the distance/aspect to the appropriate suitability level, the Reclassify method in ArcGIS is applied and the result is used as input to the Weighted Overlay method in ArcGIS to produce a land suitability map of the study area (See Figure 6).

DATA ANALYSIS AND FINDINGS

This section will discuss data analysis and findings on land use change patterns, land use suitability and development direction of Pendang based on land use data

from 2005 to 2020. The altered spatial landscape of the town can be identified by studying land use changes at several time periods.

Pattern of Land Use Changes

As shown in Table 2, agricultural land use was the most dominant land use in 2005 followed by residential and open space and recreational land uses. However, there was a decrease in land acreage for several land uses in 2012 including open space and recreational, agricultural, commercial and industrial, which this has indirectly contributed to increase in land area for housing, transportation, institutional and public facilities and others. From 2012 to 2020, agricultural land use still dominated the study area while other land uses that were experiencing major increase in land area include infrastructure and utilities, open space and recreation, institution and public facilities and others. The land use change scenario recorded a drastic decrease in land acreage for vacant land (-198.20) and water body (-30.21). However, agricultural land use is no longer declining during that time, because the available vacant land has been re-cultivated with agricultural activities.

Table 2: Land Use Changes in Pendang (2005 - 2012 - 2020)

Land Use	Year						Changes			
	2005		2012		2020		2005-2012		2012-2020	
	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%	Area (acres)	%
Housing	640.92	16.90	723.11	19.07	763	20.12	82.19	12.82	39.89	5.52
Commercial	48.29	1.27	43.75	1.15	50.13	1.32	-4.54	-9.40	6.38	14.58
Industry	9.85	0.26	9.13	0.24	10.21	0.27	-0.72	-7.31	1.08	11.83
Mix Devt			4.43	0.12	2.06	0.05	4.43		-2.37	-53.50
Inst & Pb Fac.	162.46	4.28	186.65	4.92	223.88	5.90	24.19	14.89	37.23	19.95
Opn Spc & Rec	334.45	8.82	22.12	0.58	30.96	0.82	-312.33	-93.39	8.84	39.96
Vacant Land			372.13	9.82	173.85	4.59	372.13		-198.28	-53.28
Transport	233.38	6.16	263.89	6.96	288.93	7.62	30.51	13.07	25.04	9.49
Infra & Util.	22.56	0.60	24.85	0.66	89.66	2.36	2.29	10.15	64.81	260.80
Agricultural	2269.66	59.86	2066.12	54.49	2113.71	55.75	-203.54	-8.97	47.59	2.30
Water Body	69.85	1.84	75.24	1.98	45.03	1.19	5.39	7.72	-30.21	-40.15
Total	**3791.42**	**100.0**	**3791.42**	**100.0**	**3791.42**	**100.0**				

The results of this time-series land use analysis from 2005 to 2012 and 2012 to 2020 show that there are significant changes to the three types of land use in Pendang, namely agricultural land use, vacant land and water bodies. From 2005 to 2012, land acreage for agriculture had decreased because of conversion into the development of new housing areas and for upgrading the transport system. Between 2012 and 2020, the land acreage for agriculture has increased but the vacant land was experiencing a rapid decline of -53.28%. Since vacant land usually does not bring any returns and is easy to develop, it has mostly been used for developing new housing areas, for upgrading the transport system and for re-

cultivating more productive agricultural activities. The land area for water bodies had increased from 2005 to 2012 but decreased to 45.03 acres in 2020, contributing to the increase in transportation and agricultural land uses. If compared between the two time-series, the analysis found that land use change activities were more rapid from 2012 to 2020 compared to 2005 to 2012 (see Figure 2).

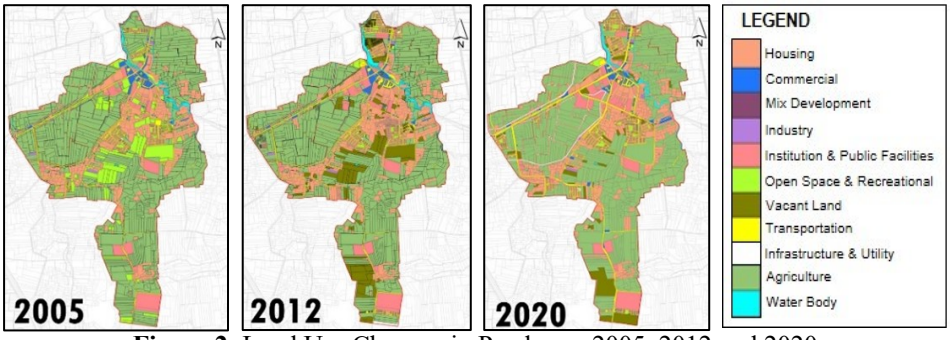

Figure 2: Land Use Changes in Pendang - 2005, 2012 and 2020
Source: Pendang District Council, Google Maps & field work

Table 3: Matrix of Land Use Changes in Bandar Pendang (2012-2020)

Land Use		Land Use 2020											
		House	Comm	Ind.	Mix Devt	Inst & Pb Fac	Op Spc & Rec	Vcnt Land	Trans-port	Infra & Util	Agr	Water Body	Total
Land Use 2012	Housing	613.89	8.19	0.31		5.60	5.75	9.32	56.35	3.18	19.58	0.94	723.11
	Comm	1.20	30.17			1.89	0.09	0.22	9.49	0.59	0.08	0.02	43.75
	Industry	0.08		6.22	0.07			2.26	0.22	0.15	0.07	0.06	9.13
	Mx Devt	0.20			1.74	0.03	0.10	0.07	1.58	0.50	0.17	0.04	4.43
	Inst & Pb Fac	1.00	0.30			174.04	0.13	1.79	5.70	1.13	2.53	0.03	186.65
	OpnSpc & Rec	0.17				0.21	19.61	0.06	1.63	0.27	0.09	0.08	22.12
	Vacant Land	55.75	3.70	1.50		19.80	0.35	101.10	14.71	2.06	173.04	0.12	372.13
	Transport	26.74	4.08	0.73	0.23	5.99	1.85	6.12	162.30	35.97	18.54	1.34	263.89
	Infra & Util	0.15				0.23	0.11		1.72	21.80	0.44	0.40	24.85
	Agricultural	57.68	3.28	1.39		15.19	2.92	52.65	31.76	17.57	1881.13	2.55	2066.12
	Water Body	6.14	0.41	0.06	0.02	0.90	0.05	0.26	3.47	6.44	18.04	39.45	75.24
	Total	763.00	50.13	10.21	2.06	223.88	30.96	173.85	288.93	89.66	2113.71	45.03	**3791.42**

Table 3 above shows the details of each land use change illustrated on the matrix of land use changes for the period between 2012 to 2020 (Note: the land use change matrix for 2005 to 2012 is not shown because the changes that occur are not so drastic compared to land use changes in 2012 to 2020). Vacant land use has declined drastically during this period, being converted to other land uses. Furthermore, land area for water bodies also declined due to the development of agricultural, infrastructure and utility, housing and transportation land uses. In addition, although agricultural land area shows an increase from 2012 to 2020, it is still experiencing a significant transition to other land uses during this period. Infrastructure and utilities and institutions and public facilities land uses rapidly

developed from 2012 to 2020. Along with other land uses, they are responsible for the declining land uses of vacant land, water bodies and agriculture. This clearly shows the rapid growth of land use for the development of Pendang from 2012 to 2020.

Land Use Suitability

The suitability of land use growth is analysed by integrating GIS and AHP applications. Figures 3 shows the suitability level maps for the seven sub-factors derived from the methodology discussed above.

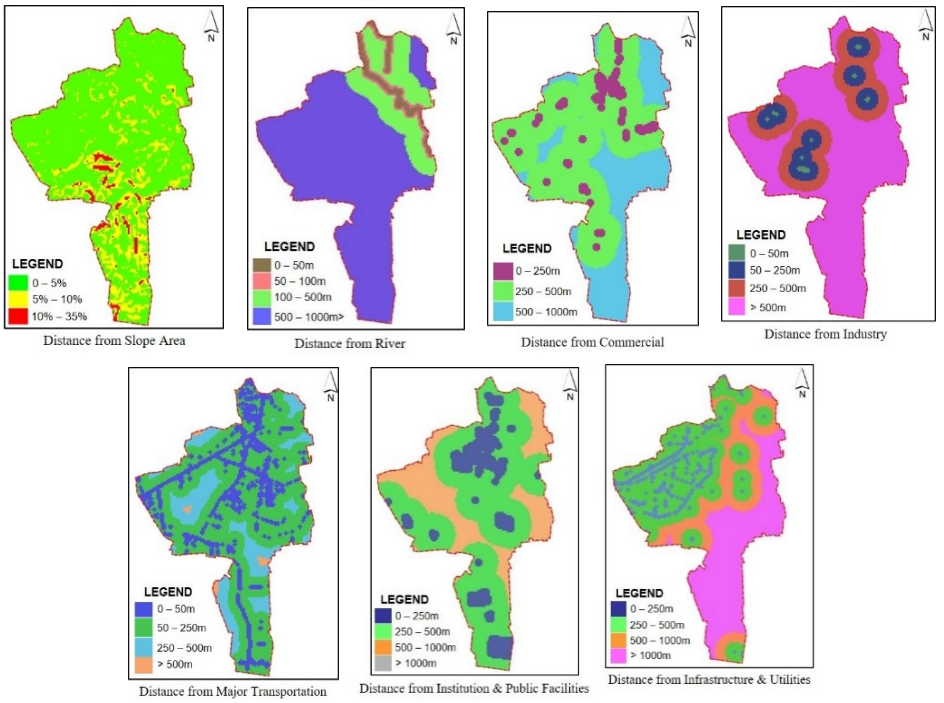

Figure 3: Land Suitability Map by Sub-Factor

The results of the land suitability analysis as shown in Figure 4 indicates that the southwest and southern parts of the study area are the potential areas for future development. These areas are strongly influenced by factors that normally contribute to the growth of towns such as excellent accessibility (e.g., close to commercial centres, proximity to public facilities) and having better infrastructure development and transportation networks. Furthermore, the analysis also shows that land development sprouts parallel with the transport corridor that connects Pendang to nearby towns in a more radial pattern. The development of existing built-up areas is also a factor that contributes to the

growth of other land uses surrounding it. The dispersal of land use occurs because the built-up area will inflict development pressure on the non-built-up area adjacent or near it.

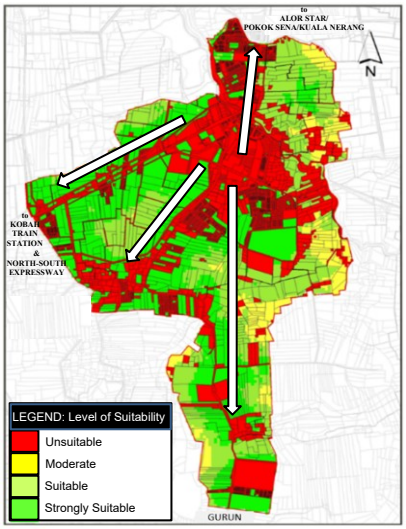

Figure 4: Land Suitability Map and Direction of Land Use Development (2020)

Direction of Development

The results from the land use changes and land use suitability analyses indicate that the development of Pendang between 2005-2020 is aligned along the main transport corridor. Figure 4 above shows the development direction of Pendang is towards the north, south and southwest of the study area. This is due to the strong accessibility factor where linear development is taking place along the main roads leading to the North-South Expressway and the Kobah's train station in the southwest as well as to the City of Alor Setar, Pokok Sena and Kuala Nerang in the north and Gurun in the south. The concentration of existing built-up land uses in the Pendang town centre has also encouraged other urban land use development to spread and grow along the main roads.

DISCUSSION

The land use changes emerged as a result of the distribution of urban activities where central areas perform economic, political, institutional and cultural functions (Rodrigue, 2020). The findings from this study show that accessibility is a major factor that contributes to the change of land uses in Pendang where its development is affected by the growth of the City of Alor Setar, Pokok Sena and Gurun. Pendang is also strategically connected to the North-South Expressway and the double-track railway lines that facilitate the movement of population between Pendang and the towns surrounding it. The pattern of land use changes also shows an increase in

built-up land uses such as housing, institutions and public facilities, infrastructure and utilities, as well as transportation. Significant changes have also occurred, particularly in the use of agricultural land, vacant land and water bodies. The pattern of agricultural land use changes which used to mature gradually has now become more planned (Amir, 2004). This has happened around Pendang since 2006, where agricultural land use has been converted to planned housing such as Taman Setia, Taman Murni Pendang, and Taman Sri Seberang. Pendang is categorized as a local town and is the administrative and service centre for Pendang District (PlanMalaysia, 2017). To strengthen the functionality of this town in the context of settlement hierarchy, land use changes have taken the form of education as well as institutions and facilities, such as Mara Science Junior College (MRSM), Land and District Office, and District Police Headquarters. A newly completed Pendang People's Bazaar Building has also been built on vacant land near the bus station.

The land use transformation can also be studied through the direction of land use growth. The development of a systematic transportation system, especially the development of highways and railways, plays an important role in influencing the pattern and flow of future development (Yaakup et al., 2008). The direction of urban land use growth is heading towards the southwest of Pendang along the K128 state road to the North-South Expressway and the Kobah railway station. This road is used by motorists to enter and exit the North-South Expressway via the Pendang Toll Plaza near Kobah. Before the operation of this toll house in 2006, travellers on the expressway exited at the City of Alor Star to go to Pokok Sena, Kuala Nerang and other parts of eastern Kedah. But now, travellers exit the expressway and take the K128 road that passes through the town of Pendang to reach the eastern part of the state. This shortcut route saves them the additional toll and avoids traffic congestion in Alor Setar. The increasing traffic on K128 state road especially during festive seasons has attracted the development of commercial and supporting services along this road. This is in line with the development strategy in the Pendang District Local Plan, which is to focus the development of vacant lands along major roads including the Pendang-Kobah corridor (PLANMalaysia, 2011). The findings of the study also found the declining land use of water bodies which is turned into agricultural land use, transportation and especially for infrastructure and utility development. This is mainly due to the implementation of a state flood mitigation program where it involves upgrading the Pendang River and flood diversion through the MADA (Muda Agricultural Development Authority) central canal (PlanMalaysia, 2017). As a result, this program has created unused water body areas that have the potential to be developed for other land use activities.

As outlined in the Second National Urbanization Policy, Pendang is a local town and an administrative centre for Pendang District, and the town performs many functions (PLANMalaysia, 2011). The changes in land use and the direction

of development in Pendang require the local authority to effectively plan, manage and monitor development to preserve the overall quality of the landscape and its environmental system.

CONCLUSION

Development along transport corridors in Pendang has triggered built-up land uses such as housing, transportation, institutions and public facilities as well as infrastructure and utilities. At the same time, land use changes in rural areas also contribute to the loss of agricultural land being converted to other type of urban land uses. This study has shown the land use changes that occurred in Pendang based on space and time and measured through the GIS and AHP technique. The pattern of change and the suitability of land use is a phenomenon that needs to be studied to produce a comprehensive scenario of suburban/urban land use in rural areas. Measurement of parameters that can contribute to land use changes also needs to be determined accurately so that factors that drive land use changes can be evaluated more effectively. Land uses that are easy targets of development pressure such as agriculture, vacant land and water bodies, need to be planned, managed and monitored so that sustainable land development can be achieved. Indeed, the complex relationship between transport and land use suggests the need for various analyses in spatial interactions in our effort to understand urban activities and their spatial impact on land use.

ACKNOWLEDGEMENT

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EXPLORING THE THEORY PLANNED BEHAVIOUR TO DERIVE THE FACTORS OF HUMAN BEHAVIOUR FOR DOMESTIC WASTE RECYCLING

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Abstract

Malaysia is experiencing waste disposal management issues involving the lack of recycling practices among human behaviour, the absence of domestic waste recycling mechanisms, and poor enforcement for recycling activities. Previous studies revealed that households generate domestic waste hence requires changes in domestic waste management. This paper aims to establish the conceptual framework of solid waste recycling practice by employing the Theory of Planned Behaviour (TPB). Content analysis was employed to verify the trends of research in the related topic. From prior related studies, a variety of approaches based on the TPB model were examined. Results demonstrated that many factors influence the household's behaviour in domestic waste recycling using the TPB model. The outcome of this study was a conceptual framework in determining the factors of human behaviour in domestic waste recycling. The framework can therefore be a mechanism for authority in managing domestic waste.

Keywords: Human Behaviour; Domestic Waste; Recycling; Theory of Planned Behaviour

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INTRODUCTION

Tolinski (2012) and Bakar et al. (2017) consider ecological sustainability ideas are linked with 'nature and technology, where the people are aware of the importance of protecting their environment despite their actual behaviours. According to Sachs (2015), acting and conducting activities to safeguard the environment is part of environmental protection. Consequently, the Malaysian government has raised concerns regarding environmental protection and the importance of waste disposal management due to a lack of landfill space, increased waste management costs, and inefficient recycling management (Eusuf et al., 2011). Moreover, Mokhtar et al. (2013) claimed that Malaysia collected 33,000 tons of waste each day in 2013, an increased volume from 19,000 tons in 2005, thereby raising the cost of waste management with a further absence of a proper mechanism that addresses the poor recycling of domestic waste. Even though Malaysia's National Solid Waste Department was established in 2007, Jereme et al. (2015) noted that further issue arises due to the unregulated waste service fees because it was no longer within the control of local authorities but rather of waste management corporations. Meanwhile, recycling has been advocated since the 1990s; nonetheless, just 5% of Malaysian waste has been recycled (Aini et al., 2002) due to inadequate planning and a lack of public participation.

RECYCLING AND THE THEORY OF PLANNED BEHAVIOUR (TPB)

The attitude of recycling can be characterised as conclusive behaviours, whereby the number of people who never recycle and always recycle is found alike. Contrarily, only a few usually recycle or hardly recycle (Barr, 2007). Moreover, people will only recycle when forced to or given the relevant opportunity (Tabernero et al., 2015). In the context of recycling behaviour, Teo (2016) claims that there have been initiatives in psycho-social aspects that prove to be successful. Therefore, this study addresses how individuals' understanding of attitudes and behaviour influences can significantly highlight behavioural aspects that significantly impact recycling practices. According to Karim et al. (2013), human behaviours are often directed by three aspects; 1) the perceptions of the expected outcome (attitude); 2) expectations of normative beliefs and the desire to meet those expectations (subjective), and 3) views on the factors that can influence behaviour (behavioural control). Verdugo (2012) opined that Malaysians would recycle if there were favourable opportunities, recycling initiatives, and incentives, which would drive the people to recycle. Meanwhile, contentment is seen as linking factors like the performance of the recycling services provided, including the duration, approachable and value of the action

(Tabernero et al., 2015). Nevertheless, demographic patterns and societal standards are also relevant, as are reward programs, strategies or how mature the recycling community is. Tabernero et al. (2015) discovered that communities with stronger motivation and understanding have healthier recycling habits. Chen & Lee (2020) also agreed that the people staying in larger cities and communities tend to recycle more than those in smaller groups and towns. Additionally, a good recycling motivation will help to forecast recycling behaviours (Aini, 2002).

Ajzen put forward the Theory of Planned Behaviour (TPB) in 1991. The theory was created to study and describe human behaviour by structuring the idea into four (4) subjects; intentions, stance toward the behaviour, subjective norms and perceived behavioural control. A significant factor in the TPB is the individual's purpose of performing an action. For instance, the stronger the intent to engage in recycling behaviour, the more likely it is to achieve that behaviour (Ajzen, 1991). The first structure of the model is the 'intention', which assumes to obtain the impulse that affects behaviour, i.e., signs of how complex people try and how much they struggle to perform recycling practice. The second structure requires behavioural beliefs and actions. It is an attitude towards an individual's action with a specific behaviour, whether desirable or undesirable.

Meanwhile, the third structure is the subjective norm that constitutes social pressure to recycle. As a result, the personal standard is formed by combining moral ideas and a desire to recycle. Alleged behavioural control is widely regarded as an essential attitude in TPB. It relates to people's understanding of how complicated or straightforward the action of recycling is to carry out. Therefore, this paper aims to explore the application of the TPB in deriving the factors of human behaviour that impacts domestic waste recycling.

METHODOLOGY

This research employed the Content Analysis method, using the *Atlas.ti* software to examine past literature on waste disposal management and formulate the conceptual framework of human behavioural factors that impact domestic waste recycling. The application of scoping study (using SCOPUS and WoS indexed publications) consists of five (5) stages of data extraction in the literature search, as suggested by Arksey & O'Malley (2005). The first stage of the process was to gather all past studies focusing on waste disposal management. A total of 181 related studies were collected spanning from 1991 until 2020. The second stage filters the literature based on their objectives that specifically concentrate on human behaviour and factors that will shape their attitude toward waste recycling. A snowballing technique was applied through the reference lists using the keywords "domestic waste AND recycling AND human behaviours AND households AND factors", scaling further 160 papers removal as they do not

match the objective mentioned above. As a result, only 21 articles were considered for the final analysis. The third stage involves categorising the research selection, which confirmed the literature for review and references. The categorisation was divided into themes: human behaviour and attitudes toward recycling and factors influencing recycling behaviour. The fourth stage was to chart and group the human behaviour and factors using the TPB accordingly. Finally, the last stage was to formulate the conceptual framework by proposing an extended TPB model (Figure 1).

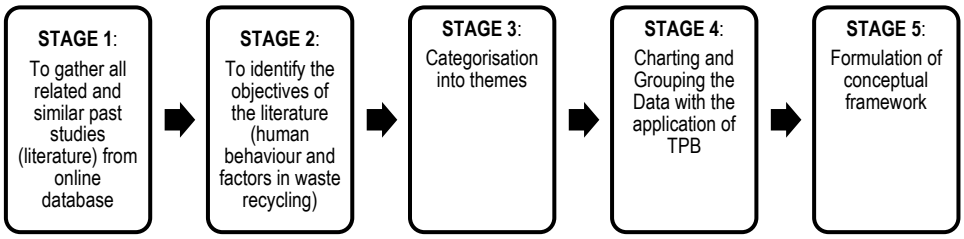

Figure 1: Scoping Study approach

The preliminary work conducted a detailed background study from previous similar literature to justify this study's need. The reviewing exercise included the online publications from 1991 to 2020 that specifically concentrate on recycling, the factors and indicators that include the TPB. Evidently, most literature had considered the TPB for their framework when discussing human behaviour. Ajzen (1991) used the TPB to forecast attitude in order to comprehend actual behaviour and concluded that the TPB is useful as a conceptual framework to study human recycling behaviour. Knickmeyer (2020) and Chen & Lee (2019) applied the TPB in studying household waste segregation in terms of social factors. Meanwhile, the behaviour of adults towards e-waste recycling was studied by Kumar (2019). Other references using the TPB include associations of the determinant's variables (Strydom, 2018; Xu et al., 2017), an inquiry on behaviours in waste management by Ong et al. (2019), socio-demographic aspect to enhance waste management (Becker & Lindhqvist, 2014), the motivation and inspiration to recycle (Miafodzyeva & Brandt 2013), pro-environmental beliefs and attitude (Chu & Chiu, 2003), the determinants of the desire for online recycling (Wang et al.), and household recycling and the effect of spatial factors (Toit et al., 2017).

RESULTS AND DISCUSSION

The research finds that a previous similar TPB Model in the literature applies to examine human behaviour using the Content Analysis Method. The following is a summary of the analysis findings.

The data collected from the twenty-one articles was thematically studied based on regions. In Asia, Chen & Lee (2020) had investigated the effect of internal and external incentives of waste separation among residents' motivation in China and the importance of public policy on waste separation behaviour. Wang et al. (2019) applied an extended TPB theory in exploring e-recycling by looking at the community's obligations to participate in online recycling efforts and investigate the contributing factors through a survey at a national level. In Singapore, Ong et al. (2019) used door-to-door surveys to compare and assess three (3) major hypotheses that explain domestic waste management behaviour, including socio-cultural, social-structural, and social psychology theories. Furthermore, Xu et al. (2017) studied key determinants influencing household waste separation intention and behaviour based on the TPB model using Systematic Sampling and Descriptive Analysis to understand the demographic characteristics factors. Chu & Chiu (2003) analysed the roots of Taiwan's household waste recycling behaviour by employing an integrated model of the Theory of Reasoned Action (TRA) and found that TPB is more likely to be applied in studying human behaviour. Moreover, findings indicate recycling habits do not rely on incentives (Chen & Lee, 2020). Nonetheless, economic variables, societal context and public knowledge might impact these practices (Wang et al., 2019; Ong et al., 2019). Also, moral responsibilities and values may impact human behaviour regarding environmental protection (Xu et al., 2017). Meanwhile, Chu & Chiu (2003) exposed that TPB is more likely to be applied in studying human behaviour.

In other parts of the world, such as in Equestria, South Africa, Toit et al. (2017) conducted a similar TPB study, demonstrating the TPB's relevance in determining the recycling behaviour of residents living in townhouses. The findings demonstrated the significance of control factors at townhouses, which indicated a gap for further research that may incorporate other independent variables such as experience, ethics, situational features, and observed effects of recycling practices. The study's findings, which involved 1,250 townhouse units from a middle-income group, showed that everyone, including non-recyclers, was inclined to recycle. However, this finding contradicts Strydom's (2018) study, which found that many Africans were hesitant to recycle due to a lack of societal pressure and obligation.

Meanwhile, in Sweden, Miafodzyeva & Brandt (2012) examined the Jarva city situated in the northwest of Stockholm discovered a connection in recycling between human behaviour and the determinants of recycling

(motivation and intention). Nevertheless, there were no connections between human behaviour and other factors like cautions for the environmental state, identity of communities, provision of facilities, faith and belief in recycling, and socio-demographic factors . In 2014, Becker & Lindhqvist (2014) found the correlation of income and age towards external conditions in recycling.

Barr (2007) applied the TPB model in the United Kingdom, which looked at households' behaviour in waste management from the environmental, situational, and psychological aspects, while Kumar (2019) undertook a behavioural study on e-waste among local university students. Kumar (2019) reported that perceived behaviour control, subjective norms, attitude, and self-responsibility all influenced e-waste recycling.

Nonetheless, not all the twenty-one articles analysed employed the TPB model in their methodology. One example is a survey in Lithuania conducted by Miliute-Plepiene et al. (2016) that used the Schwartz Theory, which can also identify other human behavioural factors like techno-organisational, normative, and socio-demographic factors. The research only compared recycling behaviour at a preliminary stage of their study and reported that people were inclined to recycle because of existing recycling schemes. Although this study used a different theory model, it was still valuable for understanding the various components of recycling behaviour. Other research, such as a study conducted by Banerjee (2015) and Towolioe et al. (2016), focused on recycling terminology and definitions regarding the process and value of recycling that broadens the understanding of recycling. The activities and process of "Reduce, Reuse and Recycle" (3R) are vital since they can avoid increased illegal dumping and landfill areas. Instead, the 3R activity may produce a new item and encourage the practice of a greener economy.

Meanwhile, in Malaysia, Aini et al. (2002) examined the sustainability of the environment from recycling activities, while Fauziah & Agamuthu (2012) reported that the government had enhanced its policy on waste management. Also, Jereme et al. (2014) studied the continuation of the discussion about waste management. The majority of findings suggest that a lack of planning and implementation hampers waste management in Malaysia according to the waste management hierarchy of reducing, reusing, and recycling (3R), as discussed above. Besides, most landfill areas are not adequately managed or maintained and are seldom assessed through the Environmental Impact Assessment or evaluated in site suitability. Moreover, Malaysia is still dealing with illegal waste disposal into rivers and streams, as well as continued unlawful dumping and the establishment of illegal landfills. In addition to poor recycling practices, many Malaysians have terrible waste management attitudes, for instance, discarding their trash along the roadsides just because the bins are defective. Unsurprisingly, according to a prior study by Abas (2014), Malaysian households do not practise

recyclables segregation. Therefore, according to Abas (2014), separating recyclable materials is often an unexpected and unplanned activity. He also mentioned that the incinerator programs in Malaysia are not fully practised. Nonetheless, Ali et al. (2017) found that waste minimisation activity among homes in Shah Alam, an urban area in Malaysia, was above average, implying that inhabitants were aware of recycling practices. Results, therefore, are highly dependent on gender, race, marital status and homeownership within the socio-demographic characteristics that affect the recycling behaviours.

Despite numerous behavioural theories, like Thomas and Sharp (2013) that focused more on psychological aspects such as attitudes and social norms in their recycling behaviour study, the TPB is the most frequently used theory to describe the pro-environmental purpose and behaviour (Al Mamun et al., 2018). Therefore, this study hinges human activities into three (3) beliefs by applying the TPB framework. It was constructed based on previous related studies by Ajzen (1991), Chu & Chiu (2003), Miafodzyeva & Brandt (2013), Becker & Lindhqvist (2014), Miliute-Plepiene et al. (2016), Xu et al. (2017), Strydom (2018), Kumar, (2019), Wang et al., (2019) and Ong et al., (2019). The first belief posits that the possible outcome of explicit action and assessing the outcome (often known as behavioural belief). Secondly, the normative anticipation of other inspirations to meet such hope (known as normative beliefs). Finally, the lack or existence of other contributing factors may affect the performance of behaviour and alleged power, such as control beliefs. In short, if people have a better understanding of recycling, they would have the tendency and motivation to recycle.

This study then formulated a model that integrates the diverse factors of environmental behaviours from the previous studies whereby, it adopted the factors and designed a conceptual framework by assimilating the Theory of Planned Behaviour (TPB) and content analysis. The single model proposed is illustrated in Figure 2 below.

An Extended Framework for the Theory of Planned Behaviour (TPB)

The study developed a conceptual framework that incorporates human behaviours and factors that impact domestic waste recycling from the analysis and findings. Figure 2 below shows the network mapping as output from the analysis, which includes the lean coding based on the themes derived from the content analysis. It demonstrated the five (5) factors to measure the structure of the variables such as knowledge of recycling measures, spatial and physical characteristics, situational factors, behavioural or motivational measures, and social psychological measures correlated with socio-demographic variables and motivational factors. A few theories designed over the years by social

psychologists were taken into consideration to examine, model, and forecast the human behaviour on recycling concerning behaviour factors and the determinants. The following section provides an overview of the proposed conceptual framework to the findings from the analysis.

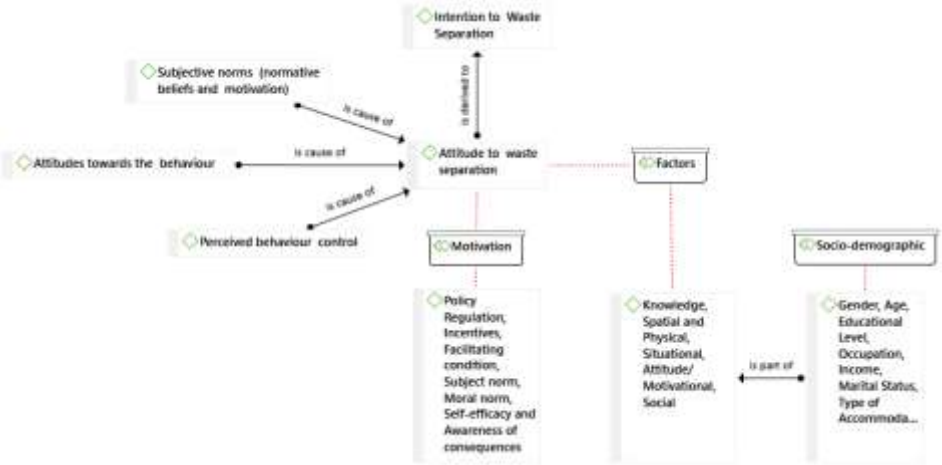

Figure 2: TPB Extended Model Framework
(Source: Adaptation from Ajzen (1991), Chu & Chiu (2003), Miafodzyeva & Brandt (2013), Becker & Lindhqvist (2014), Miliute-Plepiene et al., (2016), Xu et al., (2017), Strydom, (2018), Kumar (2019), Wang et al. (2019), and Ong et al., (2019))

The conceptual framework had considered the socio-demographic factor whereby the association between the recycling system and users should still be considered. Concerning the framework, Becker & Lindhqvist (2014) revealed that socio-demographic variables affect recycling rates and influence recycling behaviour. Those variables considered factors like education and occupation background, gender, age, income, and others.

Furthermore, the proposed conceptual framework incorporated the idea of Barr (2007) and Bakar et al. (2020), who emphasised that recycling knowledge is a necessary precondition for recycling behaviours. They emphasised the need for environmental awareness and understanding of recycling services. For example, recycled branding on products may confuse individuals with limited understanding and experience with recycling. Hence, the inadequate realisation of waste management practices amplifies information barriers such as language conflict reported by Miafodzyeva & Brandt (2013) experienced by immigrants.

The framework also included spatial and physical factors, representing how town planners and architects designated the residence or township to help facilitate recycling in a residential area. Accessibility from collection sites or the roadside should be convenient, according to Toit et al. (2017), who advised that

recycling facilities per household should be provided. The perception of comfort depends on the person who is engaged in separating the waste system. This statement was supported by Miafodzyeva & Brandt (2013) and Thomas & Sharp (2013), who assessed that the lack of appropriate infrastructure could discourage the residents from recycling. Therefore, convenience is one of the most significant factors to encourage the public towards waste separation (Khalil et al., 2019). These factors impact the recycling attitude and the willingness to recycle, significantly affecting the overall environment. As stated in the Attitude Behaviour Context Theory, the willingness to recycle is very much related to factors like convenience, time and costs unless rewards or incentives are provided. Thus, attitude barriers influence the action to recycle (Kumar, 2019). Furthermore, sorting waste in separate containers demands high internal motivation and is influenced by social perceptions and attitudes. Hence, recycling as a behaviour carried out under favourable circumstances regularly may then become habitual.

CONCLUSION

This paper summarises the use of TPB in investigating human behaviour and factors relating to domestic waste recycling. Results demonstrated that by applying the TPB model, domestic waste recycling practice could be developed by extracting the factors influencing household behaviour towards domestic waste recycling and management. The framework indicated the factors like knowledge, spatial and physical planning, situational factors, behavioural or motivational measures, and social psychological measures to determine the household's behaviours. Therefore, this conceptual framework can be a mechanism for domestic waste management planning and be applied by the managing authority. Nevertheless, this research focused primarily on qualitative analysis. Hence, a future study could look into a similar topic but employing a quantitative method or use various theoretical models or frameworks to look into different research areas in domestic waste management that could further inform and improve the recycling attitudes of Malaysians.

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FACTORS INFLUENCING RIDERSHIP PREFERENCE IN USING LRT SERVICE IN KLANG VALLEY, MALAYSIA

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Abstract

Light Rail Transit (LRT) is one of the public transports that provides a lot of benefits to the Malaysian. Yet this consumption depends on the diverse tastes of potential ridership which are influenced by various factors. However, it is very challenging to predict significant factors influencing ridership preferences. As such, the identification of these factors is very important in ensuring this transportation service really attract ridership attention. Thus, this paper intends to identify the main factors that influence ridership preference in taking LRT transportation. 28 attributes have been identified in this research which expands from four (4) main components. Data were collected from ridership's survey, site observations and ridership statistical data. Pearson Chi-square has been employed to justify the significant status and the influence level of each LRT attribute and component factors toward ridership preference. The results show that 23 attributes recorded a significant status (<0.00) in two (2) different directions of correlation. Overall, three (3) component factors namely i) Comfortable Service, ii) Economics and iii) Indoor Environment Conditions, have influenced and contributed to the same effect on ridership considerations, as compared to the negative effects displayed by the Site Design Attributes.

***Keywords**:* Influencing Factors, Ridership Preference, LRT, Public Transportation.

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INTRODUCTION

In Malaysia, the use of public transport is part of the Malaysians choice in planning their daily movements (Ona et al., 2020; Bohari et al., 2014) involving several different destinations such as the workplace, community resources, medical care and recreational place around the country. It is also seen to reduce congestion rates in urban areas (Ona et al., 2020). Therefore, public transport is very much needed in urban areas to facilitate the movement of urban life and support the development of the country (Batarce et al., 2016; Amiril et al, 2014). The use of public transport may contribute and provide a lot of benefits to the public at large such as environmental sustainability and the reduction of fossil fuel usage (Stjernborg & Mattisson, 2016). Besides, public transportation can be the best economical solution to overcome the financial challenges (Ustadia & Shopia, 2016) due to cheaper costs as compared to private vehicles.

Generally, there are a few types of public transport provided by the government to the people such as bus, taxi, motorcycle, rickshaw, bicycles, train, metro, ships and ferry (Ustadia & Shopia, 2016). However, transportation by rail is an efficient way to get around cities, especially with the Kuala Lumpur Monorail, Light-Rail Transit (LRT), Keretapi Tanah Melayu's (KTM) Commuter and Mass Rapid Transit (MRT).

RESEARCH BACKGROUND

Light-Rail Transit (LRT) is the first urban rail light public transportation introduced in Malaysia. Its operations have successfully provided various benefits to ridership. However, after years of operation, the LRT service is seen to be less popular due to different preferences among the riders. Accordingly, in an effort to overcome this problem, this study will identify the main factors that influence ridership preference in using this public transportation. Usually, various aspects can influence ridership choice in choosing public transport as the best option for them (Pawlasová, 2015; Wang & Liu, 2015; Bahreini et al., 2016). Thus, the selection of LRT as one of the main transportations is certainly based on several considerations.

LITERATURE REVIEW

Usually, various aspects can influence ridership choice in choosing public transport as the best option for them. Thus, the selection of LRT as one of the main transportations is critical to be assessed taking into account the ridership preferences. According to Zhou et al., (2014), time has become an important consideration among ridership when choosing public transport. It may refer to travelling time that heavily affects the passengers' decisions (Meng et al., 2018; Zhou et al., 2014; Gooze et al., 2013; Ren and Huang, 2020). Besides, saving time on public transport is a prominent factor when choosing the LRT system (Wang & Liu, 2015). However, according to Haywood et al., (2017), people

would have fewer opportunities to make use of the time during the public transport journey. Apart from that, passengers on public transport are also concerned about the cost that needs to be incurred each time they use this transport (Taylor, 2009; Tirachini and Antoniou, 2020). Low and affordable transportation costs are highly preferred by ridership (Tirachini and Antoniou, 2020), which may be contributed by subsidies (Zhang and Xu, 2017) as it can save the overall cost (Zakaria et al, 2017), besides, giving riders space to use these cost savings for other interests.

Ridership is also concerned about the convenience and comfort of the journey in using public transportation. Therefore, all the service and facilities that provide comfort during the trip has become the priority of ridership (Nikel et al.,2020; Sham et al, 2013; Bahreini et al., 2016). Among others, the things that lead to this comfort are the presence of a waiting area and comfortable seats for the use of riders (Haywood et al., 2017). The best condition of the toilets may contribute by the cleanliness, suitable equipment, as well as the sufficient number of toilet units, are seen to attract riders to continue using public transport services (Akmar Faisal et al., 2019). The same goes for the place of prayer which is very much needed by the riders, especially the Muslims (Kadir et al., 2020). In addition, the design of the stairs and the movement of the escalator also influence the intention of riders to continue to use public transport services (Chi et al, 2006).

The riders' decision to use the LRT service also tied to the site design and development (Ren et al., 2020). Usually, the location and site design of this transportation may influence the rider's choice (Abdullah et al, 2020). Generally, LRT has been developed in travel coaches as well as the placement of several stations which aim to facilitate travel operations. Thus, its development has included parking lots (Lambrinos et al, 2013), to make it easier for riders to park their vehicles before embarking on their journey with LRT. Therefore, the provision of parking lots is able to attract riders (Ho et al., 2017), to visit the LRT station and take LRT service. In addition, the distance from the parking lot to the LRT station also becomes the main consideration by riders to continue to take LRT transport (Hamsa et al., 2014). Apart from that, the riders are also seen to be very concerned about the distance (Minn, 2019) between their homes to the station (Huang et al, 2017), as well as the distance from the workplace to the station (O'sullivan and Morral, 1996; Sarker et al., 2017). This is because the close distance saves the entire travel time. Meanwhile, the availability of clear signage information will make it easier for the riders to taking LRT service (Bai and Kattan, 2013). Besides, good coverage of public transport may also influence ridership preference. However, according to Hensher et al (2015), this attribute does not influence LRT ridership.

Public transport should also prioritise good Indoor Environment Conditions (Sugiono et al., 2020). According to Ponni & Baskar (2015) and

Kadir et al (2020), the thermal performance of a building may be referred to as the process of modelling energy transfer between a building and its environment. Hot weather in Malaysia has pushed the interest of riders in this aspect. Among the aspects of this Indoor Environment Conditions (IEC) include Air Temperature, Humidity of Air Quality and Air Movement in public transport (Bridger, 2003; Wang and Zacharias, 2020). In addition, the high noise rate also makes riders less comfortable using public transport (Wang and Zacharias, 2020). Ridership is also concerned about the lighting level in the vicinity of the LRT service, especially for women who feel safer being in public transport (Brown, 2013).

The above discussion clarifies that several aspects may influence the ridership preferences in taking LRT service. Therefore, all these aspects have been formed under four (4) main components that become the basis of measurement for this study (Figure 1).

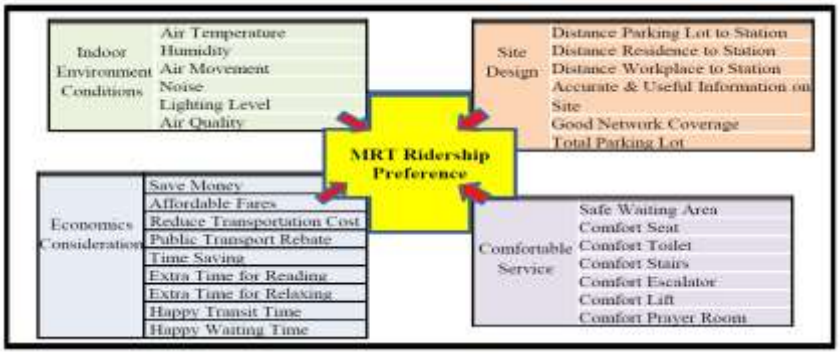

Figure 1: Theoretical Framework

METHODOLOGY

This study includes a few main sources of data namely survey data obtained from an interview for ridership, existing statistical data obtained from LRT management and observation data obtained from the on-site design. An observation task has been done in order to get information on the total unit of the parking lot and the distance from the parking lot to the main area of the station (metre). While for other attributes, data were obtained through a questionnaire survey and daily ridership data has been collected from LRT management at the same date of questionnaire distribution.

The Likert scale questionnaire was developed by emphasising 26 attributes expanding from four (4) main research components. The questionnaire has been distributed randomly to the LRT riders at ten (10) LRT stations in Kuala Lumpur.

All of the data has been allocated together as the main sample where the Ridership data has been correlated with all 28 attributes that expand from the four (4) main components. A Chi-square test has been employed to analyse the data. Attribute Any attribute with a score value of below 0.01 (Sig. 2-tailed) was considered significant to the study and would be further analysed with Pearson Correlation Analysis, to justify the existence of the relationship between the selected attribute and LRT ridership's score, explaining their decision and preference. A significant number of attributes will contribute to the Significant Status Frequency Score for each factor. The correlation value from the ridership data with the selected attribute will contribute to the Correlation Value Score by each component factor. The Status Frequency Score for Significant Attribute was aligned with the Correlation Value Score in order to derive the most influential factor on ridership decision. The Influence rate of LRT attributes towards ridership decision is given by the following equations:

$$\text{Status Frequency Score for Significant Attribute} = \sum sf\,(SiA) \quad \ldots\ldots(1)$$

$$\text{Correlation Score for Selected Attribute} = \sum cs\,(SeA) \quad \ldots\ldots(2)$$

where,
$\sum sf$= Significant Status Frequency score
SiA = Significant Attribute
$\sum cs$ = Correlation Value Score
SeA = Selected Attributes

The analysis is further analysed to find the average scores for the attributes that have been studied under the four (4) main components as discussed above. Table 1 shows the detailed information of the data concerning the distance of the workplace to the respective LRT station and the total parking lots available in each station.

Table 1: Detail information on distance and parking lot at LRT station

No	Station Name	Sample Allocation	Total unit of the parking lot	Distance parking lot to the main area of station (metre)	Station	Distance scale	Sample allocation according to scale
1	Subang Jaya	13.2%	86	10	Refer All station	Distance Workplace to station	
2	USJ 7	13.2%	61	20		<400m	29.6%
3	Alam Megah	8.0%	238	20		400m-800m	19.7%
4	USJ21	13.2%	466	30		800m-2km	20.0%
5	Wawasan	6.1%	51	10		>2km	30.8%
6	Taipan	16.5%	34	10		Distance Residence to Station	
7	Lembah Subang	6.6%	74	20		<400m	30.5%
8	SS15	9.6%	36	20		400m-800m	21.1%

9	Glenmarie	7.6%	770	10	800m-2km	73.1%
10	Ara Damansara	6.0%	50	10	>2km	27.9%

RESULTS & DISCUSSION

This study involved 904 samples from the selected ten (10) LRT stations namely, Alam Megah, Subang Valley, Ara Damansara, Glenmarie, Subang Jaya, SS15, USJ, Taipan, Wawasan and USJ 21. Each station represents a portion of the sample ranging from 6% to 13.3% (Table 1). Each station provides a total parking lot of between 51 to 770 units. It has been observed that the walking distance between the parking lot to the main station is about 10 to 30 metres.

Table 2 displays the average scores for the attributes under the four (4) main components. By employing the Likert Scale, 15 attributes obtained a score value of > 3.5, suggesting that most of the attributes have influenced the riders to choose LRT as one of their favourite public transport. The highest mean score indicated money-saving among riders (3.82). Only one attribute indicated < 3 which is 2.81 (Reduce Transportation Cost), meaning that the LRT service does not reduce the overall transportation cost.

Table 2: Mean score for attribute from ridership survey

Components	Attribute	Mean score
Site Design Attributes	Distance Parking Lot to Station	20 (metre)
	Distance Residence to Station	800 (metre)
	Distance Workplace to Station	800 (metre)
	Total Parking Lot	350 units
	Good Network Coverage	3.47
	Accurate & Useful Information on Site	3.60
Comfortable Service	Safe Waiting Area	3.57
	Comfort Seat	3.63
	Comfort Toilet	3.42
	Comfort Stairs	3.59
	Comfort Escalator	3.63
	Comfort Lift	3.59
	Comfort Prayer Room	3.64
Economics Consideration	Save Money	3.82
	Affordable Fares	3.65
	Reduce Transportation Cost	2.81
	Public transport Rebate	3.89
	Time-Saving	3.46
	Extra time for Reading	3.48
	Extra Time for Relax	3.58
	Happy Transit Time	3.47
	Happy Waiting Time	3.20
Indoor Environment Conditions	Air Temperature	3.71
	Humidity	3.58
	Air Movement	3.59
	Noise Level	3.11

	Lighting Level	3.58
	Air Quality	3.53

Next, a total of 28 attributes derived from the four (4) main components has been analysed to justify the significant status of the LRT ridership. Through Chi-Square analysis, the value of Sig. (2-tailed) for all attributes have been obtained as displayed in Table 3. Generally, only 21 attributes indicate the significant status of LRT's ridership (< 0.05). Next, all the significant attributes were further analysed with Pearson Chi-square to justify the influence of ridership towards the use of LRT services. Two (2) attributes indicate a negative correlation (-.197 **, -.343 **), while the other indicate a positive correlation within the value 0.090 ** - 0.197 **.

Table 3: Significant Status and Correlation Value between LRT Attribute and LRT's ridership

Component	Attribute	Sig. (2-tailed)	Significant status	Pearson Correlation
Site Design Attributes	Distance Parking Lot to station	.000	√	-.343**
	Distance Residence to Station	.262	×	-.045
	Distance Workplace to Station	.608	×	.021
	Accurate & Useful Information on Site	.000	√	.190**
	Good Network Coverage	.007	√	.108**
	Total Parking Lot	.000	√	-.197**
Comfortable Service	Safe Waiting Area	.001	√	.133**
	Comfort Seat	.005	√	.112**
	Comfort Toilet	.000	√	.142**
	Comfort Stairs	.002	√	.126**
	Comfort Escalator	.011	√	.102*
	Comfort Lift	.002	√	.122**
	Comfort Prayer	.025	√	.090*
Economics Consideration	Save Money	.165	×	.056
	Affordable Fares	.005	√	.112**
	Reduce Transportation Cost	.521	×	-.026
	Public Transport Rebate	.921	×	-.004
	Time-Saving	.025	√	.090*
	Extra Time for Reading	.000	√	.162**
	Extra Time for Relax	.001	√	.137**
	Happy Transit Time	.092	×	.067
	Happy Waiting Time	.350	×	.038
Indoor Environment Conditions	Air Temperature	.012	√	.100*
	Humidity	.001	√	.127**
	Air movement	.003	√	.119**
	Noise	.016	√	.096*
	Lighting Level	.000	√	.197**
	Air Quality	.004	√	.115**

Figure 2 shows the influence rate of Site Design attributes on ridership preferences. The results of the study found that the riders quite particular with the distance between the parking lot and the location of the LRT station at -34%. This

shows that the farther the distance between the two (2) locations, the less priority of riders to visit the LRT station, thus affecting their decision to use the LRT service. A similar effect found for the number of parking units provided around the LRT station. The more the parking units are provided, the less priority of ridership to visit that station by 20%. This is because the provision of many parking units will require a large site allocation for the parking area as well as creating a large distance between the parking lot and the LRT station. This has caused riders to have to walk at a relatively long pace to enter the station area. On the other hand, the LRT service, which involves a network of many stations and covers several key areas, has encouraged ridership to continue taking this transportation which is 11%. Similarly, the information facilities and clear signage at the LRT Station have succeeded in attracting passengers to continue using this service, which is 19%. The six (6) attributes under Comfortable Service component have influenced ridership's decision in using LRT transportation at different rate level (Figure 3).

Good Quality of Toilet provision has contributed 14% to ridership preferences. However, only 1% is contributed by the worship facilities because most riders prefer to perform prayers at home instead of at the station. Under Economics Consideration, the results show that the allowable time for ridership to rest and the opportunity of reading activities has influenced their decision to use the LRT service by 14% and 16%, respectively. Meanwhile, low ticket costs also affected the LRT ridership by 11%. This shows that the Malaysian community is very concerned about the free time they get during their journey in the LRT.

Besides, all attributes under the IEC have recorded an influencing rate between 1% to 13%. The Noise Level had indicated the lowest value of 1% may be contributed by a large number of riders at LRT service. The emphasis on high lighting rate (20%) is due to the need for a high safety rate among ridership. While the rate of air movement and humidity also become ridership concerns because it provides comfort during the journey of the LRT service. Apart from that, the hot weather conditions in Malaysia influence the riders to give priority to the cool air, if they were available at the station. Thus, good air -conditioning will greatly influence the riders' decision to continue using the LRT service.

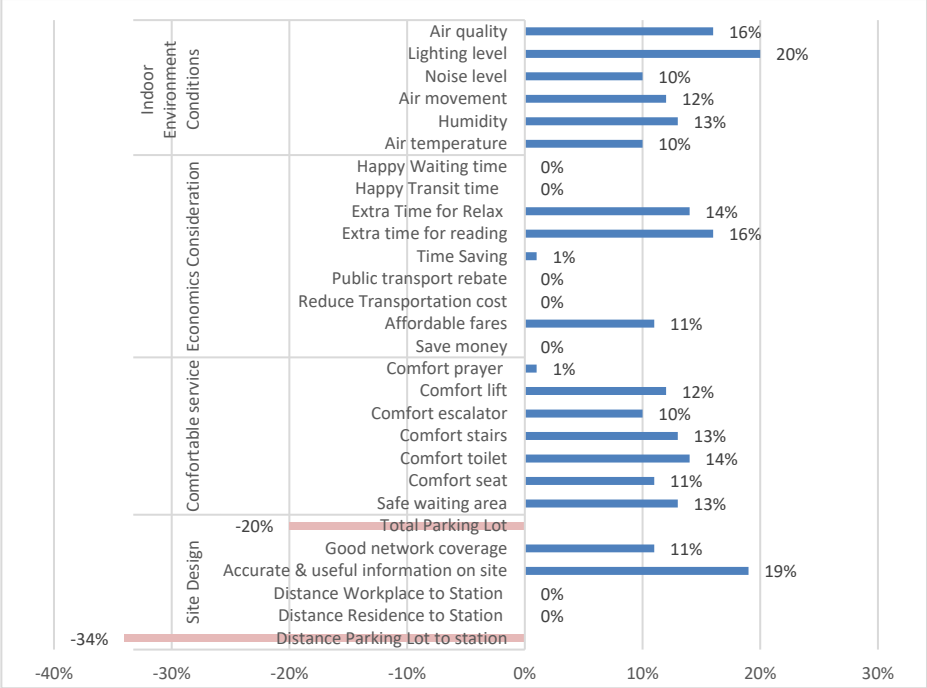

Figure 2: The influence of component factors and attributes towards ridership preference

All significant attributes (21) were aligned with the correlation score according to the four (4) components in this study. The research found that these four (4) components have influenced ridership preference in taking LRT transportation. However, the Site Design Attributes have given a different influence, through the number of parking units and also the distance that exists between the parking area to the main station area (Table 4).

Table 4: Frequency Status and Correlation Score of significant attributes

Component Factor	Status Frequency score for Significant Attribute ∑sf(SiA)⟧	Correlation Score for selected Attribute ∑cs (SeA)	$\sum sf(SiA) / \sum cs\ (SeA)$
Site Design	4.00	-24%	-6%
Comfortable Service	7.00	74%	11%
Economics	4.00	42%	11%
Indoor Environment Conditions	6.00	68%	11%

Figure 3 shows the influencing level of the four (4) components towards ridership where the site design of the LRT development has contributed a negative impact on ridership preference as compared to the other 3 components.

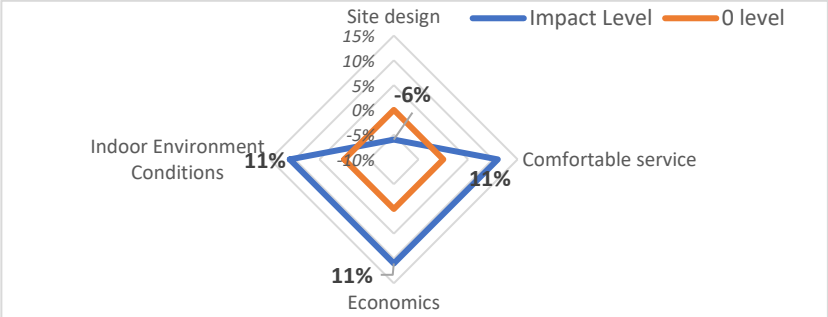

Figure 3: Influencing level by four (4) components towards ridership preference in using LRT service in Malaysia

CONCLUSION

In general, out of the 28 attributes identified in the study, there are only 23 Attributes from the four (4) component factors that influence the decision of LRT ridership to continue choosing this transportation as their choice as compared to other types of transportation. However, the results of the study show that the site design is one of the factors that reduce the intention of using the service as displayed by the negative impact results. Although only 6% has contributed by this factor, it could have a direct impact on the use of this transport in the future. Therefore, the positive impact of the other three (3) main factors, especially related to the indoor environmental condition should be maintained in terms of quality and maintenance work to sustain the ridership of LRT service.

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MOSS AS BIOINDICATORS FOR POLLUTION AT FRASER HILL AND CAMERON HIGHLAND PAHANG MALAYSIA

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Abstract

Tropical Montane Cloud Forest (TMCF) is one of Earth's most neglected ecosystems around the globe. More than half of these forests are situated within Southeast Asia. Malaysia is known for its numerous mountains that are exceptionally rich in biodiversity and locally endemic species, but they are also threatened by expanding human activity such as forestry, agriculture, infrastructure, and climate change. The study aims to critically assess the current state of moist TMCF, focusing on their physical and biological potentials as Bio indicators through Bio monitoring at Fraser Hill and Cameron Highland, Pahang, Malaysia. The mix-methods of observation surveys are to identify physical attributes such as light intensity, altitudes, temperature, wind velocity and air humidity. Secondly, laboratory tests are to identify heavy metal contamination absorbed by mosses. Based on the findings collected around the trails, a connection between altitude and microclimate could be found. The study finds that as the altitude increases and the temperature decreases, the vegetation becomes more dwarfed. Secondly, results from the analysis at Abu Suradi trail within Fraser Hill and Brinchang Trail within Cameron Highland have a higher average of aluminium and iron concentration. Mosses were manifested as good key indicators of air pollution with heavy metals to Malaysia highland forest ecosystems. It showed differential accumulation of heavy metals located near sources of pollution. Thus, the moss data confirms the persistence of risk of pollution of highland forest ecosystems in Malaysia, which demands environmental management. Furthermore, decision makers, planners and designers around the region can evaluate and improve their local strategies related to Tropical Montane Cloud Forest (TMCF) conservation and preservation, especially highlands such as Fraser Hill and Cameron Highland.

Keywords*:* Tropical Montane Cloud Forest (TMCF), Ecosystem, Bio Indicator, Bio monitoring.

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INTRODUCTION

Tropical Mount Cloud Forest (TMCF) has been reaching attention among people and researchers due to unique characteristics of flora and fauna. There are many definitions that have been debated and the main character of the forest usually has direct canopy interception of cloud water at high altitude (Boehmer, 2011 & Ramirez et al., 2017). Malaysia's cloud forest, can be said to be some of the best-documented in the region, in which some research describing local distribution, physiology, protection status, biological and ecological importance and threats to them exist (Peh et al., 2011 & Kumaran et al., 2011). Malaysia consists of two distinct parts: Peninsular Malaysia, which includes 11 states, with Titiwangsa Range forming the backbone of the Peninsular and East Malaysia. Covering two states, Sarawak and Sabah, which are located in the north and northwest of Borneo, the mountain rises sharply on a large inland mountain to the border of Kalimantan, Indonesia. Many mountains and its connection exist in Malaysia, about 7 percent of total land area which exceeds 900 meters height. On Malaysian mountains, cloud forests usually are made of shorter trees with higher stem density that are of twisted branches and twigs, solid crowns, sclerophyllous leaves that are smaller in size (Bruijnzeel, 2010; Boehmer, 2011; Peh et al., 2011; & Kumaran et al, 2011). With more elevation on the wet tropical mountains, different changes in appearance and forest structure are valid and noticed. Initially, this phenomenon changes gradually (Peh et al, 2011).

Malaysia's tropical montane cloud forest area originally sprawled around some 2.7 million hectares, but in the last decade within 23 percent have been destroyed or degraded (Sodhi & Brook, 2006). Around 9 percent or 216,300 hectares of cloud forest is protected either as a national park or as a wildlife reserve (Iremonger et al, 1997). Examples of these are Mount Tahan in West Malaysia, Mount Kinabalu National Parks in Sabah, and Mount Mulu National Park in Sarawak. Additional tropical montane cloud forests in Malaysia are within extractive reserves or various uses (IUCN-UNEP, 2010) or stated as mountain reserves. If these areas are included, Malaysia would have around 356,300 hectares or 15 percent cloud forest with some existing or planned protection levels (Iremonger et al, 1997). These estimations are still acceptable despite data being studied decades ago since the development of a small protected area in Malaysia in the early 1990s which has already existed (IUCN-UNEP, 2010).

Many types of management act have been introduced for further protection of the forest yet specific Tropical Montane Cloud Forest Management Act or protection method specifically for the ecosystem. Nevertheless, the tropical cloud forests in Malaysia are getting endangered and dismissed due to human activities, mainly infrastructure development. Preservation and conserving the ecosystem services provided by Tropical Montane Cloud Forest are essential for biodiversity and human benefits. In environmental pollution

assessments, two important instruments are applied; bio-indicators and bio-monitors. These methods, cheap and simple, are used as visual environmental monitoring devices assessing species diversity and signs of external changes caused by human activities. Bio-indicators use organisms to analyse the quality of environment and any changes occur to the environment overtime through qualitative assessment. Often used as the primary focus of bio-indicator research, pollution and other natural stressors (droughts) for instance are attributed to nature disturbance.

Another approach is called quantitative assessment. Bio-monitors quantitatively determine a response from lichen (a symbiosis among algae, fungi and cynobacteria) and moss changes to indicate the level of severity in air pollution. Bio-monitors also serve as a tool to assess the level of depositions of pollutant components accumulated in organisms in the designated parameters. It traces the elements and directions of their distribution or any changes taking place in the ecosystem in historical paradigms, hence, a good marker of these processes (Lequy et al., 2019). In short, bio-indicators qualitatively assess biotic responses to environmental stress while bio-monitors quantitatively determine a response. Mosses and lichens, on the other hand, are the best body to be bio-indicators to air pollutants. The unique characteristics, made them a significant agent, rely on atmosphere deposition for nourishment. They accumulate persistent atmospheric pollutants to concentrations far within the forest ecosystems (ie: in air quality, forest structure and climate). Without the presence of lichen, the forest ecosystem is at stake due to uncontrolled levels of sulfur dioxide, sulfur pollutants and nitrogen pollution (Holt et al., 2010). Thus, the study aims to evaluate the potential of moss species as bio-indicator for the highland environment at Fraser Hill and Cameron Highland in Pahang, Malaysia. The study focuses on two aspects, firstly, on the physical factor such as relation to the microclimate and secondly, relation to heavy metal concentration.

ABU SURADI TRAIL, FRASER'S HILL AND BRINCHANG TRAIL, CAMERON HIGHLAND

Fraser's Hill is formed by seven rolling hills with heights between 852 meters above sea level to 1,456 meters. Fraser's Hill is situated as least disturbed and the lowest between the three main hill stations in Titiwangsa Range or Main Range. Its location is located 100 kilometres from Kuala Lumpur, in the area of Raub, Pahang, covering an area of approximately 2,829 hectares. It is known that Fraser's Hill which is an environmentally sensitive area with fragile ecosystems and important areas especially for birds and highland biodiversity. Raub Local Plan 2003-2015 recommends wildlife sanctuaries to be formed. It is also listed as one of the main sites for ecotourism by the National Ecotourism Program.

The research location located in Fraser's Hills is on the Abu Suradi trail. Abu Suradi trail is located further up with an elevation of 1200 meters up to 1300

meters above sea level, temperature from 22-28 Celsius and 16-20 Celsius at night with humidity of 90%- and 2000-2500-mm rain within a year. The area surrounding the trail is robust with human activities consisting of tourism, agriculture and commercial buildings (Er et al, 2013). Meanwhile, Cameron Highlands is one of the most extensive hill stations in Malaysia, covering an area of 712 square kilometres where the boundaries touch Kelantan in the north and west, sharing some of its borders with Perak. It is located at the northwest tip of Pahang, about 90 kilometres from Ipoh and about 200 kilometres from Kuala Lumpur and is known as the smallest constituency in Pahang. Brinchang trail is located further up with an elevation of 1200 meters up to 2000 meters above sea level with an average annual temperature of 18 ° C (64 ° F). Temperatures rarely rise more than 25 ° C (77 ° F) during the day at night, they rarely fall to 9 ° C (48 ° F), only at higher altitudes.

MATERIAL AND METHOD

There are two variables that have been investigated, firstly the survey on the physical attributes of the site such as light intensity, altitudes, temperature, wind velocity and air humidity. Secondly, the samples of mosses were collected from Fraser's Hill and Cameron Highland in Pahang which are well-known tourism sites. The samples were collected based on altitudinal zones. The samples were taken right before Monsoon season starts to avoid fluctuations or sudden spikes in readings of results. All procedures were based on standard methods for the examination of dried plant tissue while our analysis was done based on Inductively *coupled plasma* mass spectrometry (*ICP*-MS).

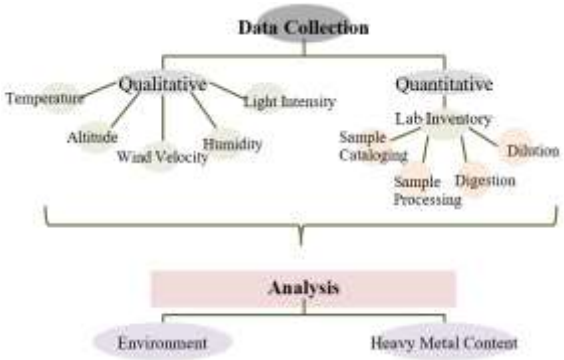

Figure 1: Summary of the research framework

MICROCLIMATE AND HEAVY METALS CONTAMINATION AT FRASER'S HILL

ABU SURADI TRAIL

Abu Suradi trail is located within Fraser's Hill, it is a public trail and is open to all members of the public and tourists. The trail's forest is surrounded by many human interventions such as agriculture, commercial activities and as a result it is very close to the road, though the location of the trail is near to human interactions, the altitude of the extraction points started higher at lowest 1238 metres above sea levels and highest being at 1279 metres above sea level. The temperature ranges between 19.3 to 20 degrees Celsius. Its wind velocity is between 0.2 up until 0.17 (m/s) with hu midity from 97.2 up to 99.2 (%rh) and Lux or light intensity measurement around 456 to 1973.

Table 1 shows the measurement recorded at extraction points of samples in Fraser's Hill on Abu Suradi trail, it shows that there are some relations between the reading of altitude and the reading of wind velocity and humidity by emphasising this with having almost similar pattern with one another. The table showed there was an increase in altitude reading when the wind velocity and humidity reading indicators were at the highest range. As the altitude level gets higher, the temperature of those environments were rather slimy and with wet conditions.

Table 1: Physical character of microclimate at Abu Suradi Trail, Fraser's Hill

Sample Id	Altitude	Temperature (oc)	Wind Velocity (m/s)	Humidity (%rh)	Lux
A.S.T 1A	1238	19.6	0.05	97.2	456
A.S.T 1B	1238	19.6	0.05	97.2	456
A.S.T 1C	1238	19.6	0.05	97.2	456
A.S.T 2A	1256	20	0.12	97.8	1973
A.S.T 2B	1256	20	0.12	97.8	1973
A.S.T 2C	1256	20	0.12	97.8	1973
A.S.T 3A	1260	19.9	0.4	97.4	526
A.S.T 3B	1260	19.9	0.4	97.4	526
A.S.T 3C	1260	19.9	0.4	97.4	526
A.S.T 4A	1264	19.5	0.2	98.2	258
A.S.T 4B	1264	19.5	0.2	98.2	258
A.S.T 4C	1264	19.5	0.2	98.2	258
A.S.T 5A	1270	19.6	0.18	99.2	544
A.S.T 5B	1270	19.6	0.18	99.2	544
A.S.T 5C	1270	19.6	0.18	99.2	544
A.S.T 6A	1279	19.3	0.17	97.9	1289
A.S.T 6B	1279	19.3	0.17	97.9	1289
A.S.T 6C	1279	19.3	0.17	97.9	1289
Mean	1261.167	19.65	0.186667	97.95	841

However, the lux reading did not show any significant score due to the nature of forest canopy which was open and shady. The results indicated that the indicative features of physical climatic conditions of the site survey at Abu Suradi trail suggested healthy, conducive and ideal growth of highland plant species such as mosses. Natural habitat for mosses often found at the forest floor and slopes and on woody and rocky surfaces ensured the healthy condition of the environment.

Furthermore, data collection of different species of mosses along Abu Suradi trail indicated there were traces of heavy metals concentrations found. These two typical moss families were known as 1) Calumperacea-*Calymperes afzelli* and 2) Sematophyllum-*Acanthorrhynchium papillatum*.

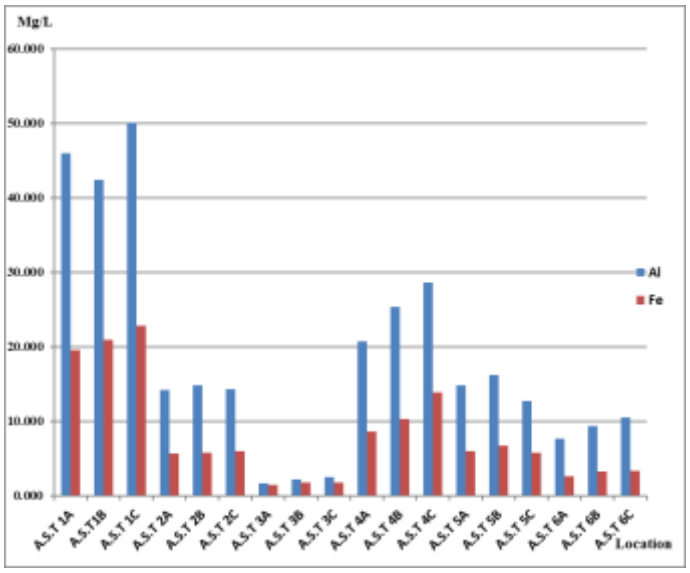

Figure 2: Heavy metal contamination at Abu Suradi trail, Fraser's Hill

Figure 2 indicates the amount of concentration in sample for Abu Suradi trail location, there were six sample locations chosen. From all the six spots, the first location which is A.S.T 1 has the most reading out of all for both Aluminium and Iron. Aluminium is > 40,000 Mg/L and Iron around 20.000 Mg/L. The second highest reading comes from location A.S.T 4. The ones that come afterward are from location A.S.T 2 and A.S.T 5 and the two last with the comparably lowest amount of concentration out of all locations are A.S.T 6 and A.S.T 3 < 10,000 Mg/L.

The increased contamination of A1 content with more than 1400mg/kg and Fe is more than 1900mg/kg shows a high level of air pollutant. Therefore, in

Figure 2, it proved that the sample soil taken from Abu Suradi trail contained increased capacity of accumulation of A1 and Fe content. Lack of concentrations of metals from Com Cu, Mn and Zn showed the site experienced an intense leaching process and faced potential risks of slope failure (Othman & Hasni, 2017).

MICROCLIMATE AND HEAVY METALS CONTAMINATION AT CAMERON HIGHLAND

BRINCHANG TRAIL

Brichang trail is located within Cameron Highlands located in it's Moss Forest Park, it is a public park but permission is needed from the Department of Forestry as part of the body of government that provides permits for any expedition as to control maximum capacity and for safety purposes. The trail is surrounded by thick muddy spongy forest away from the roads but is used by people as resting areas or a camping point. The altitude of the extraction points starts at 1963 metres above sea levels and goes up two metres, which is at 2000 metres above sea level. The temperature ranges between 15.8 to 16.8 degrees Celsius. Its wind velocity is between 0.17 and 0.78 (m/s) with humidity from 99.5 up to 100 (%rh) and lux or light intensity measurement around 665 to 1294.

The figure 3 below was designed based on measurements recorded at extraction points of samples in Cameron Highlands from Brinchang trail in Moss Forest Park. It shows that it is similar to findings on the Abu Suradi trail. There is a relation between the reading of altitude and the reading of wind velocity temperature, wind velocity and humidity by emphasising this with having almost similar pattern with one another. Figure 3, presented in the line graph shows an increase in temperature and wind velocity reading when there is an increase in altitude reading.

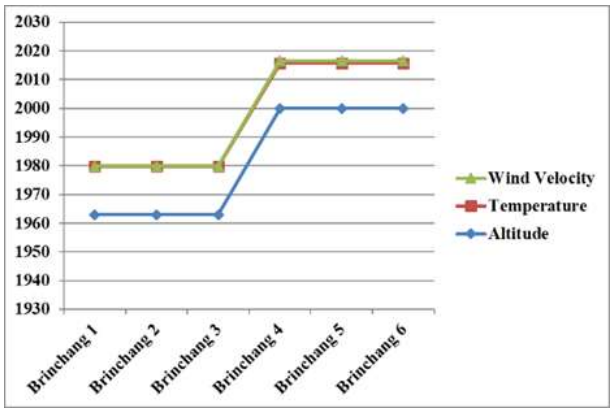

Figure 3: Physical character of microclimate graph of Brinchang Trail

Table 2: Physical Character of microclimate at Brinchang Trail, Cameron Highland

	Altitude	Temperature (oc)	Wind Velocity (m/s)	Humidity (%rh)	Lux
B 1A	1963	16.8	0.17	99.5	1294
B 1B	1963	16.8	0.17	99.5	1294
B 1C	1963	16.8	0.17	99.5	1294
B 2A	1963	16.8	0.17	99.5	1294
B 2B	1963	16.8	0.17	99.5	1294
B 2C	1963	16.8	0.17	99.5	1294
B 3A	1963	16.8	0.17	99.5	1294
B 3B	1963	16.8	0.17	99.5	1294
B 3C	1963	16.8	0.17	99.5	1294
B 4A	2000	15.8	0.78	100	665
B 4B	2000	15.8	0.78	100	665
B 4C	2000	15.8	0.78	100	665
B 5A	2000	15.8	0.78	100	665
B 5B	2000	15.8	0.78	100	665
B 5C	2000	15.8	0.78	100	665
B 5C	2000	15.8	0.78	100	665
B 6B	2000	15.8	0.78	100	665
B 6C	2000	15.8	0.78	100	665
Mean	1981.5	16.3	0.475	99.75	979.5

Other than that, several samples of moss species have been collected at Brinchang trail. There were two moss species found during data collection. The moss families in Brinchang is 1) Sematophyllaceae- *Acanthorrhynchium papillatum* and 2) Rhizogoniaceae- *Pyrrhobryum spiniforme*.

Figure 4, below stated the amount of concentration in the sample for Brinchang trail location, there were six sample locations chosen. From all the six spots, the first location which is B 1A has the most reading out of all for both Aluminium and Iron (> 10,000 Mg/L). The second highest reading comes from location B 2 (> 5.000 Mg/L). The ones that come afterwards are from location B 3. B 5 comes next and the two last with the comparably lowest concentration out of all locations are B 6 and B4 (< 5,000 Mg/L).

Similarly, to the Abu Suradi trail, the results showed high concentrations of A1 and Fe exceeded 1400mg/kg and 1900mg/kg significantly. This is due to the significant relationship of A1 and Fe concentrations with oxisol soil. The different degree of A1 substitution in iron oxides can reflect the environments in which they are formed (Othman et al., 2017).

As stated by Othman et al (2017), basic cations such as calcium, magnesium, and sodium leached away by rainwater from the soil because as compounds with chloride, they are very soluble whereas iron and aluminum that were released by weathering would remain at the site as they are highly insoluble compounds, so they cannot leach with percolating water. Conversely, under exceedingly acidic conditions some of the aluminum is solubilized as positively charged ions, mostly as $AlOH^{2+}$ and Al^{3+}. If they are percolated to surface waters in huge quantities, they can cause biological destruction and these soluble ions of aluminum are highly toxic to soil, animals and terrestrial plants. Iron oxides are important as cementation agents in soil as it acts to bind the soil particles in order to form aggregates and is difficult to be solved by water. Cementation occurs when iron oxide crystals occur in a space between particles. Then the crystals grow and interact with the soil particles and strengthen the bonds between the particles. Thus, the low percentage of iron oxide causes the soil to become friable and susceptible to collapse.

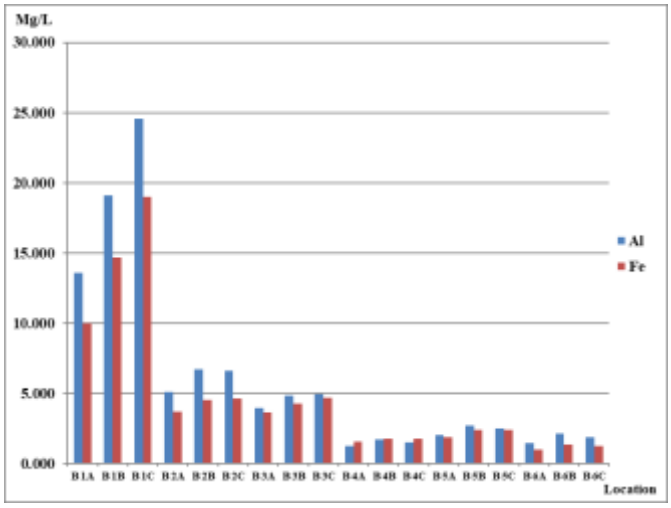

Figure 4: Aluminium and Iron graph of Brinchang Trail

CONCLUSION

Relation of moss species with local microclimate and heavy metal concentration

Tropical Montane Cloud Forest altitudes can be found within 2000 metres to 3500 metres but could as well go as low as 500 metres above sea level depending on the geographic condition and character (Boehmer, 2011 & Kumaran et al., 2011). Based on the findings collected around the trails, a connection between altitude

and microclimate could be found. The study finds that as the altitude increases and the temperature decreases, the vegetation becomes more dwarfed or less compacted than lower tropical forest. This is most probably due to the microclimate of constantly being wet, not only that as the altitude increases so does the humidity as well as the wind velocity which could explain the reason for most vegetation within the area being dwarfed (Er et al., 2013 & Sodhi & Brook, 2006).

Meanwhile, certain tourism and land use activities play a role in increasing the environmental risk (Lequy et al 2019; Rabe et al., 2019 & Latip et al., 2020) such the level of heavy metal concentration within plant. In the light of heavy metals concentrations in mosses, the result confirmed that a higher value of aluminium heavy metal concentrations was found in Abu Suradi trail within Fraser's Hill and Brinchang Trail.

The land is located near the outer route, the main local source of pollution. Thus, this area is influenced significantly by the emissions of road transport and heavy traffic (Hoon Leh et al., 2020).

In conclusion, this research identifies some moss species and issues concerning Tropical Montane Cloud Forest which are rapidly and clearly diminishing from earth. Major conservation maintenance is required as it is impossible to cultivate once it is gone (Boehmer, 2011). The research concludes that mosses are good indicators of air pollution with heavy metals concentrations in the Malaysia forest ecosystem. With different levels of humidity and light, it confirmed the mosses to be persistent of risk of pollution of forest ecosystems. Mosses are indicative features contributing positively to the development of landscape ecology, often being a significant bio indicating tool to measure the environmental health of Malaysian forests. It effectively serves as a tracer of any climate changes or air pollutant due to heavy metals concentrations. At some point, the same indices can be of a useful tool to trace any macro and micro climate changes in the environment, both natural and man-made.

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THE TOURISTS' SPATIAL BEHAVIOUR AND TOURIST MOVEMENT PATTERN IN MUAR JOHOR

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Abstract

Unsystematic transportation system and accessibility, fewer tourism packages supply, and disorganised digital marketing strategy in destination management are the factors of the limitation of the tourist movement in a destination. Therefore, this research aims to determine the characteristics of the tourist's spatial behaviour and tourist movement pattern in Muar, Johor. This research implemented a qualitative method through the semi-structured interview, which involved seven respondents who visited Muar, Johor. The result shows the characteristics of tourists' spatial behaviour and tourist's movement pattern has a significant interaction in investigating visiting characteristics, spatial data and movement. In the context of the macro-level movement pattern, the findings indicate that Muar has the potential to be developed as a one-day trip and three days one-night trip destination. Hence, it has positively affected tourism destination management to improve the travel package for domestic and international tourists. The main contribution of this research is to apply the mutual understanding of the tourist movement concept among visitors in investigating the complex visitor movement during travel related to the physical environment factor such as attractions, route and accessibility, and mode of transportation influenced by tourists' spatial behaviour. This study can also be a primary reference for Muar local authority and destination management to ameliorate many aspects of creating an efficient tourist movement considering sustainable development in the urban heritage area.

Keywords: Muar Royal Town, tourist spatial behaviour, tourist movement pattern, urban heritage

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INTRODUCTION

People travelling would produce the movement which acquires the mobility of human on the earth. The human movement pattern was formed purposely with meaningful interest and intention to travel, influenced by personal behaviour characteristics. The movements produce various patterns characterised by the numerous locations visited at different times. It provides plentiful benefits for the global economy in receiving a huge number of tourist arrival in tourism destination. Encouraging tourist arrival from different parts of the world is vital (Md Khairi, 2017); it is also critical to analyse tourists' movement and spatial behaviour to investigate the demand and supply in the tourism sector. The digital technologies application in the tourism industry influences traveller's experiences to contribute significant roles in tourism economy growth and social changes. The relevant use of the internet in tourism has unearthed more knowledge about consumer or tourist products (Masron et al., 2014). This is one of the strategies to increase the development of the destination for recovering the management of visitor flow (UNWTO, 2019).

The International Tourism Highlight 2019 specifies that travellers' current trend nowadays is to pursue a healthy life by encouraging walking and wellness tourism. Henceforth, solo travellers and multigenerational travel are considered as the ageing population in tourist flow. For instance, these travellers live like the locals and appreciate the authenticity and experiencing travel moments through social media updates during their visit. Thus, it is crucial to create awareness of sustainability in the tourism movement.

The increasing number of tourist arrival and receipts to Malaysia in 2018 and 2019 contributes to the positive achievement. Thus, it can be evident that Malaysia is a leading country in the modernisation of tourism industry performance nowadays, aligned with The Malaysian Government's Economic Transformation Programme (ETP) Roadmap, which is considered as the Malaysian Government initiative to refurbish and re-emerge Malaysia as a favourable tourism destination in the world (Aminudin et al., 2018).

In order to increase the number of tourist arrival, tourists nowadays face limitations in their movement of the journey while visiting attractions. The movement limitations can occur in transportation and accessibility, namely road congestion and the insufficient supply of public transportation. As a result, the pattern of movement based on distance, mode of transportation and tourist typology are imperative elements that need to be considered (Caldito & Dimanche, 2016). In addition to that, spatial demographic studies are still lacking in Malaysia due to data paucity (Tey et al., 2021).

Hence, in realising Malaysia's vision 2020-2030 to achieve tourism firms more competitive, while also encouraging sustainability and planning for future disasters, the federal government initiates the appropriate visitor

management by optimising the design of tourist services and improving tourist infrastructural and facilities development (Dandy, 2020). Thus, these will be the factors to attract more tourists with the diversity of tourist flow patterns in tourist destination areas. This research highlighted the importance of the theoretical understanding of tourist movement patterns in developing tourism products consisting of various attractions. Besides, it is also essential to produce a feasible tour product and provide eminence places according to its interest and preferences. Hence, the tourist movement pattern is vital in determining tourist arrivals and receipts, whether international and domestic. It will create an understanding of factors that affect tourist choices in visited places and the tourists' spatial behaviour and tourist movement pattern characteristic (Caldito & Dimanche, 2016). Places characterised by various tourism products and tourist facilities will lead to tourist satisfaction, fulfilling tourist wants and preferences during visitation.

Numerous academics in this field have examined the suitable methodology in determining the characteristics of tourist spatial behaviour and the factors that influence their movement pattern. The study from Sabereh Dejbakhsh (2008) stated that the tourist movement characteristic can be categorized into two main aspects name destination and visiting characteristic through differing needs and preferences of the particular group of visitors. The study has introduced the concept of simplified sketches of macro-level movement pattern by Lau and McKercher, 2007. Furthermore, in the context of identifying tourist spatial behaviour, Jian Hong Xia (2007) has developed a methodological framework in understanding tourist wayfinding behaviours through classified various age groups, residency, gender, and different level of familiarity with the physical environment. The model of a general map of the spatio-temporal movement has been developed which to derive the concept of ontology of the spatio-temporal movement of tourist. The aspects of the study discussed were involved in interactive interview methods from visitors. Based on the model and concept discussed it would be the main reference to address the characteristics of tourists' spatial behaviour and tourist movement in Muar, Royal Town, Johor. In conclusion, the present study intended to fill gaps in research by integrating the aspects of tourists' spatial behaviour and tourist movement patterns specifically in Muar Royal Town, Johor. Most of the study is mainly focusing on the characteristics of tourists' spatial behaviour and tourist movement pattern in urban heritage areas which considering the individual spatial data and movement patterns in the destination region. Therefore, the findings from this study could be utilized the domestic and international visitors' participation in three aspects namely characteristics of tourists' spatial behaviour, tourist movement pattern, and GPS data. It is enabling advances in tourist tracking, social media geotagging through smartphone applications and it allows people to reach movements

accurately. Hence, it is important to determine tourist's spatial behaviour in creating the efficiency of tourist movement patterns in Muar Royal Town, Johor as a potential destination to be developed as a popular tourist destination in Malaysia.

Tourist Movement Pattern

Tourist movement pattern characteristics can be viewed as a change of position or location. Understanding the movement concept can be analysed as human's movement, demonstrating a pattern of mobility on earth (Fithriah et al., 2018). The human's movement is illustrated through the relationship formed between the places. It is similar to the context of tourism whereby tourist movement created to be to visit an attraction. This is showing the human needs to move from place of origin to destination with plenty of purposes.

The concept of tourist movement pattern developed based on the points of tourist destinations, namely routes taken to visit a destination and the routes taken from the duration of tourists visiting the place. There were researchers agreed that the main focus of travel pattern would be influenced by tourist behaviour. Thus, knowing the attractiveness of a destination through tourist movement patterns is important due to identifying the attraction attractiveness, tourist preference, cultural recognition and effectiveness of destination marketing (EJ Kim, Y Jo, & Y Kang, 2018; Zhong et al., 2019). The tourist movement patterns involve two types of movement levels, namely macro level and micro level. This study focuses on the macro-level movement patterns by reviewing the simplified sketches. It is relevant for determining tourist movement patterns by understanding simplified sketches due to know the nature of space and describe the occurrence of tourist activities based on their preferences (Dejbakhsh, 2008). The patterns were identified by previous studies (Lau and Mckercher, 2006) consist that the macro-level of movement patterns have three main categories, namely single, multiple, and complex. The patterns categories as listed as follows.

1. Single pattern refers to the same route used by tourists for visiting a single destination and returning home without any diversions in the whole visitation process.
2. Multiple patterns refer to the three sub-patterns, namely base site, stopover, and chaining loop. Base site pattern illustrates tourists' journey, which starts from home and travels to a primary destination. The journey makes the 'base camp' for future overnight visits to secondary destinations within that particular area. The stopover pattern is a single destination as the trip's focus, whereby the attractions along the route are present. Finally, the chaining loop pattern demonstrates the several destinations go through by

tourists without any repetition. Usually, tourists stop in between the loop, which may not necessarily be related or connected.

3. Complex pattern refers to the two types of sub-patterns, namely destination-region loop and complex neighbourhood. The destination region loop indicates tourists' direct route as part of their travel to a primary destination or a site near the destination region. It starts from a circuitous route to visiting other destinations. Due to that, tourists prefer to finish their travel by touring loop approach to returning home through the most direct route between the primary destination and home. This pattern is a combination of the single-point and the 'chaining-loop' pattern. Meanwhile, complex neighbourhood refers to tourists who prefer to travel from one destination to another without repeating the travelling leg, which tends to plenty of places or attractions within a specific region. It can be seen from the combination of some or all patterns mentioned. Thus, this pattern most suitable for describing the complexity of tourist movement patterns, allowing deviations and blending of a different pattern.

RESEARCH METHODOLOGY

This research has employed a qualitative methodology in which emphasised on semi-structured interviewing approach. Qualitative research involving humans in many aspects of ethics, study relational, situational, and emerging (Kyngäs et al., 2020). GPS tracking devices considered as another method in the data collection process to determine tourists' spatial behaviour and tourist movement pattern. In this process, the aspect that needs to be concerned is departure point (address traveller generating region), way point (address transit region), destination point (address tourist destination region), routing points and trip itinerary. Other research has found that qualitative research would focus on the humanist essence to achieve understanding through express social reality behaviour and thinking (Macías & Contreras, 2019). Therefore, it is suitably used for determining tourist's spatial behaviour and tourist movement patterns through a tourist perspective. Conducting this research has focused on the visitors who visited Muar to identify the different viewpoints about the spatial behaviour and tourist movement pattern. Population and sample size is a vital consideration in market research whereby this research has focused purposive sampling which is reliable for identifying and selecting information related to the phenomenon approach. This research has focused on seven respondents interviewed among Malaysian and International visitors who had visited Muar Royal Town, Johor. It is a reliable number of respondents for doing semi-structured interviews method (Morse, 2000). The category of targeted respondents is among youth and eldest. Besides, the targeted respondents are domestic visitors who came from adjacent districts

or states. Therefore, identifying interviewees characteristics and behaviour are deemed critical for emerged research findings**.**

RESULT AND DISCUSSION

This result demonstrates the conceptualisation of tourist's spatial behaviour and tourist movement patterns through the Global Positioning System (GPS) tracking device. It was investigated through GPS personal and interview data collected from visitors.

Figure 1: Map of Muar Royal Town Johor

Figure 1 indicates the map of Muar Royal Town, Johor, the focus study area. The highlighted areas are following the interviews and GPS data during two days of data collection. Thus, the research has found that the study areas have covered within seven road boundaries namely Kampung Parit Besar, Taman Meranti, Jalan Bentayan, Muar City, Jalan Kesang, Kampung Temang, and Rizab Melayu Tanjung Gading

Figure 2: The Preferable Places and Activities (Leisure and Recreations, and Local Food and Beverage Attractions) Analysis

Figure 3: The Preferable Places and Activities (Shopping Centre and Entertainment, and Community Village Attractions)

The tourist spatial behaviour maps were analysed by analysing the zoning area of preferable places and activities based on GPS and interviews data from respondents. The result shows the four main zoning areas: leisure and recreation, local food and beverage restaurant, shopping centre and entertainment, and community village. The zoning analysis was determined by dividing the areas into a specific road of boundaries and locations. Thus, the location of all respondents is important to be pointed out on the map.

Figure 2 demonstrates the preferable places and activities analysis which specifically focusing on leisure and recreation and local food and beverage restaurant areas. These two areas have been classified under hot spot attractions whereby the leisure and recreation zone has recorded 85% confidence from six respondents (R1, R2, R3, R4, R5, and R6). Additionally, this zone is characterised in the red circle because the place is considered an attraction popular among visitors. Meanwhile, for local food and beverage restaurant zone has recorded 72% confidence from five respondents (R1, R2, R3, R4 and R7). The zones allocation has been shaped in green because the areas have been categorised into different roads. It indicates the respondents who visited those places are different preferences in selecting local food and beverage restaurant.

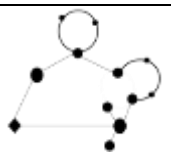
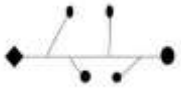
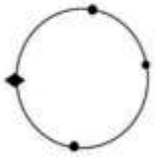
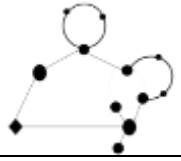
Figure 3 shows the preferable places and activities analysis concentrating on shopping centres and entertainment and community village. Tourist spatial behaviour results demonstrated that shopping centres and entertainment are categorised as non-prominent places among respondents, which recorded 28% confidence from R5. Meanwhile, for community village zone at Sabak Awor village has been categorised as not significant visitation among respondents, which recorded 15% confidence from R7.

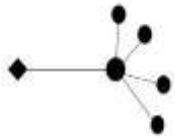
Tourist Movement Pattern Map

This section focuses on the tourist movement pattern based on GPS and interview data. The maps have been designed according to a specific travel itinerary that respondents mentioned during the interview session. The respondents can conceptualise the movement pattern through travel memories that describe six aspects: transportation, accessibility, tourist movement around the location, overall time allocation for one trip, time distance, and the corresponding time or duration. All these data acquisitions have been triangulated with GPS tracking data on a specific date.

Table 1 The Overall Data of Tourist Movement Pattern

Respondents / Transportation Mode	**Tourist Generating Region (TGR)**	**Tourist Destination Region (TDR)**	**Departure Time to Destination and Time In Destination**	**Overall time distance within destination area**	**Tourist movement patterns** / **Types of travel itinerary**
R1 Car Motorcycle	Kelang, Selangor	Primary destination: Muar Secondary destination: Melaka	From Kelang, Selangor (08:00AM) to Muar (10:25AM)	52 minutes	**Complex neighbourhood (2 days 1 night trip)**

					
R2 Ferry Walking Bus	Dumai, Riau Indonesia	Primary destination: Muar Ferry Terminal Secondary destination: Kemaman Terengganu	From Dumai City (1;30PM) to Muar Ferry Terminal (5.30PM)	51 minutes	**Stopover (Half day / one day trip)** 
R3 Car	Simpang Renggam	Primary destination: Melaka Secondary destination: Muar	From Melaka (2:30PM) to Muar (3:20PM)	45 minutes	**Chaining loop (1 day trip)** 
R4 Car	Kuala Lumpur	Primary destination: Bukit Gambir Secondary destination: Muar	From Bukit Gambir (3:30PM) to Muar (4:10PM)	42 minutes	**Destination region loop (3 days 2 night trip)** 
R5 Bus Car Walking	Pulau Pinang	Primary destination: Bentayan Bus Station, Muar Secondary destination: Edu Hub Pagoh	From Pulau Pinang (10:00PM) to Bentayan Bus Station (10:00AM)	35 minutes	**Complex neighbourhood (Half day' one day trip)** 
R6 Car	Kuala Pilah, Negeri Sembilan	Primary destination: Muar City	From Kuala Pilah, Negeri Sembilan (5:30PM) to	10 minutes	**Single point (Half day trip)**

		Secondary destination: Edu Hub Pagoh	Muar City (6:25PM)		
R7 Car	Kuala Lumpur	Primary destination: Muar City Secondary destination: Edu Hub Pagoh	From Kuala Lumpur (10:00AM) to Muar (12:10PM)	32 minutes	**Base site (I day trip)** 

The description on maps is showing the overall data of movement patterns for each respondent. Investigating the aspects of tourists' spatial behaviour and tourist movement patterns through GPS tracking data can be thoroughly described into two aspects namely map of the most preferable attractions among visitors and the tourist movement pattern. Map of the most preferable attractions shows the spatial behaviour among visitors. Meanwhile, tourist movement pattern shows the flow of movement through GPS tracking data that matching with simplified sketches of movement (Lau and Mc Kercher, 2007). The first aspect of this section has mapped out the preferable attractions through zoning the areas into four divisions namely culture and heritage, leisure and recreations, natural heritage, and shopping centre. The data shows that the map of preferable attractions among visitors contributes to culture and heritage, and leisure and recreation attractions. The second aspect of this section has demonstrated the tourist movement pattern that has been outlined on Google Maps according to GPS tracking data. As an outcome, each respondent has been characterized into different macro-level of movement namely based site, single point, stopover, chaining loop, destination region loops and complex neighbourhood.

CONCLUSION

In conclusion, this research has employed a qualitative methodology for determining tourists' spatial behaviour and tourist movement patterns through a semi-structured interview approach and GPS. This research recommends two main arguments to achieve a mutual understanding of the tourists' spatial behaviour and tourist movement pattern characteristics in Muar, Johor. Hence, the stakeholders might have to emphasise the strategies implemented in tourist destination management to incorporate digital elements and heritage value of Muar. Therefore, this study has successfully delivered a better understanding of tourists' spatial behaviour and tourist movement characteristics through a tourist

perspective. One of the significant outcomes of this research is to clarify the route and movement issues in Muar by integrating interview data and simplified sketches of macro-level movement theory. Thus, researchers and developers from different disciplines can share their knowledge in this area to benefit from this research. The review of tourist perspective on attractions image in Muar also can provide a direction in transportation planning of future facilities and infrastructure in Muar, Johor**.** The processed data provided a better awareness of the tourist movement in Muar Royal Town that has the potential to be developed as sustainable development in the future**.**

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