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A SYSTEMATIC EVALUATION TOOL FOR HERITAGE SHOPHOUSE FACADES

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Abstract

Heritage shophouses are the architectural asset that becomes a landmark of many heritage areas, particularly in major towns in Malaysia. This cultural heritage needs to be preserved or conserved to prolongs its life. However, there is still a need for in-depth study on the architectural part as to add knowledge about this heritage treasure. Thus, this paper tends to develop a definitive list of the architectural characters of the heritage shophouse façades according to its elements. The definitive list was outlined by referring and comparing data extracted from the local government reports, books, articles, and research undertaken by scholars in architecture and conservation. Furthermore, a fieldwork had been conducted at the Heritage Area of Ipoh involving 121 shophouses by using a checklist to support the secondary data. Thematic analysis was applied by sorting all architectural characters into five main categories of elements that include structural, building enclosure, opening, fenestration, and ornamentation. Later, a matrix taxonomy of architectural styles was developed to form an evaluation tool as an innovation to the existing inventory and documentation method for the heritage shophouses. The paper concludes that the concise data of architectural characters are significant to differentiate the styles of the heritage shophouse façade. Further research at other heritage areas in Malaysia should be conducted to gain more data of other architectural styles.

Keywords: Conservation, heritage shophouse, architectural styles, façade, evaluation tool

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INTRODUCTION

The British had occupied Malaya for 160 years, introduced the classical vocabulary from their world and adapted the proportion and detail within a Malay vernacular framework (Mohamad Tajuddin, 2015). During the British administration period, many Chinese and Indians migrated to Malaya, though Chinese traders have been in Malaysia since the 15th century. From 1869 to 1877, new tin mines were discovered and explored in Perak and Selangor which led to the growth of small towns and later, encouraged mass migration of Chinese labourers, who brought with them their traditional hybrid building form of dwelling and commercial purposes known as shophouse which then became common in all new towns. These shophouses incorporated architectural vocabulary from the West, China, India and Malay Archipelago from the 18th – 20th century (Fee, 1998). A large number of heritage shophouses could be found in major historical towns such as Malacca, George Town, Ipoh, Taiping and Kuala Lumpur (A Ghafar, 1997) with various architectural styles of facade. However, according to Mohd Jaki and Muhammad Firzan (2020), the Malay identity is seen to be the most prominent style of the heritage shophouse facades in small town.

The conservation of heritage buildings demand determination and dedication to preserve its cultural, historical and architectural significance (Nur Shahirah & Junainah, 2021). Heritage buildings are fragile and often unwittingly destroyed or lost due to the rush of modernisation, globalisation (Bandarin et al., 2011), growth in the tourism industry (Roders and Oers, 2011), the effect of enormous market pressures, as well as regenerating of development and survival of business by the building owners. Thus, these factors lead to the need for intervention such as physical alterations or distortions to the heritage buildings. Such interventions are mostly improper changes done on the elements of the heritage shophouse facades. For instance, incompatible building forms and styles in a state of neglect (Ummu Liyana & Noordeyana, 2021) negatively impact the architectural styles and characters that eventually lose their sense of place (Nur Raqena et al., 2020).

The architectural characteristics of a heritage building are slightly significant, not only in conveying memory and identity but also the values and sense of a place for future generations (Dogan, 2019). Unfortunately, by referring to initial interviews conducted with local authorities, one of the problems faced by these heritage properties is incomprehensive management in controlling various interventions that have taken place in the heritage building. This statement is consistent with Roders and Van (2011), who stated that there is a gap between theory and practice of management of cultural heritage, which in practise there is a significant delay in switching to a more holistic approach, where planning and management were concerned, most certainly by local governments.

While development and modernisation are necessary, there is a need of a comprehensive conservation management plan for heritage buildings (Wan Nordiana & A Ghafar, 2021a) including an information management system such as inventories that are essential tools for recognising and assessing the safeguarding of cultural heritage (Myers et al., 2016). The inventories shall include information on building, site location, physical features, function, material, and providing definitive lists that used to identify condition and values of the elements that contribute to the cultural significance (Carlisle and Lee, 2016) which is supported by photographs (Khushi, 2016). Furthermore, stakeholders also can engage in more efficient and informed decision making (Vileikis et al., 2012) and also for documentation purpose as an integral part of the nomination and management of a World Heritage property. Thus, it is significant to conduct research related to heritage shophouse, particularly the building façade as this part is subjected to the local authority rules and regulations. However, previous researches only provide a general description of the shophouse façade. In addition, there is a need to refer to a complete and standard data regarding the architectural styles and materials other than the implementation of the conservation approaches to maintain the design (Wan Nordiana & A Ghafar, 2021b). Therefore, this paper discusses and propose a definitive list of the heritage shophouse façades elements and its architectural characteristics to develop a matrix taxonomy as a reference and evaluation tool for the purposes of documentation in the information management system.

RESEARCH BACKGROUND

Located in the Southeast Asia Region, Malaya was colonised by western powers for over 300 years began with the arrival of the Portuguese and the Dutch in Malacca and later the European to the federal states, all of which have an influence on the nation's buildings' architecture. Later, Malaysia's economic growth was then supported by trade and tin mining industry and rubber planting on a large scale. Consequently, the British government bring in immense number of immigrants from China and India to carry on economic activities together with their architecture skills and knowledge. Today, rapid development is concentrated in urban areas, and the demand for housing has increased. These, encourages the construction of mixed-use buildings called shophouses that are used for residential and business. The buildings still exist today in the city centre and have become a cultural heritage asset for the urban tourism industry. At present, George Town and Malacca have been successfully declared as UNESCO World Heritage Site. The declaration has a positive impact on the local economy, which encourages other local authorities in Malaysia to preserve their cultural heritage asset for regeneration. The redevelopment in the heritage area rapidly increases and it threatens the survival of the heritage buildings. Ipoh, for instance, has gazetted its Heritage Area as stated in Special Area Plan of Ipoh City 2020

(2014) on 18th December 2014 due to the provision of Town and Country Planning Act (Act 172).

LITERATURE REVIEW
Heritage shophouse facade
Façade means the front exterior elevation or face of a building (Tyler, 2000), especially the principal front (Curl, 2006), as seen from the street or other public places (Comerma, 2008). As shown in Table 1, the elements of the façade are divided into groups relating to the structural, building enclosure, opening, fenestration, and ornamentation. Façade is the most important architectural element and capable of conveying a building's function and defines the interior space that it shelters (Comerma, 2008).

Table 1: Elements of heritage shophouse facades.

	Source	Data	Category		Elements of facade
1.	Burden (1996, 2003)	Wall surface	Building enclosure	ii	
		Structural	Structural	i	
		Fenestration	Fenestration	iv	
		Ornament	Ornament	v	
		Entrance	Opening	iii	
		Stylistic details	Ornament	v	
2.	Curl (2006)	Wall surface	Building enclosure	ii	i. Structural
		Fenestration	Fenestration	iv	ii. Building enclosure
		Opening	Opening	iii	iii. Opening
		Enclosure	Building enclosure	ii	iv. Fenestration
3.	Ahmad Sanusi & Shaiful Rizal (2012)	Motive decoration	Ornament	v	v. Ornament
4.	Hopkins (2013)	Wall	Building enclosure	ii	
		Opening	Opening	iii	
		Roof	Building enclosure	ii	
5.	Wooi (2015)	Roof	Building enclosure	ii	
		Wall	Building enclosure	ii	
		Opening	Opening	iii	

According to Fee (1998), four main influences have contributed to the building traditions of Malaysia. These influential factors are; Malay, Southern Chinese, Sino-European, and Anglo-Indian cultures. The mix of cultural influences can be seen at the heritage shophouse façade on the elements that clearly can be referred to distinguish the architectural pattern. The series of evolution or transitional changes are part of the process in the adaptation of climates, local cultural, economic demands, fashion influence, and introduction of new technologies (Wooi, 2015). However, after World War II, according to Nor Hayati (2017), the architectural diversity or traditional style that established

during the colonial periods had to be ended to unite the people through a more modern architecture that were constructed to serve public needs, totally utilitarian, and express a national vision for the future. Figure 1 shows the characters for traditional and modern styles of heritage shophouse façade.

Traditional	Modern	Characters

The Characters list:
1. Clay roof tiles.
2. Classical pediment.
3. Keystone.
4. Floral motif plasterwork.
5. Timber shutter window.
6. Full height timber shutter window.
7. Parapet wall.
8. Air vent.
9. Timber lattice above door height.
10. Freestanding column.
11. Folding timber door panelling.
12. Casement window.
13. Flagpole.
14. Jack roof.
15. High pediment.
16. Parapet roof with wall tiles.
17. Geometrical motif.
18. Glass windows in group.
19. Walkway without column.
20. Folding metal door panelling.

Figure 1: Characters of traditional and modern heritage shophouses façade.

Heritage Building Inventory
According to the Ipoh City Council, the Special Area Plan of Ipoh City (2014) documentation was prepared to create an urban design that combines the urban development and conservation of heritage buildings. One of the important tasks that needs to be made continuously in the process of preservation of the cultural heritage is to prepare an inventory of heritage buildings to be the primary reference in; i) Planning and building control, ii) Preserving significant heritage buildings, iii) Mapping the history of the building and the area, and iv) Preserving cultural heritage and urban activities. Myers et al. (2016) highlighted that the design and development of the heritage building inventory has to consider the inclusion of following items; i) Identification, ii) Analysis and research, iii) Control, iv) Conservation plan and activities, and v) Precise information.

METHODOLOGY

This research begins with the collection of articles, relevant documents, reports, reference books, and others to extract required data that cover conservation of heritage buildings, Malaysia's architectural history, and an in-depth description of heritage shophouse facades. At this stage, the data of the elements that formed and diversified the architectural style is extracted, and the list of the key elements of the heritage shophouse façade was obtained by setting the theme codes, which are structural, building enclosure, opening, fenestration, and ornamentation. There are three key elements that are broken down into sub-elements, namely: structural - beam and column; building enclosure – roof and external wall; Opening - door, window, and air vents. By indicating these elements, then the attributes that form the heritage shophouse façade were obtained. A taxonomy matrix was drafted, and general characteristics of the architectural styles were extracted from the literature study by using content analysis and are summarised to fill in the draft of the taxonomy matrix.

FINDING AND DISCUSSIONS

Architectural styles and period

From the analysis of previous research, nine researchers have conducted research and published data concerning the architectural style of heritage shophouse facades in Malaysia. Their research content is grouped according to the scope of the area that includes architectural styles that generally cover Malaysia, UNESCO World Heritage Site of Melaka and George Town, Heritage Area of Taiping and Kuala Lumpur. The architectural styles of the heritage shophouse facade at the historic areas are different based on the historical background, the construction era and the town development. Table 2 and Table 3 show the scope of research areas by authors and the architectural styles of heritage shophouse facades in Malaysia. The architectural styles are coded as P1 for Transitional, P2 for Eclectic, P3 for Neo-Classical, P4 for Art Deco and P5 for Modern.

Table 2: Scope of research areas by authors.

Code	Authors. Year & Title	Scope
A1	Fee (1998) - *Architecture*. The Encyclopedia of Malaysia, Vol 5.	**(i)** Malaysia
A2	Elnokaly and Fui (2014) - *Demystifying Vernacular Shop Houses and Contemporary Shop Houses in Malaysia; A Green-Shop Framework*.	
B1	Teuling (2009) - *Rebirth of the Malacca Shophouse, A Typological Research. Traditional Values in a Contemporary World*.	**(ii)** Melaka
B2	Noorfadhilah et al. (2012) - *Documentation and Conservation Guidelines of Melaka Heritage Shophouses*.	
C1	Rozliani et al. (2012) - *Classification of Inheritance Shop Houses in George Town, Penang – UNESCO WHS.*	**(iii)** George Town
C2	Wooi (2015) - *Penang Shophouses; A Handbook of Features and Materials*.	
C3	Omar & Muna (2016) - *Penang / George Town's Shophouse Façade and Visual Problems, Analytic Study*.	
D	Gurstein (1990) - *Malaysian Architectural Heritage Survey: A Handbook*.	**(iv)** Kuala Lumpur

E	Nur Farhana, et al.(2017) - *Character-Defining Elements of Shophouses Buildings in Taiping, Perak.*	(**v**) Taiping

Table 3: Classification of architectural styles of heritage shophouse facades.

			Scope and Authors								
			i		**ii**		**iii**			**iv**	**v**	
Period		**Architectural Styles**	**A1**	**A2**	**B1**	**B2**	**C1**	**C2**	**C3**	**D**	**E**	
1600-1700		Dutch		•		•						2
1700-1800		South China		•		•						2
1800-1900		Early		•		•	•					3
1790-1850		Early Penang						•	•			2
1800-1900		Utilitarian								•	•	2
1840-1900		Early Transitional		•		•	•					3
1840-1900	**P1**	South China Eclectic						•	•			2
1890		Transitional	•									1
1890-1920		Palladian									•	1
1880-1920		Early Straits Eclectic		•	•	•	•	•	•			6
1900-1940	**P2**	Late Straits Eclectic		•	•	•	•	•	•			6
1901-1910		Straits Eclectic									•	1
1800-1930	**P3**	Neo-Classical	•	•	•		•			•	•	6
1930		Dutch Patrician	•	•								2
1930-1960	**P4**	Art Deco	•	•	•	•	•	•	•	•	•	9
1920-1990	**P5**	Early Modern		•	•	•	•	•	•		•	7
1950-1990		Modern	•							•		2
		Total	**5**	**10**	**5**	**8**	**7**	**6**	**6**	**4**	**6**	**57**

Characters of Architectural Styles

There are 17 architectural styles that represent the shophouse facades as listed by the authors. An analysis of the construction era and similarity in pattern of architectural characters shows varieties of them that were outlined in Table 4. Then, a fieldwork had been conducted to validate the content listed. New data collected were added in the table before a matrix taxonomy of architectural styles is developed.

Table 4: Characters of architectural styles outlined by authors and fieldwork.

Elements		Characters	P1	P2	P3	P4	P5
Structural	Beam	Timber beam	•	•	×		
		Reinforced concrete				•	•
	Column	Engaged column at the upper façade and free-standing column below	•	•	•	×	•
		Five-foot walkway without column					
		Curvatures building corners without column					•
		Used of Greek and Roman order	•		•		
Enclosure	Roof	Pitch roof	•	×	•	×	•
		Greek-style pediment			•		
		High pediment				•	
		Parapet wall			•	•	•
		Terracotta roof tiles	×	•	×	•	×
	Wall	Paint in pastel or white colour	•	×	•	×	×
		Paint in vibrant colour		×			
		Paint in shade colour				×	×
		Shanghai plaster				•	
		Wall tiles		×			

(Cont'ed…)

Element	Sub	Character					
Opening	Door	Steel shutters	×				
		Solid timber shutters	•	×	×		
		Casement shutters				×	
		Removable or folding vertical timber panelling	•	•	×	•	
		Metal folding paneling or roller shutter				•	•
	Window	Louvred or solid timber shutter	•	×	×		
		Casement window				•	•
		Glass louvres window					×
		Flat arched transom infilled with glass, timber carved or louvres	•	×	×	×	×
		Arched transom light infilled with glass, timber carved or louvres	•	•	×		
		Semi circular fanlight infilled with glass, timber carved or louvres	•	×	×		
		Vertical or horizontal concrete shading fin around the windows				•	•
		Glass or steel louvres above window frame	×	×	×		×
	Air-vent	Carved timber or seramic air vent on the ground floor	•	×	×	×	
		Squares, diamond or bat shape between windows at the upper floor		•			
		Porthole air vent or concrete air vent slots				×	•
		Timber/metal lattice above door height at the ground floor	•	•	×	×	×
Fenestration		2-3 bays full height traditional windows	•	•	×		
		4-5 bays of traditional windows.	×				
		2-3 bays or repetitive modern windows				•	•
		4 or more bays of repetitive modern windows.				×	
		Large size of windows arranged in group.					•
Ornamentation		Architrave surround window frame	•	•	•		
		Pilaster column in between the windows		•			
		Keystone on top of the window frame	•		×		
		Natural or floral motifs plasterwork	•	•	×		
		Geometrical motifs				•	×
		Cornices or horizontal mouldings along the beam	•	•	×		
		Traditional design with minimal decorations	•			•	
		Possess more decorations and ornamentation		•	•		
		Devoid any decoration or craftsmanship					•
		Flagpoles and embedded building dates				•	

Note: '•' for data from document analysis and 'x' for data from fieldwork.

Fourty-eight characters of Transitional, Eclectic, Neo-Classical, Art Deco, and Modern architectural styles had been listed from the analysis and drafted in a checklist to develop a matrix taxonomy. The matrix is a reference to formulate an inventory form to classify and grade the architectural styles of heritage shophouse facades.

Matrix Taxonomy
The matrix taxonomy is an inventory form with a specific calculation method. Its purpose is to classify and grade the architectural styles of the heritage shophouse façade based on the characters and physical condition seen on the façade. Figure 2 shows the examples of the inventory form template with a list of characters whereby the evaluator will select the relevant characters of the façade for each element. The evaluator needs to select "1" in the box for relevant characters that portray the façade. Figure 3 shows the marks score for each evaluation of facade. The highest score marks indicate the styles that portray the facades. Table 4 is the

indicator for grading the integrity of the architectural styles of heritage shophouse facades. The evaluation tool then was tested on a row of heritage shophouses at Jalan Sultan Iskandar, Ipoh. The analysis is outlined in Table 5.

Elements		CHARACTERISTICS OF ARCHITECTURAL STYLES FOR HERITAGE SHOPHOUSE FACADE	Code	Style
Main element	**Sub-element**	**Architectural styles:** Select '1' for each character that relevant. Assessor can select more than one (1) character for each element if relevant.		
	Beam (R)	Timber. *(Select value 1 for relevant)*	R1	1
		Reinforced concrete.	R2	
		Others.	R3	
Structural	Column (TG)	Engaged column at the upper façade and free-standing column below.	TG1	1
		Used of Greek and Roman order.	TG2	
		Five-foot way without columns.	TG3	
		Curvatures building corners without column.	TG4	
		Others.	TG5	
	Roof (B)	Pitch roof.	B1	1
		Terracotta clay roof tiles.	B2	
		Greek style pediment.	B3	
		Parapet wall.	B4	
		High pediment.	B5	
Building Enclosure		Others.	B6	
	Wall (D)	Painted in pastel or white colour.	D1	
		Painted in vibrant colour.	D2	
		Granulated render known as Shanghai plaster.	D3	
		Wall tiles finishing.	D4	1
		Others.	D5	

Figure 2: Example of the evaluation process of matrix taxonomy for architectural styles of heritage shophouse façade.

Score for Architectural Styles of Façade			Relevant Character	(%)	Fill in the value of the highest percentage score (%).
Architectural Styles					
Traditional	Transitional	(1880-1900s)	7	50	
	Eclectic	(1890-1930s)	11	73	**73** ← Score
	Neo-Classical	(1880-1920s)	6	40	
Modern	Art Deco	(1925-1950s)	4	27	**Architectural Styles**
	Early Modern	(1910-1970s)	4	31	
	Modern	(1970s)	3	23	**Eclectic** ← Architectural styles
	Others	-	0	0	
Note: Select architectural style according to the highest score marks and fill in the percentage value. 'Others' represents the architectural styles other than listed and maximum score marks is 39 only.					

Figure 3: Example of the evaluation score for heritage shophouse façade.

Table 4: Indicator for grading of heritage shophouse facades.

Grade	Indicator for grading
A	Architectural style of façade is easily recognised and unique in term of architecture. Thus, it needs to be preserved and conserved. The original building materials and design elements should be retained, and restoration work must comply with the composition and method of original construction and preservation approach through regular maintenance.
B	Architectural style of facade can still be recognised and has a few special elements that need to be preserved and conserved. The original building materials and design elements should be retained. Conservation approach that

complies with the principles should be carried out on significant elements of the facade as to improve the grade quality of the façade.

C	Architectural style of facade is difficult to be identified. Efforts should be made to retain the façade. The original building materials and design elements should be retained. Conservation approaches in various techniques should be implemented and other alternatives may be considered if the preservation is not practicable.

Table 5: Grading analysis of architectural styles for heritage shophouse facades.

			Architectural styles, grade, nos. & %	
			A	6 50%
			B	5 42%
			C	1 8%

A	A	A	B	B	B	C	A	B	A	A	A	Grade	
	•						•	•	•	•	•	6	Transitional
												0	Eclectic
												0	Neo-Classical
												0	Art Deco
•		•	•	•	•							5	Modern
						•						1	Others

CONCLUSION

The matrix taxonomy of architectural styles of heritage shophouse has added valuable information and knowledge that can be used in the inventory or re-inventory of heritage buildings, especially the shophouse for a systematic documentation purpose. Local authorities can apply the matrix taxonomy in other heritage areas in Malaysia by replicating the procedure and customising the information of architectural styles at that particular heritage site. The evaluation generated from the taxonomy matrix in the inventory form will give systematic analysis results thus facilitating documentation work. Most importantly, this reference can be used as a guide and indicator by the stakeholders to retain or preserve the integrity of the heritage shophouse façade. Furthermore, the grading recognition may encourage the shareholders to increase effort in conserving the heritage assets as the continuity of the legacy for future generations. In conclusion, heritage buildings need to be sustained, preserved, and conserved to face global challenges and surrounding development. At the same time, they need to be able to emerge in the face of pandemic Covid-19, economic crisis, inflation and others.

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CONTROL OF VARIATION ORDERS IN THE CONSTRUCTION OF RESIDENTIAL PROJECTS IN MALAYSIA

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Abstract

Variation orders are a frequent occurrence in the construction phase of Malaysian building projects. Increased construction time and costs are inevitable when variation orders appear. The aim of the current research is to identify the effectiveness of a "cost and time model" in controlling variation orders during the construction of residential projects in Malaysia. The model was derived from a literature review, which also examined how case studies and data have been utilised to identify the causes and effects of variation orders. These were analysed using multiple linear regression analysis. Three independent variables were identified as significant positive causes, while two dependent variables were determined to be the effects of a variation order. The independent variables signify the owner's changes to the scope of work, construction materials and procedures, as well as their modifications to the specifications. The cost and duration of the project is the dependent variables. The model developed was found to be suitable in practice and the authors propose its application in the early stages of residential construction projects to control the occurrence of variation orders in such projects in Malaysia.

Keywords: Control, Residential Projects, Construction, Time and Cost Time Model

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INTRODUCTION

The construction sector contributes significantly to the Malaysian economy. It also has a sizeable impact on the development of residential projects, infrastructure and various other sectors, such as factory output. Residential construction projects are highly important in ensuring that adequate, high-quality and affordable accommodation is available to meet the housing needs of the population. Residential construction projects must be managed correctly so that they can be completed within the time and cost established and agreed in the construction contract between the developer and the construction contractor. Nevertheless, frequent variation orders during the construction stage have become one of the main problems that may prevent construction projects from being completed within the stipulated time (Ibbs et al., 2001). In addition, this problem indirectly results in higher project costs than had initially been allocated.

Variation orders can be issued for several reasons, and the frequency with which work instructions are changed during the construction phase will likely result in significant changes to the contract, which will impact negatively on all parties involved in the sector. Sun and Meng (2008) stated that a construction industry variation order refers to changes in design, construction work, implementation schedule or project aspects due to the needs of the construction project. Furthermore, any discrepancy in the original project scope or work execution schedule results in a variation order. Mokhtar et al. (2000) stated that while variation orders are undesirable, they are also unavoidable during a construction project. Variation order issues have also arisen in Malaysian construction projects, resulting in project delays and completion failures. According to a study by Chan and Kumaraswamy (1997), the client is the main contributor to variation orders during the construction stage. Several methods have been proposed by researchers to solve the problems of changes that arise during construction and incorrect capital forecasting. Therefore, this paper examines how the variation models developed by researchers can address the problem of construction delays.

LITERATURE

A review of the literature reveals that many researchers have discussed ways to solve the project administration problems that arise during the construction stage, including Al-Mayahi et al. (2018), Ismail et al. (2012) and Tung et al. (2021). However, this paper focuses on the variation order models that are used extensively worldwide to reduce the frequency of construction variation orders.

Generally, only a few models have frequently been referenced. First, Ayman et al. 2008 built a "time and cost model" to reduce project costs and duration due to job changes in the United States The resulting model can be followed by project managers to identify the critical path period of the project schedule and budget in the planning phase. Next, Engy Serag et al. (2010)

developed a model to measure the higher contract prices that result from variation orders during road construction projects in the United States. This model allows the owner to estimate the temporary allocation of money in the event of a variation order. Similarly, to explain the effects of additional time on labour productivity within mechanical and electrical projects in the United States, a multiple linear regression analysis model was produced by Hanna et al. (2005). Meanwhile, Richard et al. (2016) conducted a study on the variation order process model in Nigeria, as well as an extensive and intensive literature review in relation to the existing variation order management model. To reduce the impact of change and manage change from the start of a project to its completion means combining the existing contract provisions with the use of Building Information Modelling (BIM).

In the Malaysian context, only one "time and cost model" has been developed in helping to reduce costs and time arising from order variation during the development of terrace housing projects in Malaysia. This model has been produced as a guideline to address the occurrence of variation orders during the development project of terrace housing projects in Malaysia in particular can be applied during the pre-construction stage of the project to be implemented (Noraziah, 2017). Two models have been developed namely the Cost Prediction Model = b1X1 + b2X2- b3X3 + a = 1.271 (XI for the owner's changes to the scope of work) + 2.506 (X2 for changes in construction materials and procedures) -1.949 (X3 for the owner's modifications to the specifications) + 5.081 (constant) and Time Prediction Model = b1X1+ b2X2-b3X3 + a = 5.327 (XI for the owner's changes to the scope of work) + 10.097 (X2 for changes in construction materials and procedures)- 9.214 (X3 for the owner's modifications to the specifications) + 23.592 (constant). However, to validate the effectiveness of the developed model only the "cost model" will be validated for this study.

RESEARCH METHODOLOGY
This study aims to validate the "cost model" produced by this researcher, as described in the literature review above (Noraziah, 2017). The study involved several phases of model validation, namely:

 I.   Model: The concept of understanding the "cost model" produced by
 II.   the current researcher (Noraziah, 2017)
 III. Projects identified as potential case studies: Identification of case studies
 IV.   related to terrace housing projects in Selangor
 V.   Model validation
 VI.   Findings.

In the first phase, the identified "cost model" was as follows:

Cost Prediction Model (Y1)   = $b_1X_1 + b_2X_2 - b_3X_3 + a$
                              = 1.271 (the owner's changes to the scope of work) + 2.506 (changes in construction materials and procedures)- 1.949 (the owner's modifications to the specifications) + 5.081 (constant)

Referring to the model formula above, Y1 is the percentage increase in construction costs (the dependent variable). Meanwhile, X1 refers to the owner's changes to the scope of work, X2 refers to the owner's modifications to the specifications and X3 refers to the owner's modifications to the specifications. X1, X2 and X3 are the independent variables. Meanwhile, the constants / regression constants are referred to by the values of Y, when X1, X2 to Xn are equal to 0 and b is the regression coefficient, which increases or decreases in value.

The second phase involved the identification of projects to select as case studies. In this paper, the selected project was terrace housing built by private developers in the state of Selangor, Malaysia. The terrace housing project selection factors were as follows:

  I.   The traditional method was followed
 II.   The project cost was within the scope of the developed model
III.   The implementation period was the same as stipulated in the scope of the developed model
 IV.   Delays in construction were experienced.

Projects in Selangor were selected because this state experiences the most delays in private sector housing projects. Meanwhile, private development projects were chosen because most housing projects are implemented by the private sector (Alias et al. 2007).

The third phase involved the validation of the "cost model" that had formulated. The model was validated because in the Malaysian context, no "cost and time model" had been developed at the moment. Moreover, no other "cost and time models" had been produced by other researchers. Thus, to identify the effectiveness of the model, a validation session was implemented. Meanwhile, data from terrace housing projects in Selangor was included in the selected model formula.

The final phase was obtaining the results from the validation of the model. Here, the researcher could compare the results from the use of the

developed model compared to the manual "cost and time" calculation. The "cost and time" were obtained manually upon completion of the project. Meanwhile, the model can be used in the early stages of construction. It can reduce the occurrence of work changes that relate directly to cost and time. Once the findings from the use of the model had been obtained, the effectiveness of the model could be identified.

RESULT AND ANALYSIS

Referring to the model validation phase described in the methodology section above, phase one (model selection) and phase two (project identification) have been described. This section describes the third phase (model validation) and the final phase (discovery). It involves two main aspects, (i) cost and (ii) time. However, in this paper, only the cost aspect of the project is validated using the model.

The table 1, below outlines a terrace housing project that was tested to identify the effectiveness of the "model cost".

Table 1: Terrace housing project used for the validation of the "cost model".

Name of housing project	Original project cost (RM)	Increase in project cost (RM)	Project cost increase %
Two-storey terrace house, Shah Alam, Selangor	RM 14,800,000.00	RM 1,924,000.00	13%

Source: Author

Table 1, above shows an example of a terrace housing project in Shah Alam, Selangor that was confirmed by using the model. The table lists the "original project cost", "increase in project cost" and "percentage increase in project cost", compared to the original price. All the data were obtained without using a "cost model" or manual calculation. The data were also obtained after the project had been fully completed.

Validation of the project cost of a two-storey terrace house, Shah Alam, Selangor

Project Cost Validation Calculation
Increased overall project cost (13%) = RM 1,924,000.00

Where;
(100%=57% for X1,X2,X3 & 43% for others)

Therefore,
Increased cost by the client X1, X2, X3 = 57% x RM 1,924,000.00
= RM 1,096,680.00
Cost increase by the other parties = 43% x RM 1,924,000.00
= RM 827,320.00

The breakdown of the additional cost to the client of RM 1,096,680.00 is as follows:

Where;
100 % identifies the % for (X1, X2, X3) as follows:
Therefore,
X1 = 60% of RM 1,096,680.00 (to be included in the model)
X2 = 25% of RM 1,096,680.00 (to be included in the model)
X3 = 15% of RM 1,096,680.00 (to be included in the model)

Applying the developed construction project variation order forecast model to the cost of the completed project, the following outcomes emerged:

$Y1 = b1X1 + b2X2 - b3X3 + a$

Whereby;
Y1 = 1.271 (the owner's changes to the scope of work) + 2.506 (changes in construction materials and procedures) -1.949 (the owner's modifications to the specifications + 5.081 (constant)
Y1a = 1.271 (0.6) + 2.506 (0.25) - 1.949 (0.15) + 5.081
= 0.763 + 0.627 -0.292 + 5.081=6.179=6.18

Note: b1, b2 and b3 are fixed when used to reduce the increased project cost at an early stage.

While;
Y1b (Percentage increase in cost, etc.) = 43% from 13% (increase in cost to clients and others)
= 5.59%
Therefore;
Y1 = Y1a + Y1b
= 6.18 + 5.59
= 11.77%

Referring to the details of the cost forecast calculation using the "cost model", table 2, below summarises the findings.

Table 2: Validation results of the "cost model" of the construction project.

Name of housing project	Manual: The increase in project cost % refers to the data obtained	Model: % Increase in project cost	Model: % Accuracy of model use
Two-storey terrace house, Shah Alam, Selangor	13%	11.77%	90.5%

Source: Author

Table 2 above shows the percentage difference in project cost increase figures obtained using both the manual and model methods. The grey column in the table shows the findings obtained using the model, while the white column shows the results of the manual calculation (i.e, not using a model). The findings reveal that the model had a high percentage in terms of the cost accuracy forecast, 90.5%. This was due to the percentage increase in project cost using the reduced model, 11.77%, compared to when the manual method was used, giving 13%.

The difference in the percentage increase in project cost can be reduced by 1.23%. Therefore, the project cost reduction for this project was RM 185,000.00 (1.23%).

CONCLUSION

Therefore, it can be concluded that using the "cost model" produced in the study by Noraziah (2017) is effective in helping to reduce the costs that arise due to variation orders during the development of terrace housing projects in Malaysia. The model is presented below:

$$\text{Cost Prediction Model } (Y1) = b1X1 + b2X2 - b3X3 + a$$

= 1.271 (the owner's changes to the scope of work) + 2.506 (changes in construction materials and procedures) - 1.949 (the owner's modifications to the specifications) + 5.081 (constant)

The author proposes that this model should be applied in pre-construction management as guidelines to address the occurrence of variation orders during residential projects in Malaysia. Furthermore, the author proposes to validate the use of the "time" aspect of the "cost and time model". This will be undertaken in a future study of housing projects in Malaysia.

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WILLINGNESS TO MODAL SHIFT FROM PRIVATE TO PUBLIC TRANSPORTATION IN JAKARTA METROPOLITAN AREA

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Abstract

Commuter workers' primary mode of transportation in the Jakarta Metropolitan Area is still dominated by private vehicles (73.26 percent). The number of passengers on public transportation is recorded at 26.74 percent. It indicates that public transportation has not fully accommodated commuter activities, even though it has been strategized for an environmentally friendly mode. This paper analyzes the modal shifting of transport from private to public transport and the influencing factors. This research recommends the urgency of urban dwellers to use public transportation. The study used biner logistic regression analysis. The results showed commuter workers in Jakarta Metropolitan Area switched from private vehicles to public transportation. Most commuter workers are more likely to keep using personal vehicles. Factors that affect the willingness not to change modes from private cars to public transportation commuter workers include gender, income, work, Mileage, and travel time.

Keywords: Public transport, binary logistics, willingness to switch modes, commuting

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INTRODUCTION

Work is an activity to do something to earn (Mcquaid et al., 2012) or profiting from such activities for at least one hour in the last week. In addition to work activities, traveling from home to work cannot be ignored. (Irfan & Nooraeni, 2021) one of Indonesia's main characteristics of the demographic mega-trend phenomenon is the change in population mobility patterns from permanent to non-permanent. The primary purpose of people commuting is predominantly for work (Susanto & Welly Udjianto, 2019). Commuter travel can be interpreted as moving residents across the territorial border and back within a day (Irfan & Nooraeni, 2021).

The study (Vioya, 2010) describes the concept of a region consisting of 2 main elements covering the city core and the suburbs around the center of the city, called the metropolitan area. The urban idea of space shuttle movement (commuting) is essential. Some studies argue that urbanization in poor areas of the country does not lead to urban growth (Agustina et al., 2022). The concept of transportation in the form of travel from the original location to the destination, according to (Sukarto, 2006), is referred to as (Yin et al. 2022) a home base trip if the actual site is home. A destination location is a place of activities carried out by commuters, such as social activities (school, sports, family, and so on) and business activities (work, trade, and so on).

On the other hand, (Mansyur, 2009) stated that transportation management policies in urban areas based on the environment and sustainable development are challenges in managing urban systems and, at the same time, transportation systems in urban areas. Theoretically, (Ravi Sekhar, 2014) describes the analytical framework of factors that influence a person's decisions in selecting modes of transportation used in his mobility in urban areas. Cities should develop green zones because they benefit citizens and the environment (Afriani et al., 2022). To answer the willingness of private vehicle users to use public transit using binary logistic regression analysis. Binary logistic regression, according to (Mansyur, 2009) (Ravi Sekhar, 2014) (Oliver & Gujarati, 1993), the book essentials of econometrics is one of the models of logistic regression. The advantage is that binary regression interpretation can be used to determine the magnitude of the chances of private vehicle users who are not willing to use public transportation due to an existing explanatory variable. Therefore, this study aimed to analyze the effect of the characteristics of users of private modes of transportation on the willingness to switch to public transportation modes.

RESEARCH BACKGROUND

Several studies on model selection have been conducted in several countries, including (Ding & Zhang, 2016), (Triany & Chotib, 2021), (and Maharani Raijaya & Chotib, 2020) reported that factors that affect the selection of public transportation modes are age, type of work, salary, travel time and travel distance of (Chotib, 2020). Empirically (Irjayanti et al., 2021) tested the factors that influence the decision to choose the mode of transportation of workers in the Jakarta Metropolitan Area following the characteristics of its users, such as the availability of private vehicles, income, and other factors such as travel time, transportation costs, availability of space and parking rates, as well as safety and comfort while using these modes of transportation.

The travel time of workers' commuters is influenced by several social aspects such as age, marital status, education level, employment status, and income level(Sari et al., 2015). In (Louis et al., 2019), age proved to be a significant factor explaining commuter behavior, and the effect of age on travel was non-linear. Younger and older people are more likely to travel at shorter distances than the age group among them (adults) (Mcquaid et al., 2012).

Married commuters have a longer commute time when compared to a single (Nayka & Sridhar, 2019). In addition, marital status is also related to female commuters (Indriany et al., 2019). One of the variables in the study is that education level significantly impacts the occurrence of more extended commuter travel (Hu et al., 2015). A college education level increases the likelihood that a commuter will experience a longer commute time (Irfan & Nooraeni, 2021).

Formal employment status is considered to have a higher level than everyday work. (MacKerron et al., 2009) found a higher level of primary employment had relationships associated with longer commutes. Income levels have a connection to the length of commuting time. (Kumar & Hafiz, 2013) found that the most important thing for long trips is a weekly wage. Those on high salaries (gross weekly salaries at their primary jobs) are more likely to travel longer (North et al., 2019)

The most widely used commuting modes of transportation for round-trip activities are private vehicles, 73 percent public transportation, and 27 percent. This shows that public transit has not become the primary mode that supports commuter activities. The study aimed to identify how likely commuter workers in Jakarta Metropolitan Area were to choose public transportation over private modes of transportation on their daily commutes (Sudarmadi et al., 2001). Using data from the Jakarta Metropolitan Area Commuter Survey in 2019, the study looked at the characteristics of workers who use the choice of public or private transportation modes in the Jakarta Metropolitan Area.

Given the importance of mass public transportation as the primary mode of transportation in breaking down congestion and supporting environmentally-friendly transit, it is necessary to research the willingness of

Jakarta Metropolitan Area commuter workers of private vehicle users to move using public transportation?

METHODOLOGY

The data source used in the study was taken from the Jakarta Metropolitan Area Commuter Survey conducted by BPS in 2019. The Commuter Survey in Jakarta Metropolitan Area was developed to produce data devices and monitoring systems that serve as inputs for preparing population mobility policies and regional development of origin and commuting destinations. The survey aims to provide data sets and monitoring systems that have a role as input for commuting policymakers. The Jakarta Metropolitan Area Commuter Survey collected 46,680 individual demographic, socioeconomic attributes, and travel characteristics. The study used 3,259 personal information.

The study was conducted in Jakarta Metropolitan Area. Jakarta Metropolitan Area consists of 13 districts/cities, namely Central Jakarta City, West Jakarta City, South Jakarta City, East Jakarta City, North Jakarta City, Bogor Regency, Bogor City, Depok City, Tangerang Regency, Tangerang City, South Tangerang City, Bekasi Regency, and Bekasi City. This study uses data from the Jakarta Metropolitan Area Commuter Survey in 2019, organized by BPS. The analysis unit used in the study included all working individuals and commuter status of private vehicle users.

The analysis unit in this study is workers who commutability by using private vehicles as the primary mode (Ashalatha et al., 2013). The primary mode of transportation is a means of transport commonly used to go/return to/from the place of activity. If using more than one mode of transportation (Niemeier et al., 1997), the primary mode of transportation is the mode of transportation for the furthest distance. If the space is the same, then the primary mode of transportation is the mode of transportation that takes the longest (Fahmi & Hands, 2016).

The variables used in this study were divided into dependent variables and independent variables. Dependent variables are willing to use public transportation from private vehicles. The explanatory variable consists of 9 variables described in the following table.

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Table 1: List of Research Variable

Code	Variable name	Definition
Y (dependent)	Shifting to Public transport	Number of respondents shift from private transport to public transport (percentage)
X1 (Independent)	Age1	Age of Respondent (percentage)
X2 (Independent)	Age2	Age of Respondent (percentage)
X3 (Independent)	Gender	Denoting gender.
X4 (Independent)	Education	Denoting the highest level achieved education.
X5 (Independent)	Income	Average monthly household income in millions of Rupiah
X6 (Independent)	Martial Status	Marital status of the respondent
X7 (Independent)	Type of Job	The activity of doing work with the intention of obtaining income
X8 (Independent)	Distance to work	Average commuting distance to work in kilometers
X9 (Independent)	Time to work	Average time to work in minutes

The analytical methods used are descriptive analysis and inference analysis. A descriptive study (Chotib, 2020) emphasizes bivariate analysis in describing free variables (respondents who are not willing to use public transportation) based on the characteristics of private vehicle users in the Jakarta Metropolitan Area in 2019. The study (Ding & Zhang, 2016) inferential analysis uses binary logistic regression analysis, whose purpose is to determine the characteristics and opportunities that affect respondents unwilling to switch to public transportation from private vehicle users in Jakarta Metropolitan Area in 2019 (Irjayanti et al., 2021).

The equation model is used as follows:
$$In\ (\rho_1/\rho_0) = \beta_0 + \beta_1 * Age1 + \beta_2 * Age2 + \beta_3 * Gender + \beta_4 * Education + \beta_5 * Income + \beta_6 * Martial\ Status + \beta_7 * Type\ of\ Job + \beta_8 * Distance\ to\ Work + \beta_9 * Time\ to\ Work \ldots (1)$$

Where:

P1	=	Opportunities for private vehicle users to switch to public transport
P0	=	Chances are private vehicle users do not switch to public transport
Age1	=	0 ref. age ≤24 years; 1 if 25-44 years old
Age2	=	0 ref. age ≤24 years; 1 if ≥45 years old
Gender	=	0 if male; 1 if women
Education	=	0 if ≤ junior high; 1 if ≥ high school
Income	=	0 if Medium (3.9 M down); 1 if High (4 M and above)

Martial Status	=	0 if not married; 1 if married
Type of Job	=	0 if the work is informal (other than formal); 1 if formal employment (Labor/Employee/Employee)
Distance to work	=	0 if Near ($\leq$29 km); 1 if Far ($\geq$30 km)
Time to work	=	0 if the journey is Fast Duration ($\leq$89 minutes); 1 if a long-duration trip ($\geq$90 minutes)

In the category of Mileage, the place of activity is a one-way distance from home to the place of activity, not the distance round trip. Empirical research (Ravi Sekhar, 2014), the length of travel from the residence to the place of activity is the length of travel calculated from the place of residence to the place of activity, including the waiting time for public transportation (for those who use public transportation). While the travel time category, according to (Badan Pusat Statistik, 2019), is the length of travel calculated from the place of activity to the place of residence, including the waiting time for public transportation (for those who use public transportation).

RESULTS AND DISCUSSIONS
Descriptive Analysis
Results from the Jakarta Metropolitan Area commuter survey of the Central Statistics Agency (2019) showed that as many as 72% of Jakarta Metropolitan Area commuter workers use private vehicles as the main mode of transportation for commuting and returning. Of the total users of private vehicle commuter workers, as many as 91.6% have no desire to switch to using public transportation modes, while 8.4% are willing to switch to public transportation.

Based on figure 1 contains information about the willingness to switch modes from private vehicles to public transportation per region in Jakarta Metropolitan Area in 2019, presented in graphic form. The results of the Jakarta Metropolitan Area commuter survey of the Central Statistics Agency (2019) reported that the willingness of commuter workers who are willing to switch modes from private vehicles to public transportation per region in the Jakarta Metropolitan Area is as follows.
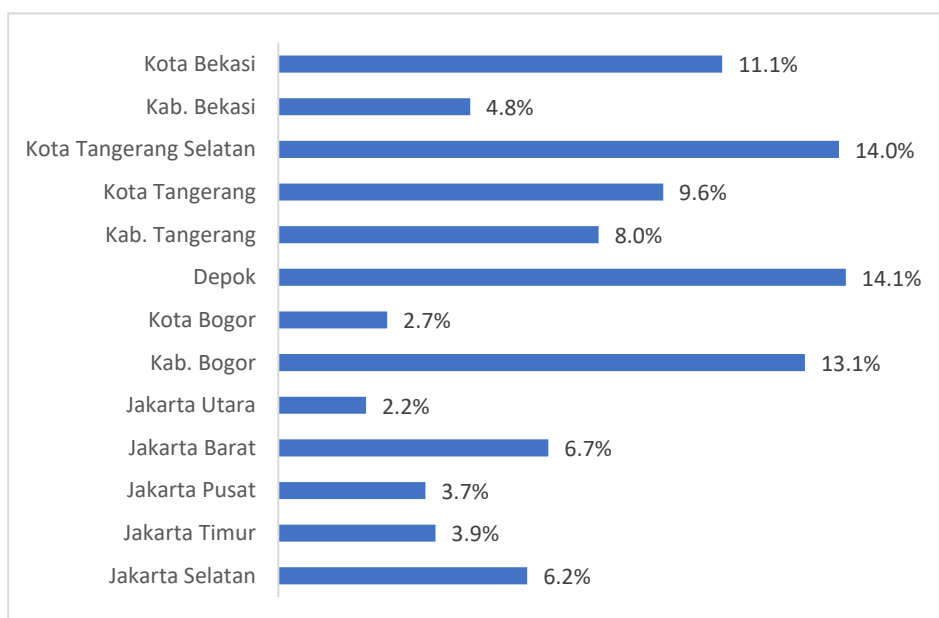
Figure 1: Willingness to switch modes from private vehicles to public transportation
per region in Jakarta Metropolitan Area year 2019
Source: Jakarta Metropolitan Area Commuter Survey 2019, processed 2021

It is generally known that the willingness of commuter workers willing to switch to using public transportation based the highest area in Depok City with a percentage of 14%, while the region with the lowest willingness to switch to using public transportation is the North Jakarta area with a percentage of 2% of the total respondents who are willing to switch to using public transportation. In the following table, a descriptive analysis of the explanatory variables and the willingness to switch to using public transportation.

Table 2: Characteristics of private vehicle users who are willing to switch to public transportation based on research variables

Variable	Category	Switching to Public Transport		Observation (100%)
		Yes (%)	No (%)	
Age Group	≤24 years	6,6	93,4	949
	25-44 years	8,6	91,4	1521
	≥45 years	9,5	90,5	842
Gender	Male	7,9	92,1	2557

Variable	Category	Switching to Public Transport		Observation (100%)
		Yes (%)	No (%)	
	Female	9,4	90,6	755
Education	≤ junior high school	6,3	93,7	601
	≥ high school	8,7	91,3	2711
Income	(3.9 million down)	6,5	93,5	1759
	(4 million and above)	10,2	89,8	1553
Marital Status	Not mating.	7,5	92,5	1355
	Marry	8,8	91,2	1957
Work	Informal Work	4,4	95,6	611
	Formal work	9,1	90,9	2701
Mileage	Near (≤29 km)	7,1	92,9	2809
	Far (≥30 km)	14,9	85,1	503
Travel Time	Fast Duration Trip (≤89 minutes)	7,2	92,8	2753
	Long Duration Trip (≥90 minutes)	13,6	86,4	559

The table above shows a descriptive analysis between explanatory variables and bound variables, namely the willingness to switch to using public transportation. The results of this analysis show, in general, the proportion of willingness to switch to using public transportation. Of the total respondents, as many as 3,312 showed that the age group over 45 years was more willing to switch to using public transportation by 9.1% compared to the age group of 25-44 years by 8.6%, and the proportion reduced to 6.6% in the age group under 24 years who are willing to switch to using public transportation.

Willingness to switch to using public transportation according to gender, 9.4% of women are more interested in switching to public transportation than men, who are willing to move by 7.4%. The proportion of willingness to use public transportation according to the last education completed tended to be dominated by respondents with education groups more than high school or by 8.7%, while the education group under junior high school equivalent of 6.3% who were willing to switch to using public transportation.

Willingness to use public transportation was also influenced by respondents' income. The results of the Jakarta Metropolitan Area commuter survey 2019 showed that workers with incomes of more than 4 million are more willing to switch to using public transportation with a percentage of 10.2%. This is in line with research conducted by (Setyodhono, 2017) which states that the increasing income, the increasing computer wants to switch to public

transportation, while in the group of respondents with income below 3.9 million, only 6.5% are willing to switch to using public transportation.

Users of private vehicles as a whole turned out to be very dominated by formal workers, including Workers/Employees/Government employees and other instances with the number of private vehicle users of 2706 respondents while informal workers of private vehicle users amounted to 611 respondents. From the data, it is known that as many as 9.1% of formal workers are more willing to switch to using public transportation than informal workers. Only 4.4% are willing to switch to using public transportation.

The distance used in this study is the distance from residence to work. This study is divided into two categories, which are less than equal to 29 km included in the category of close and more than 30 km included in the far category. Users of private vehicles with short distances are much more willing to switch to using public transportation, which is 14.9%, compared to private vehicle users with short distances, 7.1%. This is in line with research (Irfan & Nooraeni, 2021), where most commuters are motorcycle users who are a less comfortable mode of transportation to be used mode of transportation with long distances. At the same time, travel time is distinguished into fast duration travel and long duration travel. Private vehicle users with long-duration trips are more willing to switch to using public transportation by 13.6% compared to fast-duration private vehicle users by 7.2%. This is in line with research (Hu et al., 2015) that trains are more in demand for long-distance travel.

Inferential Analysis

Inference analysis is done using logistic regression analysis. This is because the bound variables used there are 2 (two) options (switching and not switching to public transportation). In this regression, it is not willing to "0" and willing to move using public transportation, given the code "1" as a reference category. Simultaneous test results show negative and significant calculation results, where the results of binary logistic regression analysis can be seen in the following table.

Table 3: Logistic regression of binary's willingness to use public transportation

	B	S.E.	Wald	Df	Sig.	Exp(B)
Bound Variable	0 = Not ready; 1= Willing to switch to Public Transportation					
Age			0.860	2	0.651	
Age1	-0.132	0.211	0.396	1	0.529	0.876
Age2	-0.230	0.252	0.839	1	0.360	0.794
Gender	-0.422	0.154	7.473	1	0.006**	0.656
Education	-0.083	0.191	0.187	1	0.666	0.921
Income	-0.318	0.147	4.703	1	0.030**	0.728
Martial Status	0.142	0.186	0.580	1	0.446	1.152

	B	S.E.	Wald	Df	Sig.	Exp(B)
Bound Variable	0 = Not ready; 1= Willing to switch to Public Transportation					
Type of Job	-0.677	0.213	10.122	1	0.001**	0.508
Distance to work	-0.618	0.175	12.502	1	0.000*	0.539
Time to work	-0.340	0.173	3.856	1	0.050	0.712
Constant	3.559	0.265	179.840	1	0.000	35.136

Description: *,**** significant at $\alpha < 1\%$, $\alpha < 10\%$

(De Witte et al., 2013) defines mode selection as the decision process of choosing between various transportation alternatives determined by a combination of individual socio-demographic factors and spatial characteristics and influenced by socio-psychological factors. Based on the data above, female workers who are commutable by using private vehicles are more willing to switch to using public transportation than men. This is the same as empirical research (Irjayanti et al., 2021). Along with the many needs of women, they prefer a more flexible model of transportation, so public transportation services are needed to be provided in accordance with the wider travel range and working hours and safety and comfort in travel.

Income variables show a significant relationship but negatively affect the willingness to switch modes. So that the greater a person's income, the more likely they are to choose not to be willing to use public transportation. The more formal workers in Jakarta Metropolitan Area who are commuters, the fewer will be willing to switch to using public transportation. Travel mileage shows a significant value where commuter workers tend to stick to using private vehicles to carry out their activities.

CONCLUSION
The results of this study revealed that the chances of willing commuter workers in the Jakarta Metropolitan Area to switch from private vehicles to public transportation amounted to 8.4% of private vehicle users willing to switch to public transportation and 91.6% of commuter workers more likely to stick with private vehicles. Based on the results of the inferential analysis, the factors that affect commuter workers are not willing to switch to using public transportation are gender, income, employment, Mileage, and travel time. This finding is an important insight to be considered by Jakarta's authority in strategizing the policy and development of public transportation.

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WHAT MAKES AN ATTRACTIVE USER-FRIENDLY STREET? EXPLORING PERCEPTIONS OF MAWLAWI SHOPPING STREET ENVIRONMENT IN THE CONTEXT OF SULAYMANIYAH CITY, IRAQ

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Abstract

Streets are one of the vital components of an urban form that supports the city dwellers' public and private activities. Therefore, the purpose of attraction is necessary for persuading people to use the street and presenting the image of the city. Thus, the problem statement of this paper is that attractiveness of the shopping street decreases due to the presence of too much traffic management, and an uncomfortable environment attributed to an over-presence of traffic lights. Therefore, the objective of this paper is to determine the attraction factors associated with the user-friendliness of the shopping streets. This paper uses a case study approach of Mawlawi Street in Sulaymaniyah city in Iraq. The methodology used is the quantitative method via a survey of users (n = 330). The data were analysed statistically by SPSS using the mean values. The results show that the cultural attraction factor is the strongest form that contributes to people using the shopping street with a mean value of 3.1446. It is expected that the findings from this study will help designers, urban planners and policymakers to understand the needs and attitudes of users towards creating an attractive user-friendly shopping street environment in Iraq.

Keyword: user-friendly street, street attractions, user perceptions, attractive environment, shopping street, Mawlawi Street, Sulaymaniyah

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INTRODUCTION

This research identifies the idea of "user-friendly shopping street" in Sulaymaniyah city centre in Iraq. The major focus is to research on the physical design features and the main attractions in the shopping areas in terms of physical, social, and cultural aspects. Such attractions are strongly connected with the mixed use of the streets through various activities in places with building that have architectural features (Gehl, 2010).

Based on the problems highlighted by recent studies, urban shopping streets are regarded as not user friendly as many of the streets do not fulfil user's needs. The urban shopping streets are also found to have lack of connection with main attractions in terms of physical, social, and cultural, despite the fact that these are the most vibrant aspects that provide the image of user-friendly built environment (Capitanio, 2019; Khalaf et al., 2021).

Urban areas all over the world are now experiencing the challenge of domination of private vehicles. Other than that, issues such as insufficient amount of the walking streets as well as poorly designed path make it difficult for the pedestrians to utilize the walking area (Chua & Ahmad, 2021).
In Iraq, the rapid economic growth after the war in 2003 has made the citizens prefer the use of private cars, resulting in difficulties of preserving good walking environment and cause unattractive surroundings for shopping area (Khder et al., 2016). The unpleasant quality of the built environment in most of the city's historical street has made the streets to be inactive most of the time. Therefore, it is essential to improve the attractiveness level of the shopping street by focusing mainly on the design and provision of streetscape elements (Handoyo & Wijayanti, 2021; Mazin & Radi, 2019).

This paper presents the attractions factors that users associate with the user-friendliness of the shopping street in Mawlawi Street, Sulaymaniyah, Iraq.
It is expected that the findings from this study will help designers, urban planners, and policymakers to understand users' needs and attitudes towards user-friendly shopping street in Sulaymaniyah context.

LITERATURE REVIEW

Previous studies have highlighted that there is a major difference between the definition of a road and a street. Road is known as "an ordinary route of communication between different places for travellers using vehicles." In contrast, a street is referred as "an enclosed space between two lines of adjacent buildings" (Ernawati et al., 2018; Moughtin, 2003; Yassin, 2019). In this perception, streets are more inclined to be people-oriented that caters to people's functional, leisure, and social requirements (Jacobs, 2013; Moura et al., 2017; Wan Ismail et al., 2018). It is essential for streets to be user-friendly in order to

provide a liveable environment for users such as pedestrians (Jaafar et al., 2017; Khalaf & Ja`afar, 2020).

Among all publicly accessible space in a city, streets, much like parks, are the most used by the city dwellers. Thus, the characteristics of a street and its qualities must meet the needs of all users (Wan Ismail et al., 2018; Yassin, 2019). In this research, street is regarded as "one of the essential elements in designing an urban space" (Ali et al., 2019; Sipan et al., 2021).

The term "user-friendly" in this study refers to a functional balance among factors like social needs, environmental as well as financial constraints (Shamsuddin.S et al., 2002). The level of user-friendliness of the street is an important factor to bring people to the street (Asadi-Shekari et al., 2019; Harun et al., 2020). Therefore, the understanding of current users' needs in a specific context is important (Chladek, 2019; Rahman et al., 2016). By understanding the specific contextual needs in space, a remedy that leads to the street improvement can be strategized (Rahman & Shamsuddin, 2010). One of the challenges for urban and transport planners is negligence in providing the appropriate places for walking which could attract pedestrians in cities (Elhamy, 2012; Khalaf & Ja`afar, 2020; Roozkhosh et al., 2020).

Attractions on the street represent factors that user-friendly shopping streets possess (Taylor, N., 1999; Jacobs, 1993; Rahman et al., 2015b). Attractive pedestrian environments are also linked to economic benefits because financial returns derived from land or property value increase with lively and high-quality streets (Capitanio, 2019; Carmelino & Hanazato, 2019).
Streets may be made to attract and suit pedestrians by considering several factors. For instance, when a street is designed to improve its aesthetic qualities, people become more attracted to the street and hence use it more. Another factor in making the street more attractive is the consideration of night-time activities and allowing the street to cater to diverse functions. Furthermore, successful public pedestrian area should have open spaces that are accessible, well-designed, and comfortable (Ismael et al., 2019; Sepe & Pitt, 2013). Abbaszadeh (2011) discussed that buildings' features must form an attractive public environment, as well as creating places that could be seen and enjoyed by the public.

In this paper, attractive is categorised in physical, social, and cultural aspects of the use of streets where various activities are conducted at buildings and architectural feature (Gehl, 2010).

Streets supply a space for commercial activities such as stores, service facilities such as banks, post offices, and social spaces for health, education, administration, cultural facilities, and political activities. In addition, public spaces all over the city can be used for variety of activities (2012; Ja'Afar et al., 2017; Mehta, 2018).

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Physical attractiveness is represented by the physical factors at the spatial rank availability, facilities, lighting, landscape, recreational space, and safety of the users (Nathiwutthikun K., 2006; Cambra & Moura, 2020; Rahman et al., 2018). Physical aspects of street consist of providing devices and facilities for users' daily needs. The physical role covers the shape and size of the street as well as visual complication (visual and aesthetic factors such as seating, landscaping to subspaces, protection and shield lighting from the sun and cold and human being scale) (Zeka B., 2011; Tandon & Sehgal, 2017). It is also important to combine elements such as architectural style, materials and traditions, relationship of buildings to landscape, history, and economic factors to create distinctive and specific places to their location, not the qualities of somewhere else (Cadw, 2013; Al-Obeidy, 2015).

In terms of social attractiveness, attractive public spaces in urban areas are paramount to construct the feeling of comfort or wellbeing to the users. Attractiveness is strongly connected with the mixed-use of streets, various activities and good places with buildings and architectural features (Gehl, 2010). The social components' personalisation, vending activities, kiosks, shows and performances, activities involving human desires and needs can be considered when upgrading a street to achieve a more cohesive society (Mazin & Radi, 2019). Sociable streets are streets that can offer various purposes such as socialising, daily or festive shopping, dining, lingering, promenading, holding celebration or protest, and survival. Such streets are the desired component of any good mixed-use neighbourhood and therefore of any good city (Chladek, 2019; Mehta, 2018). All this leads to greater social participation, gathering, and communications among society, which provides greater linkage in the community (Mazin & Radi, 2019).

In contrast, cultural components give streets a sense of place and identity that consider the local and regional context (Initiative Global Designing Cities, 2016). The cultural components include the sense of place (local and regional contexts), time factor, adequate personal space, and demographic structure (Initiative Global Designing Cities, 2016). They also consider diversity, change, and a sense of history from the street's years and the successive decisions regarding design, construction, or reconstruction (Jacobs, 2013; Mazin & Radi, 2019). Across the world, there are cities that have some major streets which anchor significant civic, cultural, and commercial buildings and spaces. Such streets host various historical memories of the city. Revitalising such streets provides an easy way to restore image and identity (Ja'afar & Harun, 2018; Mehta, 2018).

This paper categorises attractiveness into three: (1) physical, (2) social, and (3) cultural. Physical attractiveness means that the street is traditionally situated in the city centre where it becomes the most common place to earn

income. The physically attractive street is regarded as the main source of commerce and labour through the presence of shopping centres. It must also have the presence of landscapes and public spaces with adequate public facilities as well as attractive buildings. The second type which is social attractiveness means the street must have leisure and aesthetic value. Such street will make the users to feel comfortable with the presence of various types of outdoor cafes, refreshment kiosksas this kind of street is suitable for people to gather for different activities The users of the street would feel relax whenever they use a socially attractive street. Finally cultural attractiveness is regarded as streets that have culturally unique name that remind the users of sweet memories which reflect the city's identity, and the historical values it possesses.

METHODOLOGY
This research uses quantitative methodology. A total of 330 questionnaires were distributed. The respondents were asked to answer the variables regarding the attractiveness of street attractions that they perceived. All the data were analysed using the SPSS 2017 version 25.0 software. The questionnaires used items with 5-point Likert scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *undecided*, 4 = *agree*, 5 = *strongly agree*). The 5-point scale is chosen when researchers want to collect many attitudes in a short time. The highest mean values among the three categories of attractiveness and between each one of them were recorded. The range of 3 to 5 was determined for the mean score, where 3 represents the scale's midpoint (Johns, R., 2005; Ali et al., 2020).

CASE STUDY
The data were collected from Sulaymaniyah city centre users. The city of Sulaymaniyah is the centre of Kurdish culture with historical values (S. Hisham, et al., 2019). The study focuses on users' needs in the shopping area and the relationships with physical, cultural, and social attractions of the built environments.

Mawlawi Street is chosen because the street is one of the busiest and the most famous shopping streets located in the city centre of Sulaymaniyah in Iraq. It can be considered as the main link that connects the city centre and historical areas to the Public Park and Salm Street (Figure 1).

The width of the street is 15 m, and it is almost 1 km long. It is the entrance to the city centre and historic district in Sulaymaniyah (Taha H., 2007). There are various activities on both sides of the street, including hotels, green groceries, retail shops, restaurants, book shops, and informal activities such as vendors and hawkers (Figure 2). However, the lack of efficient public transportation has made the city dwellers to become more dependent on private cars. After 2003, most of the residential houses around Mawlawi Street were

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bought by traders who have now demolished the houses and converted them to commercial buildings (Khder et al., 2016).

Figure 1: Mawlawi Commercial Street- Sulaymaniyah City Centre
Source: (Google earth)

Figure 2: Mawlawi Street land use
Source: (Khder et al., 2016)

RESULT AND DISCUSSION

Table 1 shows that the cultural attractions (3.1446) are the most attractive attractions for Mawlawi Street, followed by social attractions (2.9503) and physical attractions (2.9022). This finding shows that cultural attractiveness is the strongest form that contributes to people using the shopping street (Figure 3). Shopping streets are crucial to the liveability of any city because they accentuate lifestyle features that are distinct by forms of activity from the social and cultural values of people leveraged by shopping habits. Hence, streets attractions must be friendly, culturally and socially convenient for users to attend shopping event compared to the physical aspects (Carmelino & Hanazato, 2019). In addition, the streets are culture-specific, which have been developed over the years (Tandon & Sehgal, 2017).

Table 1: Degree of Attractiveness based on Mean Values

Descriptive Statistics		
Category	**Variables**	**Mean Values**
Cultural Attractiveness		3.1446
	Name of the Mawlawi Street itself	3.2727
	Remind of sweet memories	3.1515
	Reflect Sulaymaniyah identity	3.1242
	The historical values it possesses	3.0303
Social Attractiveness		2.9503
	Its leisure and aesthetic value	3.1152
	It makes me feel comfortable and well-being of using it	3.0576
	Lots of outdoor cafes, refreshment kiosks	2.9545
	This street gathers people to do different activities	2.8788
	It makes me feel relaxed when using this street	2.7455
Physical Attractiveness		2.9022
	It is traditionally situated in the city centre	3.0545
	Attractive best place to earn money or income	3.0515
	Presence of the landscapes	3.0182
	Presence of the public spaces	2.9182
	It is regarded as the main source of commerce and labour	2.8939
	Presence of public facilities	2.8333
	Attractive buildings	2.7939
	Presence of shopping centres	2.6545
Mean Value Response format 1=strongly disagree 5= strongly agree		2.9343

Source: (Field surveying 2020)

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Figure 3: The Main Attractions of Mawlawi Street
Source: (Fieldisurveyi2020)
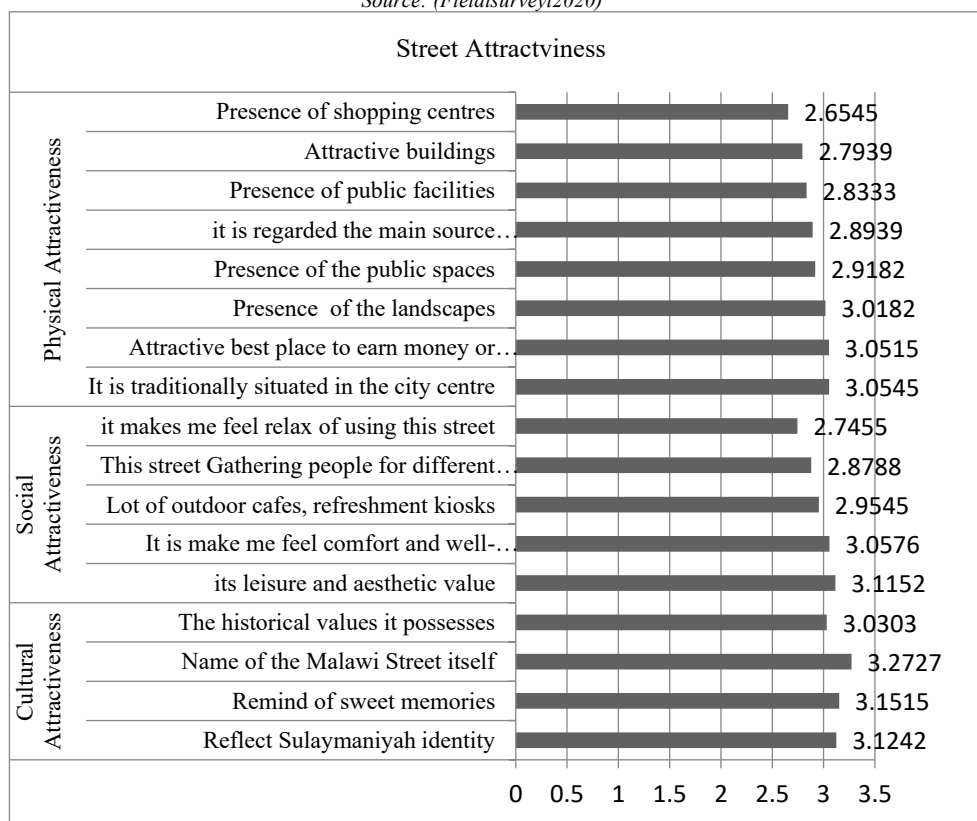
Figure 3 shows that the respondents acknowledge Mawlawi Street's cultural attractions as the main factor of its role as a shopping street from the responses such as "name of the Mawlawi Street itself" (3.2727), "remind of sweet memories" (3.1515), "reflect Sulaymaniyah identity" (3.1242), and "the historical values it possesses" (3.0303). The results portray that a sense of alternate relationship and friendliness are present among users in Mawlawi Street. This is due to the reputation of a Kurdish culture city and the attractive town gained by Sulaymaniyah city over the years, making the city habited by different types of users (Khder et al., 2016). Cultural components give streets a sense of place and identity that considers the local and regional context in addition to creating a user-friendly place (Jacobs, 1993; Mazin & Radi, 2019; Initiative Global Designing Cities, 2016).

This is an important contribution of the study because not all shopping street with user-friendly design elements from other countries with different culture are suitable for Iraq.

The results show that social attractiveness has a higher mean value (2.9503) compared to physical attractiveness. This clarifies that users are more attracted to social elements from the statements "its leisure and aesthetic value" by mean value of 3.1152, and "it is making me feel comfortable and well-being of using it" by mean value of 3.0576. This illustrates that the street offers less social opportunities among the users of Mawlawi Street because the street is too crowded for any outdoor activities. According to Ismael et al. (2019), public spaces are some of the most important city elements.

In short, the social attractiveness influences the user-friendly environment design of shopping street on user perceptions in Mawlawi Street, Iraq. Although the street is not socially attractive for social activities, a good social attractiveness of the shopping street design should be achieved by integrating its aesthetic values and outdoor refreshment activities to attract shopping environment.

The results portray that physical attractiveness has the lowest mean value of 2.9022 on user perception. The most significant mean value is 3.0545 for "this street is traditionally situated in the city centre", 3.0515 for "attractive best place to earn money or income", and 3.0182) for "presence of the landscapes".

In addition, the dissatisfied features of the shopping environment in such historic street have made the street unattractive most of the time (Khder et al., 2016). Previous studies stated that shopping streets are more attached to the common sense of the commercial event compared to the physical setting (Carmelino & Hanazato, 2019; Mazin & Radi, 2019; Mehta, 2018; Moura et al., 2017).

In short, physical attractiveness is important because it will enhance the function of a street as a user-friendly shopping street by considering the functions, such as the attractive best place to earn money or income. Physically attractive street is regarded as the main source of commerce and labour where it will attract people to the street for gatherings.

CONCLUSIONS
In conclusion, cultural attractiveness is the highest attractions among all variables in the context of Mawlawi Street in Sulaymaniyah city. However, the street is not socially and physically attractive in some parts of the items. Thus, the provision and design of the cultural attractions have a significant role in improving attractiveness in the shopping street in Iraq generally and in northern Iraqi cities in Sulaymaniyah particularly.

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It is also noteworthy that the variables that contribute to the attractiveness vary for each context, especially countries with a different climate and economic level such as between developing and developed countries or culture of the place. This identifies the variables that need to be considered in future guidelines and policies for planning and design in urban spaces, especially shopping streets. It is hoped that these attractiveness factors will be considered by those involved with the decision making in urban design, as a guide to create a user-friendly shopping street environment that is generally lacking in the current urban streets.

ACKNOWLEDGEMENTS

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THE ARCHITECTS' AND LANDSCAPE ARCHITECTS' VIEWS ON THE DESIGN AND PLANNING OF THE HOSPITAL COURTYARD GARDENS (HCG) IN MALAYSIA

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Abstract

This paper presents the architects' and landscape architects' point of views on their original design intentions in designing and planning hospital courtyard gardens (HCGs) in Malaysia. Following a field observation, a semi-structured interview with two architects and two landscape architects was conducted. Additionally, the architectural design briefs for three selected Malaysian hospitals were obtained as secondary data for this study. The results revealed that the intended common design pointed out by the architects includes: i) Daylighting strategy; ii) Ventilation strategy; iii) Access to nature; and iv) Point of orientation. Landscape architects, on the other hand, are concerned with: i) Forest-like garden concept; ii) Natural and organic form instead of aesthetic appearance; iii) An escape place for relieving stress and; iv) A hang-out space for socialisation. This paper contributes to the understanding of how designers would think and determine the architectural plan and landscape design in achieving an optimal HCG design to meet the needs of the intended users.

Keywords: Hospital courtyard garden (HCG), design intentions, architect, landscape architect

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INTRODUCTION

Courtyards are climatically responsive areas that instigate the cooling effect for buildings in hot and humid climate areas (Nugroho et al., 2020) and provide indoor ventilation and daylighting to hospitals (Yoon & Lim, 2020). In addition to its functions as a passive design strategy, the hospital courtyard garden (HCG) has essential means of providing a place for staff, patients, and family members to respite and have a connection with nature (Idris et al., 2019). Integration of both the environmental and restorative functions into courtyard design in today's contemporary hospital buildings is critical to effectively meeting the needs of the various users (Idris, 2020). In achieving this goal, it calls for careful collaboration and consideration among the key players while designing and planning the hospital projects.

The design and plan of the hospital garden have been criticised by the previous scholar: "too often landscapes are created as an afterthought and are not treated as part of the architecture composition" (Verderber, 2010, p.60). The architects were more concerned with the building's overall layout, and the garden was frequently treated as an afterthought and 'leftover' (Cooper Marcus, 2007). In most cases, the garden design is usually designed after the architect has completed the building design and specified the layout for the courtyard. As a result, the concept of a well-designed courtyard is often separated from the building's overall master planning and design process. Therefore, this paper sought to examine the design intentions of these architects and landscape architects to determine factors that influenced their decision to incorporate courtyards in hospital settings.

RESEARCH BACKGROUND

During the British colonial era (1874-1957), hospitals were often built in a single-story with a pavilion-style arrangement in rural areas and medium-rise hospitals in cities and towns (Aripin, 2007). The standard plans for a small-scale hospital were used to build new hospitals in the 1960s (Nawawi et al., 2013). Private consultants were not involved in the hospital design during this time, and courtyard gardens had yet to be included in the development of hospital plans. Over time, the Ministry of Health (MOH) made a lot of changes to the physical and social facilities in Malaysian hospitals. In order to make sure that Malaysian hospitals can keep up with the changing environment and expectations of their patients, the Ministry of Health keeps changing and refining the environmental quality of Malaysian hospitals (Suleiman & Jegathesan, 2001). This has led to changes in how hospitals are planned which focus on providing a green and healing environment, and also environmentally sustainable buildings (Aripin, Othman & Nawawi, 2015; Nawawi et al., 2013).

Furthermore, in response to the growing awareness of the importance of contact with nature in terms of the well-being of hospital occupants, the Minister of Health proposed in 1998 that all hospitals in Malaysia under the MOH incorporate gardens into the planning and design of hospitals (Shukor, 2007). Since 1998, the inclusion of a courtyard garden in the design of large or medium-sized hospitals has become standard practice as a means of implementing a passive cooling strategy, particularly among private consultants involved in hospital construction projects. In recent and newly constructed hospital projects, this practice has been carried out in the same way. However, it is still unclear whether the space serves its intended purpose of providing a comfortable environment and a positive experience, or whether it has been being well used by the intended users (i.e. patients, staff and visitors).

Nature's role in decreasing stress levels and improving health outcomes for various user groups
There is strong scientific evidence that being in contact with nature (either by looking out onto a garden or being in one) helps hospital patients recover faster, especially because nature helps them relax and reduces stress, thus improving their health and well-being (Ulrich et al., 2018). For example, a large percentage of ICU patients' families reported that sitting in a garden reduced their feelings of sadness and reduced their stress levels more than sitting indoors (Ulrich et al., 2020). A recent study also found that psychiatric patients in newer hospitals with stress reduction features (e.g. access to nature, nature window views, noise reduction design, and daylight exposure) had less aggressive behaviour (Ulrich et al., 2018). Moreover, greenery (i.e. the view of nature) and brightness of the window view (i.e. natural sunlight) significantly lessen the length of stay of psychiatric inpatients in the hospital (Mascherek et al., 2022). Another recent study also discovered that exposure to outdoor activities such as gardening can sustain and improve the physical functions among older cardiac rehabilitation patients during the Covid-19 pandemic (Ogura et al., 2022).
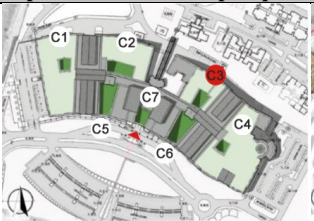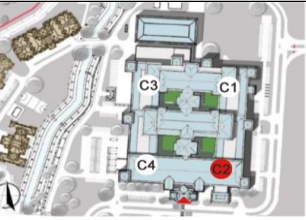
RESEARCH METHODS
The setting
A sample representing three Malaysian public hospitals (H1-hospital, H2-hospital, and H3-hospital), respectively located in Johor Bharu, Selangor and Kedah, were selected to be the case study hospitals. These hospitals were carefully chosen to represent a range of closed courtyard garden configurations. Due to time and budget constraints, the research was limited to Peninsular Malaysia and State Government hospitals with bed capacities of 500-700 beds (See Table 1). All of these twentieth-century hospitals were completed and put into service more than a decade ago. These three hospitals have a variety of HCGs

with different design plans: H1 (large central type), H2 (interlinked type), and H3 (clustered type).

Table 1: The selected case study hospitals.

H1-HOSPITAL	H2-HOSPITAL	H3-HOSPITAL
Year of operation: 2007 **Site area:** 50.58 acres **Floor area**: 105,417m^2	**Year of operation:** 2005 **Site area:** 60 acres **Floor area**: 129,000m^2	**Year of operation:** 2007 **Site area:** 40 acres **Floor area**: 77,940m^2
Floor plan and sectional perspectives		

(Source: Idris, 2020, p.144)

Methods

Three methods were employed in this study: i) field observation; ii) expert interviews; and iii) document analysis. Ethical approval from the Malaysian Medical Research Ethics Committee (MREC), was granted and permission from the gatekeepers was also obtained before carrying out the data collection.

First, the field observations on the characteristics of the HCGs in the three selected hospitals were conducted. Between January to March 2018, site observations were carried out at the selected HCGs, starting from the H3, H2 and H1 respectively. On-site activities involved walkthrough observations, taking photographs, field notes, sketching the HCG layout and mapping the hardscapes and softscapes in the HCGs. Secondly, semi-structured interviews with two architects and two landscape architects were carried out at their respective offices between February and March 2018 on the dates agreed by both parties. Additionally, documents such as an architectural design brief (secondary data) were also gathered by the researcher during the session to aid this research.

FINDINGS

Designers vary in their unique way of thinking which is often based on their logical thinking, reasoning and imagination during the design process (Lawson, 2006). Examining designers' intentions on the design and planning of the HCGs

in Malaysian hospitals is fundamental in understanding the important key issues highlighted by the designers pertaining to the optimal HCG design to meet the functional needs. Based on the qualitative content analysis, the key findings related to the design intention of the architects and landscape architects are presented below:

Architects' design intention

Several key issues are highlighted in the interviews with the architects involved in the design and planning of the H1, H2, and H3 hospitals, including: (i) daylighting strategy; (ii) ventilation strategy; (iii) access to nature; and (iv) point of orientation.

i) Daylighting strategy

This study revealed that the architects intend to include the courtyard as part of the design and planning of hospitals, focusing more on the environmental aspect. The HCG serves as a daylighting strategy to bring daylight into the internal spaces of the hospital building (e.g., cafeteria, waiting area, corridor, basement level) (See Tables 2 and 3). Moreover, the architect highlighted that the HCG function is to avert a deep planning in a large hospital complex by allowing natural light into the interior spaces.

Table 2: Key issues related to the daylighting strategy

DAYLIGHTING STRATEGY	Avoid the 'deep plan nature' of the building	*'...there are so many medical departments here [referring to the floor plan for level 2], so this is the diagnostic and treatment blocks, so you've **got very deep planning in itself**. So, the other part also you **want to have exposure to get the light** from here as well as this side [Referring to the East and West side hospital blocks]' - (H1-Architect).*
	Bring daylight to the internal spaces and corridors	*'As you can see in H2 Hospital, particularly it's a very long building. From one end to another is about... how many kilometres something. So, **if you don't introduce those courtyards, it'll be like a long continuous walkway, no break, no light**' - (H2-Architect).* *'... **we don't want it to be too enclosed, that's why we introduced the courtyard**. So, in a way, as I said just now, this courtyard came into the picture because of the necessity - (H2-Architect).*

Table 3: Daylighting in the internal spaces of the hospital

H1 - Cafeteria	H2 – Waiting area	H3– Corridor
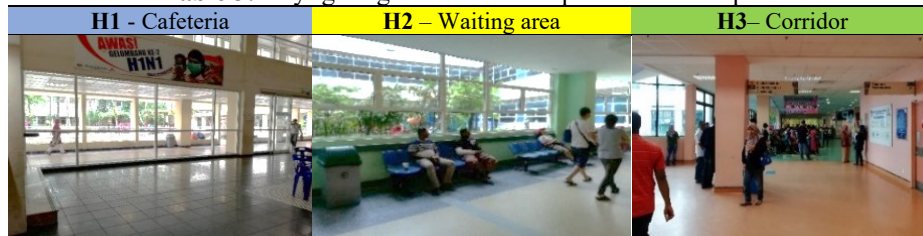
This study corresponds to the previous study which suggested that adequate opening to allow daylighting into the wards, rooms, corridors, and air wells can sway the spread of infectious diseases in the hospital (Emmanuel et al., 2020). Muhamad et al. (2022) also highlighted that daylighting in the hospital can improve the inpatient's well-being and hasten their recovery process. Another recent study suggested that a grid courtyard-type arrangement to helps to reduce the energy consumption to run the hospital building (Shi et al., 2021).

ii) Ventilation strategy
According to the architects interviewed, courtyards were used in hospital planning to ventilate internal spaces such as corridors and other hospital spaces. (See Tables 4 and 5). This is consistent with the findings from a previous study that courtyards and atrium could promote daylighting and ventilation which lead to a reduction in energy consumption and a more efficient usage of electricity in hospital buildings (Mahmoud et al., 2019).

Table 4: Courtyards as ventilation strategy in a hospital building

H1 hospital	H2 hospital	H3 hospital
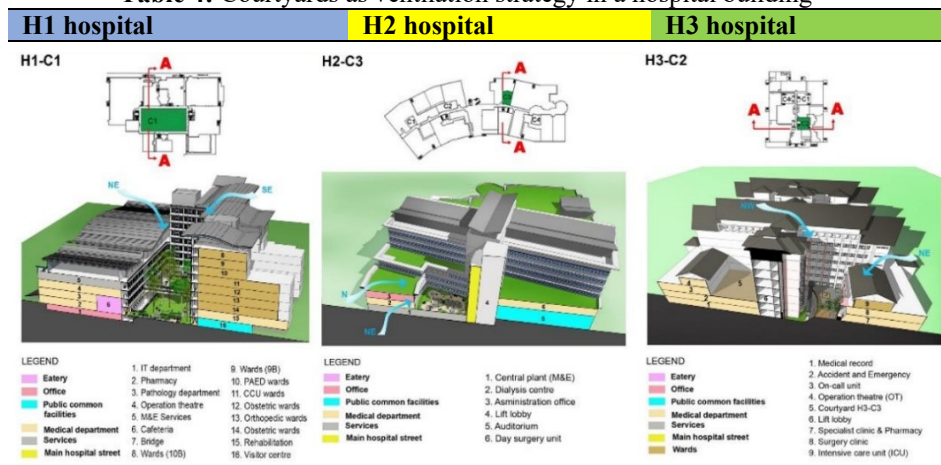
Source: Idris (2020), p.316.

Table 5: Key issues related to the ventilation strategy.

VENTILATION STRATEGY	The necessity to ventilate the corridor	*'The design brief [referring to the MOH brief] has not changed since the old time. So, their idea of the hospital is like this, so **whatever corridor they have, is supposed to be naturally ventilated**' - (H2-Architect).*
	Provide natural ventilation to the corridor	*'As you can see also, I think you've seen the building itself, the corridor or what we called the hospital streets are arranged around a courtyard. That also **provides natural ventilation to that corridor**' - (H1- Architect).* *'When we do a design like this, quite compact, then you realise **how to ventilate the corridor?** Imagine if I don't have any of this courtyard, how can I ventilate, right? You imagine all this thing, internal with no opening, of course, natural ventilation will be terrible, right? **It's out of necessity we need ventilation**' - (H2-Architect).*

iii) Access to nature

In addition to the daylighting and ventilation strategies, this study also found that the architects highlighted on the need to bring nature into the hospital environment. Through the interview, all architects were exposed to the concept of a healing environment where nature aids in their psychological healing process (See Table 6). This supports previous research showing that nature contact reduces stress and exalts positive moods among the patients and their family members (Sachs et al., 2020; Ulrich et al., 2020).

Table 6: Key issues related to access to nature.

ACCESS TO NATURE	Nature as a healing process	*'Um. I think the courtyard is not a new phenomenon or design element. It has been there for ages and centuries. But especially for the hospital, I think it contributes towards a healing **type of environment**. That is important in hospital design' - (H1-Architect).* *'...whether you are a patient or staff or visitor, you still want to be connected to the outdoor ... using a courtyard environment can **promote daylight into the indoor spaces, it is part of the healing process**' - (H2-Architect).* *'it can be more natural as I said... it has to feel... you see **when something is felt more natural, people tend to be more relaxed**' - (H3- Architect).*

The architects also pointed out the importance of creating a visual connection between the indoor and outdoor spaces. H1-architect highlighted his intentions to bring the outdoor in so that people from every floor either from the lobby, cafeteria, corridor, and bridge can appreciate and enjoy the soothing view of the garden within the hospital environment (See Figure 1). Patients exposed to the uncertainty in recovering from health-threatening problems could elevate their stress levels. Having contact with nature can facilitate recovery from stress and allow them to calm their mind and improve their mood while being hospitalised (Idris et al., 2021).

Figure 1: View from the bridge (left) and main lobby (right) in the H1 hospital.

Based on the observation, HCGs are often used as a place for the patient and family to meet and spend time outdoors (See Figure 2). As mentioned by the H1-architect, the idea of introducing HCG is to provide an alternative place for the patients or visitors to spend time outdoors while waiting for appointments with doctors or during visiting hours. The findings of this study suggest that HCG allows patients, family members and staff to get into the open air to refresh their minds and reduce stressful thoughts. HCG provides them with some opportunity for relief from the congested and sterile indoor hospital environment.

Figure 2: The HCG serves as an alternative place for users to spend time outdoors.

iv) Point of orientation

An important viewpoint stressed by the H1-architect on his initial idea is to make a courtyard garden as a point of orientation to help navigate and reorient hospital occupants. The wayfinding problem is a common issue found in large hospital complexes, people tend to be lost and wander around clueless due to insufficient

or inappropriate signage or map, or when they are unfamiliar with the hospital environment. Therefore, H1-architect's idea was to design a courtyard garden as a landmark that will guide the hospital users in their respective ways in the hospital (See Table 7).

Table 7: Key issues related to the point of orientation

POINT OF ORIENTATION	Oriented people navigation in the hospital	*'...So, what we wanted to do is **to have a centre that could reorient you...Whenever you are in the courtyard you know where you were supposed to be, so it becomes a point of orientation** and, at the same time, it provides the garden, the green space and it would be used'* - (H1-Architect).

Landscape architects' design intention

The following are some key findings from interviews with landscape architects about their design intentions for the HCG: (i) Forest-like garden concept; (ii) Natural and organic form instead of aesthetic appearance; (iii) An escape place for relieving stress and; (iv) A hang out space for socialisation

i) Forest-like garden concept

As previously discussed, architects are primarily concerned with the design functions and introduce courtyard gardens in hospital buildings for bringing natural daylight and ventilation into the building. Both landscape architects interviewed, on the other hand, stated that their design goals for the designated hospital courtyard garden are to create a "forest-like" environment. The H1-landscape architect asserted that his goal is to create a forest garden concept in this hospital environment by designing a free-flow-shaped organic garden. His concept for a forest garden was not an issue, and it was approved by the hospital manager and duly implemented. Similarly, the H2-landscape architect was motivated to realise a forest concept (i.e. tropical rainforest). His goal was to incorporate 60-70% garden work with plants in the H2-HCG, but he was unable to move ahead with the original concept due to hospital manager disagreement because they demand a hotel-like environment (See Table 8).

Table 8: Key issues related to the forest-like garden concept

FOREST-LIKE GARDEN CONCEPT	Forest	*'If I was given the chance to do it my way, you know, we **wanted to have a forest-like garden**... 'It was never accepted. They wanted it to be like a hotel environment at that time the tropical rainforest was not the thing they wanted'* - (H2-Landscape architect).

Other factors that prevented the landscape architect from executing their initial concept were loading issues and structural problems, which the engineers were concerned about.

ii) Natural and organic form instead of aesthetic appearance

H1 and H2 landscape architects realised the value of natural contact with one's well-being. The interview was associated with the richness of greenery and different types of vegetation provided in the courtyard gardens. The H1-landscape architect mentioned that he had the vision to create a more natural-looking informal garden that was not regimented. Similarly, the H2-landscape architect stated several times that the garden's appearance should be more natural and healing rather than focus on aesthetics (See Table 9:).

Table 9: Key issues related to the natural form

NATURAL FORM RATHER THAN AESTHETIC	Informal garden	*'I designed it to be **free and easy, move around**, ...**it's not regimented and controlled**, what you see is **everything complements with each other**' - (H1-Landscape architect).* *'**It should be more natural, it should be a healing environment, rather than aesthetic. In this case, it was more aesthetic**, if you look at this, this is part of, see, this circular thing, the design, the form itself is not natural' - (H2-Landscape architect).*

iii) An escape place for relieving stress

Both H1 and H2 landscape architects explained how viewing nature and greenery could boost positive moods and aid in the healing process. Furthermore, the H1-architect emphasised that a patient who is in contact with nature can benefit from its positive impact on their body's healing process through positive changes in mood, such as feeling calm, peaceful, and happy when they are in the garden, which subsequently encourages the body to heal. A recent study highlighted the impact of having a short break and escape from their indoor hospital environment for respite in the natural setting significantly reduce the stress among the healthcare staff at the time of the Covid-19 pandemic (Gola et al., 2021).

iv) A hang-out space for socialisation

Another intriguing point raised by the H1-landscape architect is the need for a place where people can hang out to socialise with others. Sitting and waiting in a sterile indoor hospital environment can be stressful for some people. H1-landscape architect designed an HCG that functioned as a focal point for patients, families and staff to gather and socialise (See Figure 3).

Figure 3: Social activities among the users in the H1 HCG

As stated unequivocally by the H1 landscape architects, the goal was to promote social interaction and improve the users' experiences by providing a variety of vegetation, a shaded sitting area and a water fountain. The layout of the HCG that connects to the adjacent indoor spaces, and appropriate landscape features are among the critical factors that make the HCG an attractive feature and encourage utilisation by its users.

DISCUSSION
Through the interview with the architects and landscape architects, two important key findings are summarised as follows:
- Courtyard Garden regarded as a passive architectural design strategy in Malaysian public hospitals
- The value and benefit of greenery and forest-like gardens in the healthcare setting.

Courtyard Garden regarded as a passive architectural design strategy in Malaysian public hospitals
This study found that the inclusion of a courtyard as a passive design strategy is a common practice in healthcare facilities. According to the interview, the integration of courtyards in the buildings is due to the need to avoid a deep plan nature of a large-scale hospital building. As part of the project requirements specified in the MOH brief, the architects mentioned the necessity of ventilating the corridor and optimising daylight penetration into the hospital building. Following the consideration of all of the site constraints, the architect sets out the overall site planning and design concept for a specific hospital project and includes the courtyard as part of the planning. The courtyard garden is a common passive design strategy in a variety of building categories, including educational, residential, commercial, and healthcare buildings. It not only helps to regulate air temperature and optimise microclimatic conditions, (Ghaffarianhoseini et al., 2019), but it also promotes better indoor thermal comfort (Nugroho et al., 2020), while lowering the overall energy consumption of the building (Shi et al., 2021).

The value and benefit of greenery and forest-like gardens in the healthcare setting.

While architects tend to focus more on passive design strategy, landscape architects pay more attention of creating a forest-like setting in the hospital environment. This study also found that both the architects and landscape architects the importance of access to nature and its impact on users' well-being (i.e. reduction of stress and mental fatigue). The HCG was found to be used in a lot of government hospital projects in Malaysia and courtyard gardens were still implemented in newly built hospital projects. However, the current HCG design has very few options of seating facilities, and lack of greenery and shades, which may affect users' experiences and level of comfort. If 80 percent of the HCG is made up of hardscape with very little vegetation, the air temperature in the HCG will rise, reducing thermal comfort. As a result, the HCG might be left unutilised and abandoned. Past studies have revealed the role of plants in lowering HCG temperature (Ghaffarianhoseini et al., 2019; Morakinyo et al., 2016). The best practice for an outdoor garden, according to Cooper Marcus and Sachs (2014), is to have a 70:30 ratio of plants to hardscape. Moreover, outdoor gardens with a lot of greenery were also reported to be more soothing and captivating to their users (Jiang et al., 2018; Sachs et al., 2020), which is consistent with the current findings.

CONCLUSION

This study has emphasised the significance of implementing the courtyard gardens as a passive design strategy to avoid a deep plan building and bring natural daylighting and ventilation into the hospital building. This study also suggested the necessity of providing natural greeneries (forest-like environment) in hospitals which can elevate positive moods and promote better feelings among the users. This study will be useful for future architects and landscape architects to take into consideration the important aspects of environmental and restorative during the design and planning stages of HCGs in hospitals. It will also be beneficial to the decision-makers to ponder the issues and challenges highlighted by the designers so that necessary improvements can be done to add to the design brief and make changes to the existing HCG.

ACKNOWLEDGEMENT

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GREEN INFRASTRUCTURE TRANSITIONAL MANAGEMENT SPHERE ANALYSIS OF POLICIES AND REGULATIONS IN KUALA LUMPUR, MALAYSIA

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Abstract

Kuala Lumpur (KL) is experiencing rapid development leading to urban green space fragmentation. Green infrastructure (GI) could be the answer to the fragmented green space issue. Nevertheless, how policies and legislations contribute to the spatial establishment of GI in KL remains unclear. Thus, the policies and regulations governing GI establishment in KL were examined in this study. A total of 77 records associated with policies and regulations that may contribute to GI spatially were reviewed. In order to evaluate the efficacy of the chosen articles, the transition management sphere analysis was applied. The study discovered that Malaysia is still lacking in GI policies and regulations. Furthermore, this study also highlighted different challenges and opportunities during optimising GI implementation in spatial design. The finding can be a reference for future policy and regulation establishment.

Keywords: Green space, green network, planning, transition management sphere analysis

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INTRODUCTION

As urbanisation increases, natural ecosystems and green spaces disappear, causing biodiversity loss (United Nations, 2019). Since 1990, almost 1.3 million kilometres of forests, mainly in tropical regions, have been destroyed (United Nations, 2019). Rasli et al. (2019) discovered that insufficient policy accelerated urban expansion and fragmented green areas in Kuala Lumpur (KL). The establishment of urban corridors may help reduce the impact of urban-induced forest fragmentation (Danjaji & Ariffin, 2017). Therefore, establishing green infrastructure (GI) may be a viable option.

The definitions of GI vary significantly depending on the focus of the document and researchers' work (Mell, 2016). To begin with, GI can be interpreted as strategic network planning of natural, semi-natural, and artificial spaces to conserve natural ecosystems that provide ecosystem services that benefit humans in rural or urban areas. The primary roles of GI are to preserve and link parks and other green areas for ecosystem services. Besides, GI protects and connects natural regions to promote biodiversity and mitigates habitat fragmentation by conserving flora, wildlife, natural processes, and ecosystems (Benedict & McMahon, 2006). Thus, the spatial arrangement of patches, corridors, and matrices comprising a landscape is essential in determining how functional flows and movement occur within the landscape (Forman, 1995) that supports a crucial ecological process, hence contributing to a sustainable landscape (Ahern, 1995; Shi & Qin, 2018). Uy and Nakagoshi (2008) denoted that linked green areas have higher ecological benefits than isolated green spaces.

Crammond & Carey (2017) stated that the policy is found in various forms of documents, discussions, and actions reported and observed formally and informally. Policies and procedures can lead to specific protocols, regulations, or developed standards (Stewart, 2014). Karuppannan et al. (2014) suggested that comprehensive acts, policies, and guidelines are necessary for urban wildlife protection. Hence, the following research question is addressed in this study: Do the policy and regulation contribute to KL's GI establishment via transition management sphere analysis? Although Malaysia has a green spaces policy and regulation, assessing if the policy and regulation are adequate to maintain and contribute to GI establishment via transition management sphere analysis is necessary.

STUDY METHOD

First, the related policies and regulations were identified by selecting articles related to GI. Table 1 lists the relevant documents: policies, plans, acts, guidelines, and non-governmental organisations (NGOs) plans or reports that contribute to GI planning and establishment. As GI-related documents were limited, this research also included draft reports.

Table 1: Type of policies and regulations

Level	Policies and Regulations
National	11th Malaysia Plan, National Landscape Policy, National Housing Policy, National Policy on Biological Diversity 2016-2025, National Green Technology Policy 2009, National Agro-Food Policy, National Forestry Policy, National Policy on Climate Change, National Sports Policy, National Tourism Policy 2020-2030, Low Carbon Cities Framework, Green Earth Programme, National Community Programme, Smart City Framework, National Urban Policy 2, National Physical Pan 3, National Urban Community Garden Policy, National Policy on the Environment
Structure & Local Plans	KL Structure Plan 2020, KL City Plan, KL Low Carbon Society Blueprint 2030, Strategic Plan KL 2010-2020, Draft KL Development Control Plan 2008, Draft KL Structure Plan 2040
Guidelines	Urban Stormwater Management Manual for Malaysia, Planning KL Guideline for Building Setback in Landed Housing (Bungalow, Semi detach or Terrace), KL Planning Guideline for Low-Density Housing Development (Bukit Tunku, Taman Duta, Bukit Persekutuan Dan Bukit Damansara), KL Planning Guideline for Submission of Planning Approval Document Digitally, Planning Guideline for Green Neighbourhood, Planning Guideline for Identification of Brownfield Development, Planning Guideline for Healthy Walkable City, Planning Guideline for Community Facilities, Planning Guideline for Theme Park, Planning Guideline for Golf, Planning Guideline For Preservation and Development of Environmental Sensitive Area, Planning Guideline For Housing, Planning Guideline Rooftop Garden, Draft Planning Guideline for Open Space & Recreation, Planning Guideline for Carpark, Planning Guideline for Old Folks Physical, Planning Guideline Erosion and Sediment Control in Malaysia, Landscape Masterplan Manual, National Landscape Guideline, Wayleave for Electricity Supply Line, Planning Guideline for Commercial Area, Planning Guideline for Transport Oriented Development, Planning Guideline for Strata Community Scheme, Planning Guideline for Mix Used (Vertical) in Commercial Zone, Planning Guideline for Infrastructure & Utility, Planning Guideline for Utility Infrastructure,
Acts	Act 172 Town & Country Planning Act 1976, Act 171 Local Government Act 1976, Act 133, Street, Drainage & Building Act 1976, Act 313 National Forestry Act 1984, Act 716 Wildlife Conservation Act 2010, Act 226 National Park Act 1980, Act 267 Federal Territory (Planning) Act 1982, Act 645 National Heritage Act 2005, Act 418 Water Act 1920, Act 56 National Land Code 1965
NGOs Plans/Reports	Landscape Architect Agenda, Green Transformation Programme – Think City, MyCrest, Green Building Index

The study was analysed and synthesised using the thematic approach Braun and Clarke (2006). Figure 1 shows the study flow that applies theoretical thematic analysis using Atlas.ti to code GI and transition management spheres.
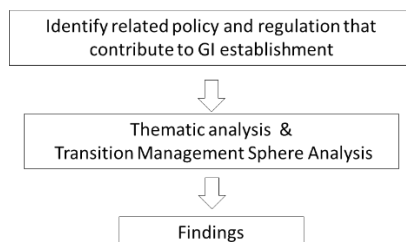
Figure 1: Study flow

Firstly, identification of related policies and regulations. Second, the coding process was undertaken according to the code group and theme ideas presented in Table 2. Saldana (2015) defined a code as a term or phrase summarising a language-based or visual data segment. The coding was done according to the title of sections or subsections containing ideas or themes, as shown in Table 2. According to Loorbach and Rotmans (2010), the general concept of transition management sphere analysis is four distinct forms of governance behaviour that can be explained in Table 2. During the analysis phase, the codes were linked together and explained. Code co-occurrences and Sankey diagrams from Atlas.ti were used to explain the relationship between the findings.

Table 2: List of code groups and ideas for themes

Code group	Ideas for themes
Green infrastructure	Green infrastructure
Patch - hub/space	Green space, park, national park etc.
Corridor - network	River, pedestrian, railway etc.
Component	Tree, green building, hardscape etc.
Ambiguous	Environment, landscape, natural resources etc.
Strategic: Practices at the level of a societal system that considers a long-term perspective is related to the structuring of a dynamic societal issue and the creation of alternate futures	Vision, objectives, goals, targets, green space definitions
Tactical: Operations at the level of subsystems linked to the creation and breakdown of system structures	Supporting strategies alliances, engagement, institutions, regulation, physical infrastructures, financial infrastructures, integration with other influential policies, principles, measures

| Operational: Activities relating to short-term and day-to-day choices and behaviour. At this stage, actors either reconstruct system structures or opt to restructure or modify them | Instruments and delivery mechanisms, responsibility, timing and funding, resources for implementation, technical skills, action plan |
| Reflexive: Activities related to the assessment of the current condition at different stages and their interrelation of a misfit by structured evaluation, research, social problems are continually reformulated and updated | Monitoring, evaluation, processes, indicators and targets, peer-to-peer policy learning |

*Note. Adapted from Friese et al. (2018) and Bush (2020)

FINDINGS AND DISCUSSION
Green Infrastructure with Policy and Regulation
Figure 2 represents a Sankey diagram that shows the disparity across the policies and regulations with GI. Most of the policies and regulations contributed to patch (n = 285), followed by corridor (n = 101), component (n = 94), ambiguous (n = 43), and finally GI (n = 6). The next section will address how policies and regulations contribute to GI establishment.
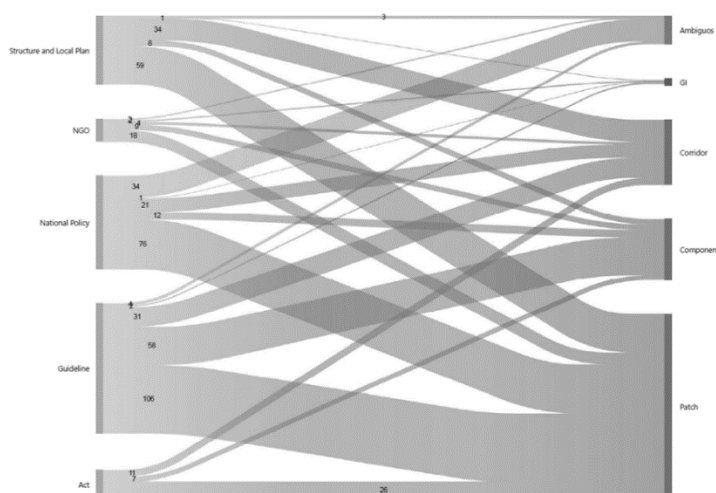
Figure 2: Contributions of the policies and regulations towards GI

National Policy and Green Infrastructure
The national-level policy contributes mostly to patch (n = 76), followed by corridor (n = 21), component (n = 12) and GI (n = 1). At the national level, the National Landscape Policy (NLP) defines GI as a network of open spaces, green areas, parks, wetlands, natural habitats, and natural landscapes for ecosystem

preservation. Therefore, the definition is compatible with the landscape ecology principle by having a patch and corridor to protect the ecosystem. Although GI is mentioned in Kuala Lumpur City Plan 2020 (KLCP 2020), it focuses more on green technology and stormwater. Thus, clearly, GI is not covered in the Malaysia acts, structures, and local plans. Nevertheless, a progressive effort is ongoing to connect the green area and blue corridor as urban ecological nodes in KL structural and local plan. National policy (n = 34) has the most ambiguous codes, such as environment, natural resources, or landscape. Although national policy uses ambiguous terms, other national plans can still adhere to it. Nonetheless, having specific terms such as GI for top-down application and execution for detailed policy and regulation is better.

In National Urban Policy 2 (NUP 2) Objective 5.5, the government strives to increase the size, quality, and quantity of open space by acknowledging agency responsible and achievement indicators. Furthermore, NUP 2 defined green space as an area covered by natural plants or planted. The definition of green space provides more opportunities than open space to establish GI. Nevertheless, no specific act protects green spaces, except for the act that covers forest reserve and open space. On the other hand, in NPP 3, a greenfield is defined as an area with forest and productive agricultural area that also includes a green network in the urban area. Nonetheless, no consensus is available in the concept of green space whether to include only public places or private green areas (Nor Akmar et al., 2011). Therefore, the exact definition of green space and GI elements should be proposed in future.

Guidelines and Green Infrastructure
Unfortunately, no specific guideline is available for GI in Malaysia. Nevertheless, the available guideline covers patch, corridor and elements of GI. Guidelines provided most of the contribution to GI establishment (n = 201), followed by the national policy (n = 144), structures and local plans (n = 105), acts (n = 44), NGO guidelines (n = 35) and GI (n = 2). Patch (n = 106) and component (n = 58) is prioritised by the guideline more than corridor (n = 31). These findings demonstrate that Malaysia has numerous guidelines for GI that support the national policy, structure, and local plans.

PLANMalaysia has produced significant guidelines to preserve and conserve the environment. For example, the Draft Planning Standard Guideline for Open Space and Recreation by PLANMalaysia derives its power from Act 172. It provides seven hierarchies of open space: national park, regional park, town park, local park, neighbourhood park, playfield, and play lot. Besides, the guideline sets a 10% for open spaces for any development application in peninsular Malaysia. In line with the Draft Kuala Lumpur Structure Plan 2040 (Draft KLSP 2040), Kuala Lumpur City Hall (KLCH) constantly updates and provides more specific guidelines, such as management of shading tree

guidelines, that suits KL locally in terms of supporting other planning guidelines by PLANMalaysia. Nonetheless, GI does not solely depend on green space as it also needs corridors and the elements in the patch itself. Hence, a need for a specific GI guideline exists.

Acts and Green Infrastructure

No act covers GI as a holistic entity in Malaysia. The act only mentioned patch (n = 26), corridor (n = 11), and component (n = 7). Hence, how can GI connectivity be established if no such act exists? Thus, the GI act can be proposed to protect GI as a holistic entity instead of preserving only part or parcel of green spaces. Moreover, there are differences in execution in different local authorities. As for KL, the open spaces policy under the Federal Territory Act 1982 (Act 267) is almost similar to Act 172 except for some addition. Act 267 comprise more details regarding the commissioner's power and tree girth size. The difference is due to subsection 35G in Act 172. The local planning authority may amend or revoke a tree preservation order, including granting planning permission under subsection 22(3) regarding an area where a Tree Preservation Order (TPO) is for the time being in force.

Nevertheless, most experts believe that Malaysia's TPO execution is still inadequate and ineffective (Hasan et al., 2016). Mohamed Sukri et al. (2019) found that most construction industry respondents have not read the TPO (Act 172) document. Furthermore, Kanniah (2017) mentioned that monitoring the existence and disappearance of trees is difficult as less comprehensive inventory information is available on the existing trees.

Local Government Act 1976 (Act 171) provides local authority responsible for land planning and development control, including open space. In Act 172, the local government is responsible for planning and managing public space that covers any open space, parking place, garden, recreation, and pleasure ground or square. Street, Drainage, and Building Act 1974 (Act 133) help local governments to perform their functions under Act 171. The act covers streets with any road, square, footway, passage, or service road. Conclusively, Act 172, 171, 267 and 133 can contribute to GI establishment in the urban area by protecting open spaces and trees with proper amendment and execution.

As for a corridor, the Waters Act 1920 (Act 148) defines a river as a tributary of a river and any other stream or natural watercourse. The National Heritage Act of 2005 (Act 645) included provisions for the protection and preservation of national heritage, which includes natural heritage such as rivers. Thus, rivers with heritage significance can be part of the GI corridor with the protection of this act. Nevertheless, the acts also depend on the execution of the related plan and guidelines of the corresponding agency and local authority.

Nonetheless, a discrepancy exists in the National Forestry Act 1984 (Act 313). For instance, economic growth takes precedence when economic

development and environmental protection clash. Cutting down trees is permissible if the land is to be used for a more economically valuable purpose than the forest's current use (Kanniah, 2017). The National Land Code authorises public authorities to revoke reserved and protected public parks and recreational areas (Kanniah, 2017). Thus, policymakers should be aware of this issue and amend these sections. As observed, the act in Malaysia is primarily concerned with patches. Hence, according to the landscape ecology principle, a holistic GI act should encompass patches and corridors to ensure sustainable development.

Structure, Local Plan and Green Infrastructure

Structure and local plan discuss primarily on patch (n = 55), followed by corridor (n = 33), component (n = 8), ambiguous (n = 3), and finally GI (n = 1). The KL city aspires to be a world-class city. Thus, KL tries to support this vision by having strategic, tactical, operational and reflexive measures. In order to achieve the vision, KLCH developed its open space hierarchy based on PLANMalaysia open space planning guideline. Besides, KLCH protects green space by conserving Environmental Sensitive Areas, forests, civic spaces, neighbourhood areas, and green networks. In addition, KLCH also protects more green spaces by creating creative policies such as imposing green roofs and derelict land utilisation. Spaces underneath elevated KL highways can be incorporated as part of GI (Mohamed Anuar & Abdullah, 2020). In summary, KLCH is performing a great job in planning the policy of patches. However, there is a need for more policies and guidelines on GI.

On the other hand, the Kuala Lumpur Low Carbon Society Blueprint 2030 (KLLCSB 2030) suggested improving existing policies by-laws and existing open space policy. In this case, open space in KL is constantly improving from time to time. For instance, in the Draft KLSP 2040, the open space hierarchy includes pocket parks and linear corridors. Furthermore, Draft KLSP 2040 supports GI establishment by having a green and blue network that connects the green area and blue corridor as urban ecological nodes. Other potential GI elements that can contribute to GI establishment must be assessed to establish GI.

Non-Governmental Organisations (NGOs) Guidelines and Reports

Although NGOs pay less attention to GI, patch (n = 18), component (n = 9), corridor (n = 4) and GI (n = 2), NGOs are known to support government initiatives. Norhanis et al. (2012) stated that the crucial environmental protection aspects in Green Building Index (GBI) are to conserve and maximise existing natural areas to promote habitat maintenance and restoration. Although GBI has provided eight contexts, vertical greenery is only found in the historic building part. Despite the fact that GBI rates mainly on the building, this applaudable achievement might be a role model for GI planning. Hence, a GI index that is governed by NGOs is suggested. Nor Akmar et al. (2011) posited that although

public sectors, such as federal and municipal levels, continue to guide policy and management, private actors (corporations and NGOs) have become increasingly prominent in green space governance.

Furthermore, corporate social responsibility (CSR) projects such as Adopt-A-Park Programme has become an innovative approach by the KLCH (Abdullah et al., 2020), while Landscape Malaysia planted 19,000 trees in KL (Kanniah, 2017). The Landscape Architect Agenda by the Institute of Landscape Architects Malaysia (ILAM) emphasises enhancing a conducive housing environment by creating blue-green infrastructure. Furthermore, Think City created a Green Transformation Programme that encourages green roofs and vertical greenery in the historic core of KL. Thus, NGOs play a crucial role in the knowledge transfer and implementation of GI.

Green Infrastructure and Transition Management Sphere Analysis
The Sankey diagram in Figure 3 provides an overview of GI and transition management spheres. The transition management spheres that contributes the most to GI is tactical (n = 317), followed by operational (n = 205), strategic (n = 138), and finally reflexive (n = 84). As expected, patch (n = 402) is the most crucial element of Malaysia policy and regulation, followed by corridor (n = 148), component (n = 124), ambiguous (n = 61), and lastly, GI (n = 9).
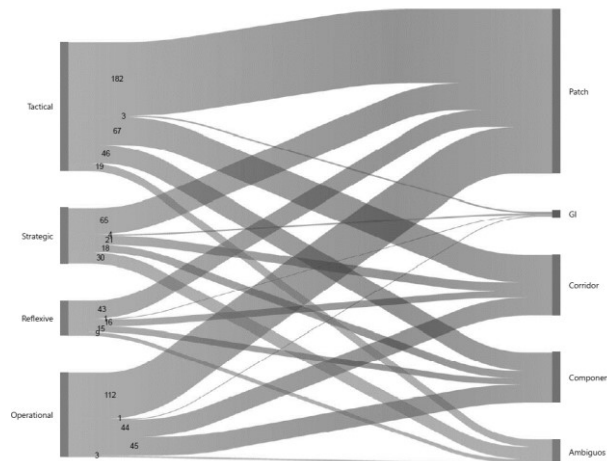
Figure 3: Contributions of transition management sphere towards GI

In NLP, Thrust 3 explain how strategic, tactical, operational, and reflexive spheres create functional and sustainable GI. For example, the implementing agency is allocated in Strategy 3.1. In terms of the reflexive measure, providing adequate quality GI to international standards might not be sufficient. Hence, a GI index or indicator might provide better monitoring. Moreover, the most

beautiful garden nation index was proposed to measure landscape quality in development areas.

Operationally, the quality of planning officers should be strengthened, with a focus on staff competence, procedures, and public relations ability (Mohd et al., 2011). Furthermore, technical departments need extra time to provide their comments (Mohd et al., 2011). Lack of sufficient information and competent experts in developing policies may create doubts about the validity of the policies (Mohd et al., 2009). For example, awareness campaigns, public dialogues, and in-house training are essential to publicise the TPO (Act 172), TPO Guidelines and TPO Rules (Sukri et al., 2020). The National Landscape Guideline provides a holistic guideline operationally, whereas the Landscape Masterplan Manual issues planning guidelines for local municipalities. Draft KLSP 2040 also mentioned operational measures on establishing public and private partnerships public trust for green areas.

In terms of reflexive measures, Draft KLSP 2040 proposed Kuala Lumpur Urban Observatory (KLUO) to monitor urban sustainability. Besides, KLUO also provides technical input and reporting on the sustainability status of KL. Moreover, the city biodiversity index was proposed in Draft KLSP 2020 for habitat monitoring purposes in the reflexive sphere. Nevertheless, indicators alone will not guarantee better reflective practices unless an assessment by a particular organisation supports the indicators (Bush, 2020). Thus, an organisation in charge of the monitoring should be set up. Another reason for reflexive shortcoming is the organisation's fear of failure and short timelines for evaluating the performance of installations and innovations (Bush, 2020). Hence, Malaysian policymakers should be aware of these shortcomings and learn how to manage them.

The monitoring framework should consider issues such as coordination, institutional responsibilities and links, indicators, and timeframes to create a system for evaluating performance versus goals (Yaakup et al., 2009). In this respect, the policies are part of an integrated government effort that creates a coordinated public policy framework (Marzukhi et al., 2012). The legislative framework should provide for the development process requirements, monitoring, and enforcement (Othman et al., 2014). The refinement and enhancement of the Malaysian Urban-Rural National Indicators Network on Sustainable Development (MURNInets) would provide a more realistic assessment of Malaysia's progress towards sustainable development (Shamsuddin, 2013). Thus, GI may be included as an indicator in MURNInets.

Overall, the national level policy should have GI planning policy supported by structural and local plans, guidelines, NGOs, and acts with logical monitoring and enforcement. According to Kanniah (2017), a unit should be established to coordinate the monitoring and administration of public and private green spaces in KL for a more rapid and effective service delivery process.

CONCLUSION

The study highlighted that the Malaysian government intends to protect the environment. Unfortunately, Malaysia's policies are still lacking in GI establishment as most of the policies contribute to patches. Resultantly, the limitations may cause the fragmentation of green areas. Strategically, the policy should be included at the national level to ensure that other policies and regulations can adhere to it through tactical, operational, and reflexive measures. Moreover, GI reflexive measures must be established and executed to monitor and update the GI status continuously.

In this case, KLCH developed an impressive policy in adhering to the national policies in terms of green spaces planning. Besides, KLCH even created detailed guidelines for tactical, operational, and reflexive purposes. Nonetheless, improvements can be made by developing a GI policy. Finally, the policy and regulation need to be improved to plan and establish GI. The government and NGOs should collaborate to address these issues. Gaps in strategic, tactical, operational, and reflexive spheres should be addressed accordingly to produce a holistic plan. Finally, the policy and regulation need to be improved in order to plan and establish GI. The government and NGOs should collaborate to address these issues. Any gaps in strategic, tactical, operational, and reflexive spheres should be addressed accordingly to have a holistic plan. Policy planning to safeguard GI from changes requires long-term protection goals, quantifiable policy objectives, and practical and adaptive policy instruments to detect and mitigate predicted effects on ecosystem services (McWilliam et al., 2015).

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HOW MUCH DOES AN AFFORDABLE HOUSE COST TO BE PAID BY YOUNG PROFESSIONALS IN GREATER KL, MALAYSIA?

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Abstract

Affordability of housing has been a hot topic among various socioeconomic groups. Surprisingly, given the current situation, the majority of the young generation is negatively affected by this stressful issue. This study, therefore, focuses on young professional groups from the built environment profession, namely, the engineer, architect, urban planner, and quantity surveyor. These professional groups also earn an income between B40, M40 and T20. Two research objectives were composed in this study: (1) To measure the monthly affordable housing cost and (2) To define affordable housing types by different household income groups amongst young professional based on the residual income model (RIM), which is used to measure housing affordability. The surveys were distributed amongst 341 respondents selected through stratified random sampling. The findings have revealed that B40 can only bear a monthly housing' costs not exceeding MYR 728, followed by M40 and T20 around MYR 2503 and MYR 6159, respectively. Hence, the B40 group had lesser house option types, i.e., around ten house types compared to M40 and T20.

Keywords: Affordable house cost; Housing affordability; Young professional, Residual income model; Cost of Living

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INTRODUCTION

What is the affordable housing price in Greater KL? Arguably there is no standard pricing to indicate affordable house price. Local governments employ a variety of criteria to determine what constitutes a reasonable house price. For example, PR1MA charges between MYR 100,000 and MYR 400,000 for households earning between MYR 2,500 and MYR 7,500, and then the income eligibility is raised to MYR 15,000 after that (PR1MA, n.d). Meanwhile, the Department of State Housing defines an affordable house as one that is sold for less than MYR 300,000 and has a monthly household income of less than MYR 5000. (Ministry of Federal Territory and Urban Well-being, 2013). Accordingly, houses in the *Rumah Mampu Milik Wilayah Persekutuan* (Rumah WIP) project are priced at MYR 300,000 and below, assuming a household income of MYR 10,000 (Ministry of Federal Territory and Urban Well-being, 2013). Notably, there is the National Affordable Housing Policy, which is a sub-policy of the National Housing Policy 2018-2025. Unveil by the Ministry of Housing and Local Government, this sub-policy aims to highlight the housing affordability issues and most importantly to provide details for the ceiling price of affordable houses. Therefore, the policy has set the price of affordable houses to MYR 300,000, however, the actual selling price will differ across different states based on the median household income and construction cost in each area. The policy has set the affordable house price in Kuala Lumpur at MYR 326,628 with a median household income of MYR 9,073. This is followed by Putrajaya at around MYR 297,900, while the affordable house price in Selangor is between MYR 184,284 and MYR 267,948 with a median household income between MYR 5,119 and MYR 7,443 (Department of Statistics, Malaysia, 2020).

LITERATURE REVIEW
Residual Income Model

Measuring housing affordability should not merely be weighed in housing cost as applied in the price-to-income ratio (PIR) approach, but also to take into account basic human needs- to ensure the household well-being and sustainability (Sohaimi, 2018). The RIM differs from PIR, as PIR indicates the ratio based on the median housing prices over the annual household income (Osman et.al, 2020). The younger generation make their basic daily expenses including transportation and education cost as their first claim on household income. As a result, the RIM is used in this study since it considers the sufficiency for other home essentials after removing the housing cost (Milligan, 2003). Figure 1.0 shows that in order to achieve housing affordability, monthly household income (residual income) must be positive after deducting monthly housing costs and monthly household expenditures, whereas unaffordability is the opposite. A positive proportion of

residual income indicates that a household's income is sufficient to cover housing costs and other expenses.

Figure 1: The Theoretical Framework of RIM
Source: (Stone, 2006)

The reasons for adopting the RIM are, first, it assesses the household living standards (Nwuba, 2015; Stone, 2006). By employing the RIM, the affordability considerations are expanded to include household income, housing costs, and household expenditure, with a household's size and composition having a direct impact on household expenditure. Housing affordability is determined not only by the link between housing costs and income, but also by the integration of other factors. For example, in a prior study, it is also expressed in terms of housing quality and location (Shuid, 2016) as well as the interpretation of socioeconomic and development environments (Zainon et al., 2017). Overall, the RIM is an alternative to the housing cost approach (PIR), as it considers both aspects, i.e., the housing cost and non-housing cost simultaneously.

Household Income
Most previous researchers believe that household income is a key component of home affordability (Yates et al., 2007) and a ubiquitous factor in measuring affordability (Ismail et al., 2015; Bujang et al., 2010; Md. Sani, 2015[a,b]). In Malaysia's perspective, 'household income' refers to a household as an individual or a group either related or unrelated who live together, as well as share food and other necessities (Khazanah Research Institute (KRI), 2018). However, according to Arimah (1997), only the income of spouses (if both are working) is considered family income, and the income of adult children is not included because they will leave the house. Accordingly, this study employs Arimah's view on household income. The graduate traces report (2011-2016) is reviewed as stated in Figure 2.0, in which the information of six graduate traces reports have been compiled. Overall, it proved that young graduates earned below the standard income. Most graduates received an income in the range of MYR 1,501-MYR 2,500. Between 2011 and 2013, the salary range of MYR 1,501-MYR 2,000 had the greatest percentage (20.7% - 22.1%). However, the percentage of this income range has shrunk in the following years. Instead, for 2014-2016, the income range of MYR 2001-MYR 2500 was the greatest. Another trend that existed referred to the percentage for the income range of MYR 5001 and above, which had been recorded to have increased during 2011 until 2016. However, this has only contributed to the lowest percentage (1.2%-2.8%) amongst the other

income ranges. The fact that current graduates earn less than MYR 1000 is also a source of concern. Despite the percentage fluctuations between 2011 and 2016, the cost of living continues to rise year after year. The MYR 1,000 wage range not only falls short of housing affordability, but persons in this income bracket will also struggle to satisfy other family essentials.

	1000 & below	1001-1500	1501-2000	2001-2500	2501-3000	3001-5000	5001 & above
2011	15.9	14.7	22.1	19.7	13.1	13.3	1.2
2012	18.5	14.7	22.1	19.5	12.5	11.5	1.3
2013	17	14.6	20.7	20.2	14.1	11.8	1.5
2014	16.3	15.6	20.2	21	14.8	10.5	2.1
2015	13.9	12.3	15.8	18.6	17	20	2.5
2016	14.3	15.1	18.5	20.7	15.3	13.2	2.8
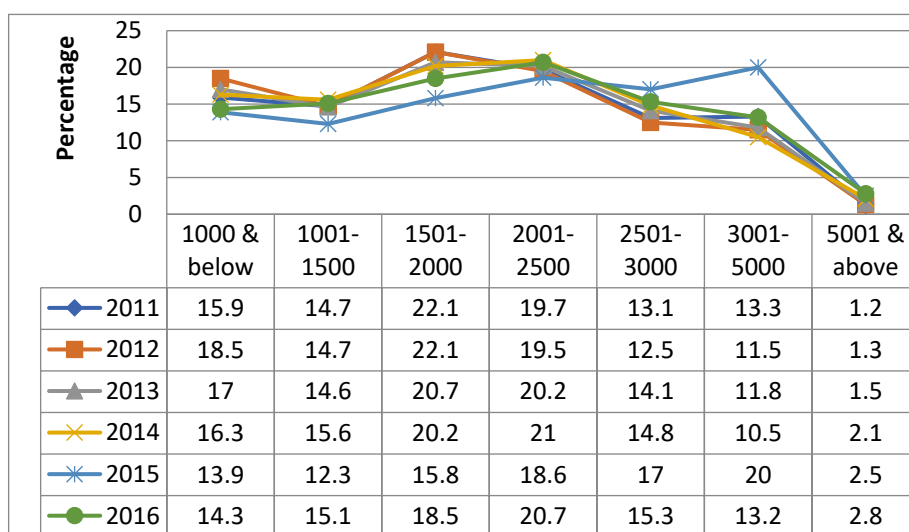
Figure 2: Income Trend among Malaysian Graduates from Year 2011 until 2016
Source: (Ministry of Higher Education Malaysia, 2012-2017)

Household expenditure
Housing expenditure is a variable to housing affordability since the household expenditure pattern is linked to budgetary capability for other consumption, and this is an agreed fact by most prior studies (Ismail, et al., 2015; Md Sani, 2015$_b$). In this study, the categories of expenditures have been obtained from the Department of Statistics (2017) and the Central Bank of Malaysia (2016), which comprise food and beverage (non-alcoholic & alcohol), tobacco, clothing and footwear, utilities (water, electricity, gas), household maintenance (decoration and hardware), health, communication, entertainment (recreation and culture service), education, dining outside (restaurant and hotel), as well as miscellaneous goods and services. However, the household expenditure attributes are not discussed in detail, as this study specifically focus on identifying the affordable housing cost. Correspondingly, the monthly housing cost has been considered as a financial stress and is ubiquitous in determining the housing affordability. As Zainon et al. (2017) has stressed, house price is one of the decision attributes for homeownership preferences. Most Malaysians cannot afford to own a newly launched residential unit, as the realistic median house

price is MYR 793,000 in current market but ironically the maximum affordable price is MYR 454,000 (Ganeshwaran, 2019). In addition, since 2014 in Kuala Lumpur, there is an absence of houses that are launched below MYR 250,000, and instead there is a massive launched in the range of MYR 500,000 - MYR 1M (KRI, 2015). This is also proven by the Malaysian House Price Index (MHPI) as shown in Figure 3.0 (a), which exhibits the prolonged rise at a gradual trend. The MHPI stood at 100.0 points in 2010, increased by 1.9% on an annual basis (193.7 point at year 2018), and in 2010 was reported as the lowest. However, Kuala Lumpur recorded a decreased by 0.4% to MYR 785,000 (2018: MYR 788,000) compared to other states such as Selangor, Johor and Penang who reported moderate annual growth (see Figure 3.0 (b)). Overall, the house price shows prolonged increases and albeit the house price in Kuala Lumpur that indicates shrinkage with MHPI 9.1 points in 2014, and a decrease to 0.4 on two conservative years- 2018-2019, the actual house price in Kuala Lumpur especially for those that are newly launched is considered as unaffordable for the young group of adults.

(a) (b)
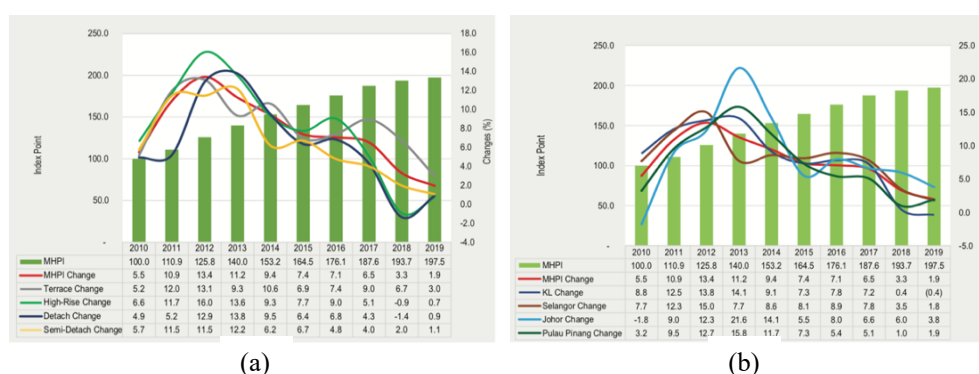
Figure 3: MHPI-Point and Annual Changes by Types (a) and Changes by Major States (b), Year 2010-2019.
Source: (Valuation and Property Service Department, 2019)

METHODOLOGY

The unit of analysis of this study refers to the young professional group. The data were collected through a survey, through professional bodies from the field of the built environment, namely, the Institution of Engineers Malaysia (IEM), Malaysian Institute of Architects (MIA), Malaysian Institute of Planners (MIP) and the Board of Quantity Surveyor Malaysia (BQSM) for the engineer, architect, urban planner and quantity surveyor (QS), respectively. The young professional criteria are (i) being between the ages of 25 and 35; (ii) having a Bachelor's degree; (iii) working or living in Greater Kuala Lumpur; (iv)profession as an

engineer, architect, urban planner, or QS. Meanwhile, fieldwork was conducted utilising self-administered questionnaires based on 341 out of 372 returned surveys. Because there were four separate groups in this study, a probability sample with stratified random sampling was used, and then simple random sampling was chosen from each stratum. The study region is Greater KL, which was chosen by young working groups to include professionals and business centres (Zyed, 2014). This study used a deductive approach because it is based on the RIM, which uses the equation below to determine housing affordability.

$$HA = MON.HI – (MON.HE + MON.TC + MON.HC)$$
$$= \pm \text{ balance of HI}$$

Note:

HA: Housing affordability   MON.TC: Monthly transportation cost
MON.HI: Monthly household income   MON.HC: Monthly housing cost
MON.HE: Monthly household expenditure

Figure 4: The Conceptual Framework of The Study
Source: (The author, and adapted Stone, 2006: Md Sani, 2015b)

RESULT AND ANALYSIS

By revealing the number of respondents by gender, age, and marital status, the respondent's background was descriptively stated. The total sample size was 341 (n= 341), and the data distribution between genders among the professionals appeared to be about equal, with 178 males and 163 females, respectively. The cohorts aged 25-28 had the highest number of responses (143), followed by cohorts aged 29-32 (123), and cohorts aged 33-35 (barely a fourth of the sample size) (75 respondents). The data then revealed that married respondents exceeded single respondents by only 18 people, three of whom were divorcees.

Table 1: Respondents' Background

Gender		Age			Marital Status		
Male	Female	25-28	29-32	33-35	Single	Married	Divorced
178	163	143	123	75	160	178	3

Figure 5.0 illustrates the varying housing cost in three different ownership types, namely, homeownership, rent, and parental home. Notably, most of the young groups bore a housing cost that ranged from MYR 500 and below, about 93 respondents under the rent type being the highest (84 respondents). Housing cost was the second highest with a zero range, as 89 respondents lived with their parents. Meanwhile, the cost of home ownership ranged from MYR 501 to MYR 2000, with the higher the cost, the fewer respondents who could afford it.
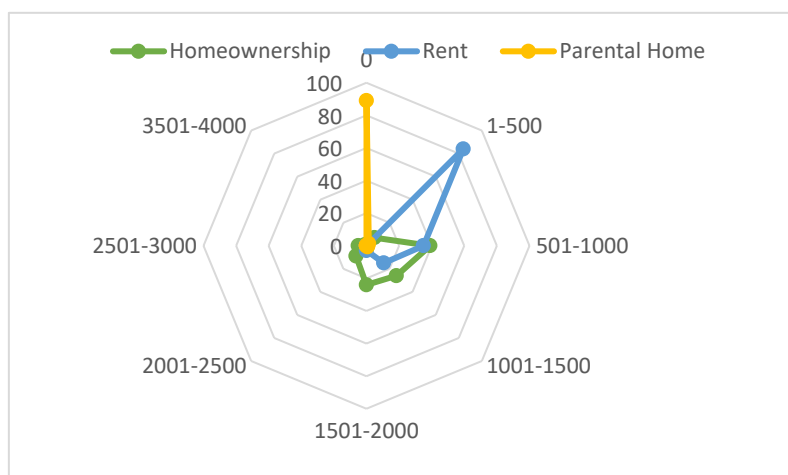
Figure 5: Housing cost for different ownership types

Table 2.0 presents the residual income after household expenditure has been deducted from the household income but excluding the housing cost for three of the young professionals' income groups. The result showed that the B40 group was the most affected by housing affordability issues, as they bore monthly housing costs not exceeding MYR 728. Meanwhile M40 and T20 were more privileged as they had a residual income of about MYR 2503 and MYR 6159, respectively, as presented in Table 2.0.

Table 2: The Residual Income for Three Income Groups

Groups	Monthly household income	Monthly household expenditure (exclude housing cost)	Residual Income
B40	2763	2035	728
M40	5883	3380	2503
T20	10650	4491	6159

Figure 6.0 shows the correlations between monthly housing costs for various dwelling types and household income, as well as expenditure, for three categories. The dwelling price was collected from the Property Market Report (PMR) of 2017 (issued by the Valuation and Property Services Department (Napic), 2018), while household income and spending were obtained through the survey conducted for this study. The house price from PMR 2017 was calculated using the property calculator with an assumed interest rate of 4.5 percent, a loan margin of 90 percent, and a loan tenure of 35 years, resulting in a simulation of monthly housing costs. The chart also displays the two monthly home cost values

for each house type, which represent the minimum and maximum monthly housing cost (instalment). The affordability issue clearly impacted the B40 group of young professionals the most, since their household income and expenditure margins were very tight, leaving them with little residual cash to pay for housing costs. Meanwhile, as compared to B40, M40 appeared to have more housing options, but had fewer than T20. The table shows that the B40 group is more likely to struggle to satisfy their basic needs since their household income is insufficient to cover all of their expenses, forcing them to set aside housing costs. Then, with a residual income of MYR 728, the B40 group might not be limited to renting, but rather to owning.
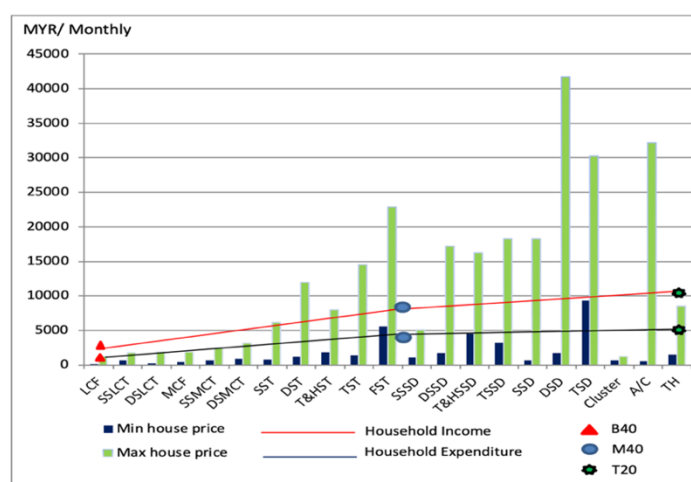
Figure 6: The Relationships Between Monthly Housing Cost, Household Income, and Expenditure
Source: (The author, and Napic, 2018)

LCF	: Low-cost flat	DST	: Double storey terrace	TSSD	: Three storey semi-detach
SSLCT	: Single storey low-cost terrace	T&HST	: Two & a half storey terrace	SSD	: Single storey detach
DSLCT	: Double storey low-cost terrace	TST	: Three storeys terrace	DSD	: Double storeys detach
MCF	: Medium cost flat	FST	: Four storeys terrace	TSD	: Three storeys detach
SSMCT	: Single storey medium cost terrace	SSSD	: Single storey semi-detach	CLUSTER	: Cluster house
DSMCT	: Double storey medium cost terrace	DSSD	: Double storey semi-detach	A/C	: Apartment/Condominium
SST	: Single storey terrace	T&HSSD	: Two & a half storey semi-detach	TH	: Town house

Note: House Type

This study also defines affordable prices of sub-sale houses in Greater KL for three income groups of young professionals, as represented in Table 3.0. The housing preferences of young professionals are not considered in this regard. Overall, the B40 group has fewer housing alternatives, as they can only choose from ten house types at a minimum cost of less than MYR 700 per month, while the highest cost of a similar house type is between MYR 1,277 and MYR 2,555

per month. The M40, on the other hand, has 29 house type options, while the T20 has 38. (see Table 3)

Table 3: Affordable prices of sub-sale houses in Greater KL

House Type	Value	Kuala Lumpur Price	Monthly	Cash Required	B40	M40	T20	Selangor Price	Monthly	Cash Required	B40	M40	T20
LCF	Min	65000	276	13693	✓	✓	✓	35000	149	9579	✓	✓	✓
	Max	300000	1277	48645		✓	✓	290000	1235	47169		✓	✓
SSLCT	Min	190000	809	32441		✓	✓	150000	638	26575		✓	✓
	Max												
DSLCT	Min	280000	1192	45693	✓	✓	✓	425000	1810	67094	✓	✓	✓
	Max	450000	1916	70784		✓	✓						
MCF	Min	95000	404	17807		✓	✓	60000	255	13007		✓	✓
	Max	450000	1916	70784		✓	✓						
SSMCT	Min	600000	2555	93618			✓	160000	681	28041		✓	✓
	Max							410000					✓
DSMCT	Min	300000	1277	48645		✓	✓	200000	851	33907		✓	✓
	Max	735000	3130	114324			✓	648000					✓
SST	Min	360000	1533	57501		✓	✓	170000	724	29508		✓	✓
	Max	1450000	6176	223034			✓	732000					✓
DST	Min	530000	2257	82828		✓	✓	290000	1235	47169		✓	✓
	Max	2800000	11926	426077			✓	2140000					✓
T&HST	Min	1338000	5698	206167			✓	440000	1874	69308		✓	✓
	Max	1880000	8007	287791				1872,000					✓
TST	Min	340000	1448	54549		✓	✓	635000					✓
	Max	3400000	14481	515751			✓	2,000,000					
FST	Min	2280000	9711	347938			✓	1,300,000	5537	200444			✓
	Max	5380000	22915	808891									
SSSD	Min	690000	2938	107422			✓	260,000	1107	42741		✓	✓
	Max	1200000	5111	185338			✓	950,000					✓
DSSD	Min	665000	2832	103588			✓	400,000	1703	63405		✓	✓
	Max	4050000	17250	612116				3,650,000					✓
T&HSSD	Min	2000000	8518	305863				1,050,000	4472	162584		✓	✓
	Max	3800000	16185	575052				2,050,000					
TSSD	Min	1500000	6388	230564				750,000	3194	116624			✓
	Max	4300000	18315	649179				2,800,000					
SSD	Min	4300000	18315	649179				140,000	596	25109	✓	✓	✓
	Max							1,200,000					✓
DSD	Min	2750000	11713	418564	✓	✓	✓	400,000	1703	63405		✓	✓
	Max	9800000	41741	1435077	✓	✓	✓	6,630,000					✓
TSD	Min	3300000	14055	500893	✓	✓	✓	2,188,000	9319	334113			✓
	Max	7100000	30241	1060591			✓	6,150,000					
Cluster	Min	140000	596	25109	✓		✓						
	Max	299000	1273	48498	✓		✓						
A/C	Min	125000	532	22909	✓		✓						
	Max	7570500	32245	1129023									
TH	Min	355000	1512	56763	✓		✓						
	Max	2000000	8518	305863									

Source: (The author, 2019 and Napic, 2018)

CONCLUSION
The B40 group of young professionals were the most affected by the housing affordability issue, as their household income and expenditure margin was very narrow. Meanwhile, M40 seemed more likely to have more housing options when compared to B40, but had fewer than T20. One must bear in mind that although low-cost housing has met the young professional's affordability, especially the B40 group, however, due to the high cost of living, they have limited themselves to do so. Besides that, those who are new in the employment industry (Zyed et al., 2016) also face the dilemma of being underpaid, while simultaneously they also have to bear an education loan and other non-housing costs. Subsequently, the RIM approach is appropriate in defining housing affordability as it reflects the household's ability to buy a house and considers the household's spending patterns, although the RIM requires detailed household income and expenditure data. As such, recommendations for future work are to define the young professionals' housing affordability by taking into account their housing preferences, and that the research extends beyond the monetary aspect in defining housing affordability.

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RESILLIENT LIVING BY OPTIMIZING THE BUILDING FAÇADE IN DESIGNING POST-COVID HOUSING

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Abstract

The living performance in sustainable development outline contributing factors towards efficiency, such as ecological, economic, health, and social integration. The performance of facade design must be emphasised to describe resilient living and access to mitigate the design of post-coronavirus disease (COVID-19) housing. The spread of the pandemic underlines the importance of providing quality of life and well-being in the building environment, hence highlighting a crucial need to improve indoor air quality and passive building performance to minimise the transmission of COVID-19 and indoor airborne diseases as a result of poor ventilation. The passive building performance and facade complement the energy demand and reduce heat gain. Currently, passive design and health are emphasised to link the environmental design approach and architecture and highlight the quality-of-life post-pandemic. The study aims to provide important healthy indoor strategies and passive building performance for open-plan home-office design, to investigate the open-plan home design with optimum thermal performance based on the passive indoor environment, and to examine the bioclimatic response and energy efficiency of home-office design during the pandemic. The responsiveness of bioclimatic and modular construction incorporated with the new home-office design aim to save energy through sustainable material. The Integrated Environmental Solutions Virtual Environment (IESVE) computer software was utilised using simulations involving ranges of illuminance levels in daylight and revealed the acceptable levels of between 300 lux to 500 lux for the home office area. The results demonstrated that the optimum range of solar heat gain coefficient (SHGC) of 0.46 and a U-value of 0.04 W/m2 K reduced the indoor temperature by 5 degrees Celsius during peak time and maintained the air-condition at 28 degrees Celsius, which was within thermal comfort level.

Keywords: Passive indoor performance, Daylighting, open-plan home

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INTRODUCTION

The emergence of COVID-19 has changed life trends, tactics, and well-being, particularly in neighbourhoods. The growing role of a home has tremendously reshaped behavioural trends. Therefore, the solutions for immediate change focus on environmental, social, and physical aspects. The passive design strategies are essential to encourage health and safe living relevant to the current pandemic in housing development. The light harvesting for facade design could maintain the quality of daylight penetration from the fenestration system (Vlachokostas et al., 2017). Moreover, the daylighting arrangement in the interior could satisfy the occupants. Most efforts in facade integration in buildings only highlight the colour change (Costa et al., 2019), while the explored technologies regarding the building envelope, facade components, and the efficient use of green resources must be integrated into the building design and construction. Thus, several strategies have demonstrated the benefits of construction technology.

Considering that the virus could be spread and transmitted through modified heating, air, and surfaces through human contact, the strategies in providing indoor air quality could mitigate the disease spread (Navaratnam et al., 2022). Furthermore, Lim et al. (2021) stated that work from home changes the lifestyle that avoids confined and enclosed spaces and promotes social distancing of one to two metres to prevent close human contact. The building facade for the home-office acts as a limit and filter through supplementary measures for glare protection. The study emphasised technology resiliency that contributes to the preparedness phase during any outbreak based on the density of people in a space or room. Currently, the acceptable indoor lighting level for learning spaces follows the standards and guidelines of between 300 lux to 500 lux (Husini et al., 2021). Nonetheless, few studies outline the types of a facade system that influence indoor lighting. Hence, the study constructed the design strategies that emphasise resilient living in housing settlements. Issues on building design contamination without proper daylight and fresh air cause severe environmental pollution (Peter et al., 2020).

Lim et al. (2021) stated that factors such as connectivity, crowding, and order directly spread the virus provided that people maintain a safe social distance. Instead of sufficient opening for daylighting and ventilation, the building walling material should ensure thermal performance for humans. In the pandemic response phase, the implementation of sustainable material and resilient designs should be integrated to better manage the maintenance of resilient living and to enhance understanding of health and architecture. The study mainly focused on how the passive design of wall facade and internal layout could impact the home-office space setting towards a healthy environment. The development of the building facade with the effort to reduce the electricity demand of the air-conditioning system should outline the thermal transfer value (OTTV) regulation (Chan et al., 2014). The study calculation demonstrated more

possibilities on thermal behaviour when the facade area was installed with materials that reflect the heat gain.

The study aims to investigate the open-plan home design with optimum thermal performance based on the passive indoor environment. Secondly, the study aims to examine the bioclimatic response and energy efficiency of home-office design during the pandemic. The facade design for occupant wellness could be achieved by controlling the indoor temperature, incorporating sunshade, and optimising the window to wall ratio. The effectiveness of fenestration could balance the building management and increase occupant wellness. The source of psychological comfort is stimulated via lighting, colours, materials, sizes, and shapes while balancing the internal-external relationship in housing (Bettaieb & Alawad, 2018). Functional flexibility is needed to accommodate numerous activities in a home, but the space arrangement should configure the interconnection between the indoor-outdoor environment (Bettaieb & Alsabban, 2020). Presently, working from home is a norm and the number of hours residents spend is increasing, which complicate the redesign and retrofit of the indoor area concerning daylight and fresh air (Peter et al., 2020).

Internal planning in dwelling
In the preparedness phase, indoor planning and house material measures should utilize a technological approach for better resilient living. The decision towards developing proactive measures of the socio-cultural and physical environment is highlighted through post-pandemic sustainability living (Bettaieb & Alsabban, 2020). The preparedness phase planning in housing is reflected in the healthy environment concept where the focus is on the internal layout and reduction of temperature to promote human thermal comfort in living. Tang et al. (2021) proposed that the surveillance system using digital information was partly the plan during the outbreak. Natural daylight concerns the stimuli to energy consumption. The design variables to measure an efficient classroom must experiment with the visual comfort metric together with the efficient layout. Meanwhile, the responsive facade covers the design aspect of light intensity (Ahmed et al., 2016). Previously, the efficient facade material was measured by adjusting the position of light intensity.

For student performance, the minimum glazing factor of 2% was achieved with 75% occupied areas in a space (Arabi et al., 2018). The acceptable illuminance level in classrooms was achieved when the ranges were measured when the occupant density reached 25 to 50% and the window to wall ratio was 70% (Husini et al., 2018). The light interaction with surfaces or facades predicts daylight performance, while the optimization of daylight performance with various materials captures the visual comfort from the dynamic modular grid. Presently, the planning of internal spaces applies the open-space concept (Manaf et al., 2019). Although the approach produces conflicting designs with privacy

and traditional layout, eliminating barriers with walls and clear divisions are necessary during the lockdown and suitable in building the home office environment.

The housing characteristics of the internal layout enable cross ventilation and lighting. The pandemic changes the home design and transforms into a fully functioning home office. The homeworking space promotes the working environment associated with productivity through the performance measures of windows and walls for facade layering. The sustainability and energy efficiency in dwellings could achieve human comfort by highlighting the waste materials as insulation to reduce heat and better indoor quality to prevent airborne diseases (Megahed et al., 2021). The ergonomic design layout and spatial arrangements in housing could compromise indoor comfort considering the relationship of the space planning and function. (Ismail et al., 2017)
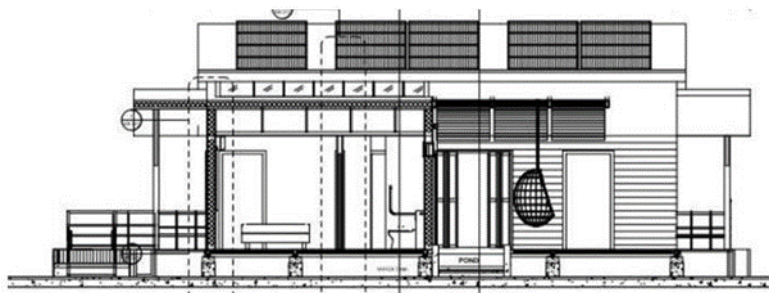
Figure 1: Open concept in housing scheme

Figure 1 displays the section of the open-plan home office design that enables cross ventilation and daylighting. The working environment suits the need for a comfortable environment when natural lighting is integrated into the design. Figure 2 illustrates the three modules as dwelling options during the outbreak. The modular construction depicts that the other parameter to measure human comfort and investigate the thermal condition of various building configurations is the surface temperature and the building facade at a critical orientation to provide a critical thermal condition (Abdullahi et al., 2021).
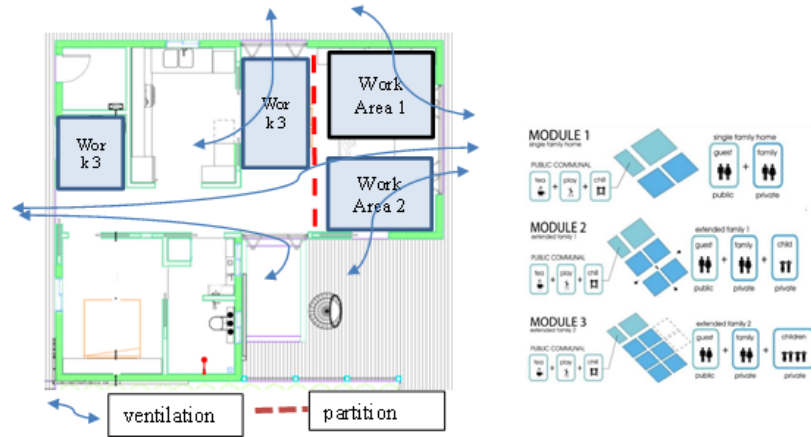
Figure 2: Internal layout with cross ventilation and design of open home-office design concept

Façade design and Overall Thermal Transfer Value (OTTV)
The indoor and outdoor environment depend on the wall of the building, which acts as a barrier and is an essential element in enhancing the thermal building performance. The energy performance of buildings is achieved at the minimum level when the thermal insulation and indoor temperature are improved. The significance of the OTTV is to measure the heat gain and the portion of the building where thermal energy is transferred or the thermal solar transmitted the heat gain through the building envelope. The OTTV concept describes that the building envelope is completely enclosed. The study formulated the calculation of OTTV based on a house with green walls at the side and palm oil trunk fibre as insulation at the wall. Using the formula, the heat conduction through walls and windows and solar heat gain could improve the average surface of solar radiation. The formula is stated as follows:

$$OTTV_i = 15\alpha (1- WWR) U_w + 6 (WWR) U_f + (194 \times CF \times WWR \times SC)$$

Where α = solar absorption
WWR = window to wall ratio U_w = U-value of wall
U_f = U-value of window CF = Correction factor
SC = Shading coefficient
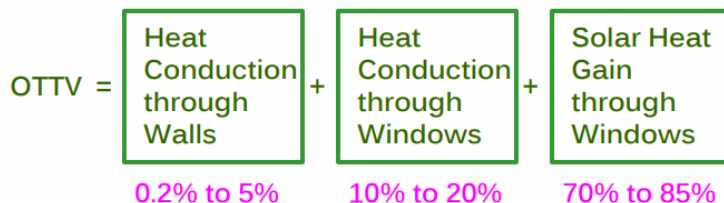
Figure 3: OTTV and heat conduction parameter
(Source:MS1525:2007 Clause 5.2.2)

The heat conduction through walls is estimated between 0.2 to 5% to reach the thermal conductivity of the material. The conduction becomes lower if the thermal conductivity of the material is low. Meanwhile, the heat conduction through the wall is based on a window-to-wall ratio. The solar heat gain through the window is at 70 to 85% of solar energy to pass through the glass.

Table 2 : Thermal conductivity among the material

Material	Value (W/mK)
Hemp	0.038-0.040
EFB palm fiber	0.04
Coconut fiber	0.048
Wood fiber	0.04
Kenaf	0.061-0.065
Glass wool	0.036-0.038
Structural softwood or plywood	0.115

Source: Ahmad Marzuki,2016

In Table 2, the thermal conductivity in the EFB palm fibre demonstrates that the property is significantly longer for high conduction among other materials. The fibre from plant waste with 0.04 U-value depicted the lowest U-value in Figure 4.
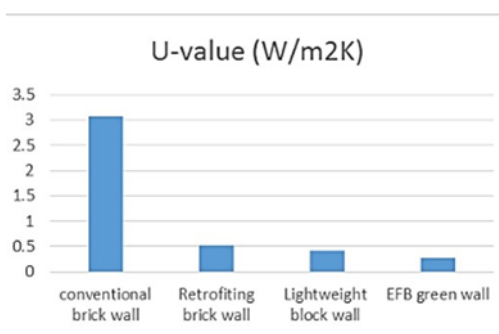
Figure 4: The U-Value comparison of wall profiles
(Source: Husini et al,2018)

Benefits of Green Wall to Environmental and Psychological Aspects

The green wall provides numerous benefits to the built environment in the environmental and psychological aspects. For environmental benefits, green wall facilitates in reducing indoor air temperature (Basher et al., 2016; Perez et al., 2014), minimizing the energy consumption for air conditioning (Perini et al., 2017), mitigating the urban heat island effect (Sheweka & Mohamed, 2012; Shafiee et al., 2020), enhancing the air quality, reducing indoor air pollution (Torpy & Zavattaro, 2018), and reducing noise pollution (Azkorra et al., 2015; Paull et al., 2020; Shushunova et al., 2021). Additionally, the green wall provides psychological benefits.

Apart from providing an aesthetic value to the environment, the visual contact with the green wall significantly impacts stress recovery and human well-being (Elsadek et al., 2019; Laage et al., 2019; Lotfi et al., 2020; Chan et al., 2021) and enhances students' cognitive skills (Van den Berg et al., 2017; Mccullough, Martin, & Sajady, 2018). To lower the OTTV, the specification of the opaque surfaces results in heat reduction. The selected insulation inside and variation of glass types provide an effecttive way to minimize the cooling load, leading to acceptable thermal performance. (Vijayalaxmi, 2010).

METHODOLOGY

The study performed a literature analysis in living concept concerning indoor-outdoor activities with the physical elements of a house during the pandemic and observation of indoor temperature that impact the cooling load. The test was conducted on a selected mockup house in Nilai, namely Mizanhome with an open plan layout to identify the indoor environment, activity, and energy consumption. Simulation tools were adapted to assess the thermal performance and temperature based on four orientations following a case study of a house located in Al-Makhtoum, United Arab Emirates (UAE), Dubai. The parameter for calculating OTTV was based on building design parameters: orientation and walling material. The opening based on the facade layer tested the temperature and cooling load when the open plan of a home-office layout was introduced in a housing scheme. The study also recorded the temperature when the window was opened and closed during the day and night.

RESULT AND DISCUSSIONS

The temperature in the building with insulation and building envelope forms resilience to drastic weather changes during the day and night, while the wall of the house was a cavity wall with organic insulation being installed in between the wall to act as insulation material. The organic insulation is made from compacted palm trunk residue using a special machine due to good thermal conductivity for the house. The thermal performance results in Figure 6 demonstrate a 25%

reduction of thermal heat gain inside the house when the integration of the wall and organic insulation is compared to external weather.
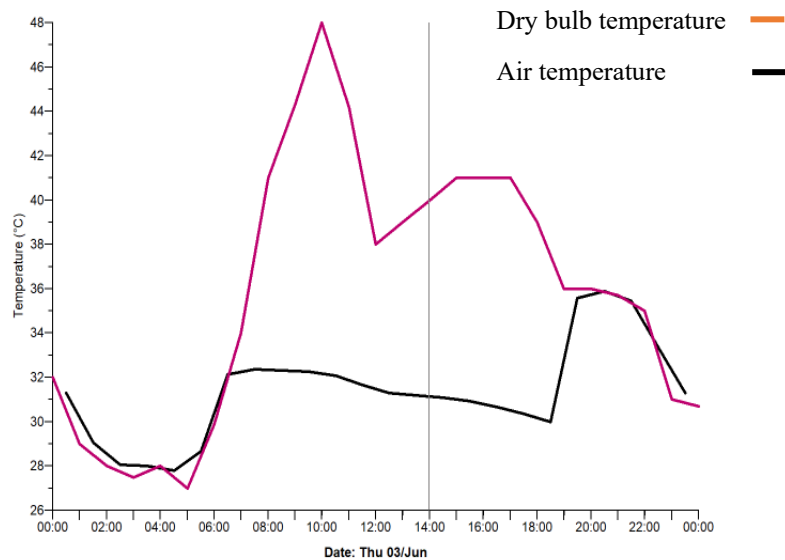
Figure 5: Air temperature and Dry bulb temperature
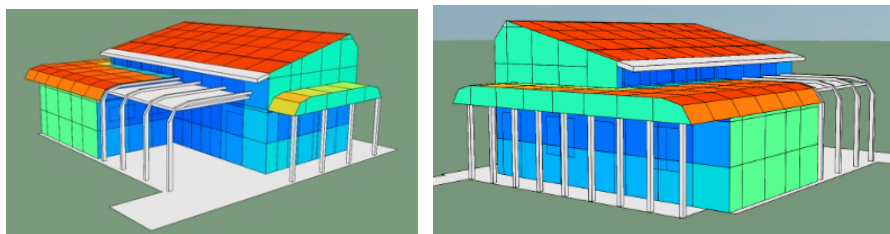
Figure 6: Thermal performance on West and East

Figure 6 depicts the solar heat gain from the orientation at the east and west facades. The passive strategy on the wall facade design was selected to adapt the insulation with the increase of 55% thickness from the standard wall design to provide a better thermal transmittance based on the building orientation. A complete annual weather data was acquired for the energy analyses. Weather was a primary driving force for the simulation and should closely reflect the real climatic conditions encountered by the building. The data must be in hourly time steps or shorter, provided that the simulation programmed can handle it.

The study used hourly weather data ARE_AL-MAKTOUM-IAP_411945_TYP.epw as the published ready-made weather file. Meanwhile, measured weather data sets from on-site measurements were not available. The

ideal solution was to compare results with weather reports as a general observation. The building form was modelled close to the architectural geometry of the building design. The form included the orientation and shape of the envelope, location and size of the windows, and zoning of the interior spaces. Several simplifications were applied to ensure a successful simulation with plausible results.

No solar-neutral simulation was considered as the form and orientation were fixed; hence the test did not require simulating the building at multiple orientations as only one simulation was necessary. Figure 8 illustrates the fenestration and window location in the solar home allowing sufficient daylight, particularly in the living, bedroom, and working areas. The illuminance level was between 90 to 130 lux level. Experimental work was performed on the insertion of an external screen to prevent direct sunlight indoors. The indoor lux followed the recommended lux for home, which is more than 110 lux.
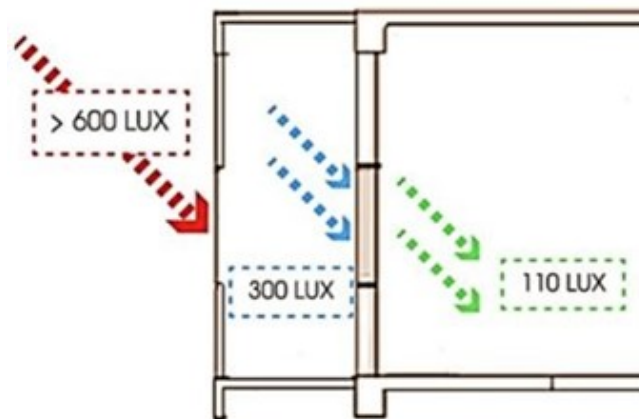
Figure 7: Daylight availability

OTTV CALCULATION BASED ON ORIENTATION
Table 2 reveals that the OTTV values for the house which faces the East orientation produced a higher value compared to the facade facing the North, West, and South. The OTTV value on the East orientation was 63.80 compared to the recommended OTTV value of 45, thus indicating high heat gain.

Table 3: Overall Thermal Temperature Value (OTTV) calculation based on orientation

SIDE	North	West	East	South
OPENING AREA	1.8 x 2.2 = 3.96 1.2 x 1.2 = 1.44	1.2 X 1.2 = 1.44 1.2 X 1.2 = 1.44 1.0 X 2.2 = 2.2 0.75 X 2.1 = 1.65	3.0 X 2.2 = 6.6 0.9 X 1.2 = 1.08 0.9 X 1.2 = 1.08	1.0 X 1.2 = 1.2 1.8 X 2.2 = 3.96
TOTAL m2	5.4	6.73	8.76	5.16
SIDE AREA m2	10.4 x 3.2 = 33.28	8.25 X 3.2 = 26.4	8.25 X 3.2 = 26.4	10.4 x 3.2 = 33.28
WWR	5.4 / 33.28 = **0.1623**	6.73 / 26.4 = **0.255**	8.76 / 26.4 = **0.3318**	5.16 / 33.28 = **0.15514**
α	0.55	0.55	0.55	0.55
U_w	0.37	0.37	0.37	0.37
U_f	0.4	0.4	0.4	0.4
SC	0.77	0.77	0.77	0.77
CF	0.9	0.94	1.23	0.92
FORMULA	**15 α (1-WWR) U_w + 6 (WWR) U_f + (194 x CF x WWR x SC**			
OTTV	24.767	38.695	63.80	21.986

Figure 8 depicts that the result of the simulation of the house was thermally performed, where only natural ventilation was present without an air-conditioning system, the thermal requirements, and the predicted indoor temperatures. Moreover, cooling loads decreased by 5 degrees even during peak hours between 3 to 6 pm. The observations by simulation data suggested that indoor temperatures were optimal when the air-conditioning in the house was switched on and set at 28 degrees Celsius to control humidity rather than cooling and mainly due to external ambient temperatures.
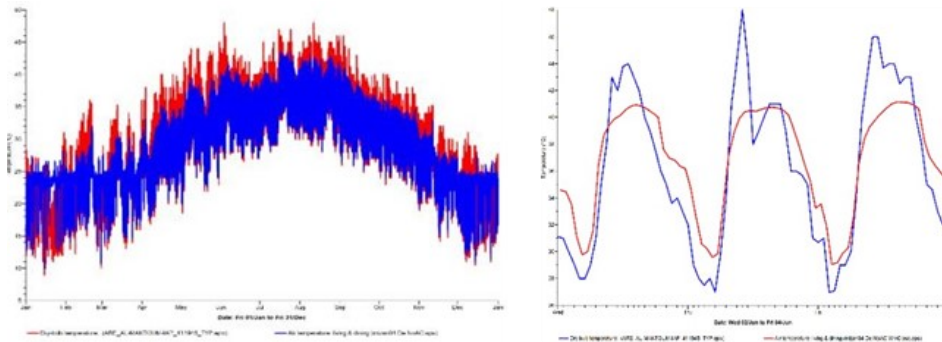
Figure 8: Passive analysis without air-conditioning system

CONCLUSION

The results revealed that the development of an open-plan home office design should incorporate passive strategies and orientate the building intelligently. The facade design significantly affected the thermal performance when insulating the wall with the fiber material reducing the thermal transmittance and heat gain without compromising thermal comfort. The thermal conductivity was critical to an indoor temperature where the reduction of 5 degrees Celsius during peak hours introduced the high performance of the building and maintained the air-condition at 28 degrees Celsius. The design parameters with shading coefficient based on the OTTV calculation depicted the bioclimatic response. The design determined the building envelope shape effect and ensured that the home office design during the pandemic achieved optimum efficiency. Therefore, the case study was categorized into the design of the building envelope and solar absorption efficiency where the basic criterion was environmental suitability and sustainability that produced significant results. The home-office layout modification and material selection demonstrated an excellent measure of OTTV even in the new layout of the home office design. Using the material of fibre for insulation and providing the window-to-wall ratio of 30 to 50% reduced the heat gain and fulfilled the study objective to provide a healthy indoor environment using passive strategies

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STRATEGIES IN IMPROVING THE BUILDING EFFICIENCY AND DAYLIGHTING: A CASE STUDY OF GREEN BUILDING

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Abstract

Malaysia is one of the rising countries with the highest energy consumption rate, which is attributable to strong economic development in the residential and commercial sectors that consume approximately half of the total electricity generated. Several criteria have been implemented in Malaysia to develop efficient building design, such as the Green Building Index (GBI) and Passive Daylighting Strategies. The study aims to investigate passive daylighting solutions for different building orientations and facade materials to measure energy efficiency through building designs. Buildings are a variable that contributes to growing energy consumption resulting from population increase and climate change. The building facade is a factor that could control the indoor environment, which affects the energy consumption in buildings. A case study determined the elements that maintain building efficiency and electric savings by examining two buildings certified by the Green Building Platinum and the Ministry of Finance (MoF). Low consideration of Passive Daylighting Strategies in building designs allows direct sunshine and increases the use of air conditioning to maintain the room at a comfortable temperature.

Keywords: Facades, Climate, energy efficiency, daylighting, passive strategies

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INTRODUCTION

Malaysia is a tropical Southeast Asian country near the equator, located between the latitudes of 1° and 7° north and the longitudes of 100° and 119.5° east. Each month, Malaysia is exposed to approximately 400 to 600 Mj/m2 of radiation (Aziah & Ariffin, 2004). The average temperature in Malaysia is between 24.5° to 28.5° Celsius, which is higher than the advised range by the Ministry of Energy, Telecoms, and Posts (Zain, 2008). Most studies proposed that the comfortable air temperature in Malaysia is around 25° C.

Numerous studies explore the factors impacting energy efficiency with population, climate change, and economic growth. Climate change is considered the most significant global challenge. The buildings in Malaysia emit the greenhouse effect that contributes over 40% of carbon gases (Zakaria et al., 2021). The condition is detrimental to the environment, which affects climate change. Thus, various sustainable building assessment tools have been established since the late 20th century (E. Papargyropoulouet et al., 2012).

The WHL energy mentioned the basic energy efficiency principles, which balances between maximising heat gain to minimising heat loss. Energy efficiency also depends on the size of space, orientation, the building material, and the thermal storage mass (Passive design strategies, metal architecture, 2021)

The Malaysian population is increasing, which leads to an increase in energy consumption. Modeste et al. (2014) stated that energy are the most significant resource in developing countries and the rapidly growing world population. Han et al. (2021) predicted that urbanisation affects energy use on several factors, such as the population and economic development. Meanwhile, Kavousian et al. (2014) mentioned four major factors that influence the building energy consumption and occupants' behaviour based on the location, weather, physical characteristics, and appliance usage.

Buildings utilised approximately 40% of the total world energy in 2015, and the figure is predicted to increase to at least 50% by 2030 based on current trends. Numerous aspects influence the energy efficiency of a structure. Daylighting is the controlled intake of natural light, direct sunlight, and diffused skylight into a building to reduce electric lighting and conserve energy (Gregg D Ander, 2016). The building efficiency is also determined by the material used to construct the building. In a tropical setting, the insulating wall lowers energy consumption by minimising the peak heat load from the tropical climate (Y.H.Lee et al., 2021).

The passive daylighting strategies in the study emphasise the building orientation and the material of the facade building. A vital element includes the design that exposes the building to sunlight to minimise the heat load. A building with an excessive amount of heat and direct sunlight could encounter issues in controlling and maintaining the internal building temperature, thus affecting the building efficiency and electricity usage. The study discussed the material with

an optimum U-value and K-value that optimally controls the interior building temperature. Additionally, the study investigated the major passive daylighting strategies with GBI certified buildings for building efficiency.

ENERGY EFFICIENCY
Building efficiency is defined as a building that can minimise the energy demand for heating and cooling (ISOVER, 2021). The energy efficiency concept is to generate and utilise energy as efficiently as possible. The New World Research Institute (WRI) examines the significant role of building and shaping sustainable cities of the future and developing the communities. Natural daylighting has always been a topic of improvement due to the availability of cheap electricity and to control the illumination level due to artificial lighting.

The ISOVER (2021) mentioned thermal insulation of components which involve cost and is widely available as energy-saving components. Thermal insulation components depend on the building material, consisting of a K-value and U-value that determine the heat received into the building. The term 'K-value' refers to the thermal conductivity of a material. The K-value is also known as the rate of the constant heat flow via a unit area of a homogeneous material in the perpendicular direction (Gordon H. Hart, 2009). Additionally, the material thickness determines the K-value. Meanwhile, the 'U-value' refers to thermal transmittance. Heat transmission defines the area of material construction and the boundary air films (Gordon H. Hart, 2009). The lower the number of the U-value and the higher the K-value, the better the energy efficiency in warm climates, such as in Malaysia.

Building materials are categorised into two: heavyweight and lightweight. Concrete, masonry walls, and stone finishes are heavyweight materials with a high density and heat capacity (Saleh et al., 2017). In warmer areas, lightweight materials, such as timber, steel framing, insulated panels, prefabricated items, and polystyrene construction products respond instantly to temperature fluctuations and cool rapidly overnight (Rhys Kelly UDIA WA President, 2017).

DAYLIGHTING AND ENERGY EFFICIENCY
Daylight is the use of windows and skylights to attract natural lighting and temperature regulation, which saves cost and minimises energy consumption. Daylight reduces the use of artificial lighting where the study proved that daylight reduces the cooling load and demand of building energy (D.H.W. Li, 2005). Artificial lighting produces 70 to 100lm/Watt and daylight has a higher luminous efficacy of 110 to 130lm/watt, hence reducing the cooling load (P.J. Littefair, 1985). Yu and Su (2015) found that daylight harvesting can save energy in lighting by 20 to 87%, assessed through simulation and algorithm calculations. Moreover, Kamaruzzaman et al. evaluated the tropical context at the Klang

District, where the office building had average lighting consumption and saved approximately 37% from daylighting.

PASSIVE DAYLIGHTING STRATEGIES

Passive Daylighting Strategies are measures that do not require using any special mechanical equipment or energy source in the building design. The solutions are described as a component that accumulates natural light and reflects the light into dark areas to increase the distribution of daylight inside the building. Several studies have proven that daylighting is the most efficient way to achieve building efficiency. For instance, Surendran mentioned that passive daylight strategies in tropical buildings reduced the impact of the building environment. Furthermore, daylighting provides significant health and wellness benefits to the users. Natural light improves users' performance, healing, productivity, and satisfaction, which concern the four major factors that influence energy consumption.

The HMC Architect news listed various criteria of the passive daylighting system, such as building orientation, window type, skylight, clerestories, external shading system, light shelves, solar tubes, light wall colours, Parametric modelling, daylight simulation, and artificial intelligence (AI). Meanwhile, A. Zain- Ahmed examined tropical buildings in Malaysia and discovered four significant types of passive daylighting strategies that should be emphasised: the orientation of the building, shading elements, window to wall ratio, and window type. Hence, the findings demonstrated that a minimum of 10% savings could be made from simple daylighting strategies.

METHODOLOGY

The study conducted a comparative analysis of three case study methods that described the building orientation and U-value of facade that control the temperature inside the building, which contributes to energy savings. Two of the selected buildings were certified by green building while the other building encountered an issue with energy management. The Wall Simplified Energy Index table in the passive design guideline is the base line for the comparison

RESULT AND DISCUSSION

The three offices were compared to analyse the passive strategies used to cater to the climate change and electric usage. Table 1 compares the passive strategies on the MoF, the Energy Commission Building (ECB), and the Public Work Department Block G (PWD).

Table 1: Description and difference of the selected building

Description/ Building	Location	Award	Material	Daylight Strategies	Energy Savings	Scores in Green Building Index
Ministry of Finance (MoF)	Putrajaya	-	-Full reinforced concrete -Green a front and back facades -landscape are (60:40)	-Shading device and blind (75%) -WWR (65%)	(0.5%) due to office management setup	-
Energy Commission Building (ECB)	Putrajaya	Multi-award-winning green building (GBI Platinum and Green Mark Platinum in non-residential category.	-double glazing glass	-Building Orientation -light shelf and atrium - WWR (50%)	52.8%	88%
Public Work Department Block G (PWD)	Kuala Lumpur	GBI platinum	- glass and concrete deep partition	-Building Orientation -horizontal Louvers & Interior Partition -Windows type -WWR (90%)	40.9%	86%

Mohd Nasrun's (2014) study on the MoF Putrajaya suggested that the building orientation and material were the key factors that need to be considered in controlling the heat consumption in buildings. The windows in the building were designed facing the east and west, which brings in direct sunlight in the day and evening. Furthermore, the office management set up by the occupants in the building holds a crucial role in saving electricity and supporting building efficiency.

louvers

shading
device
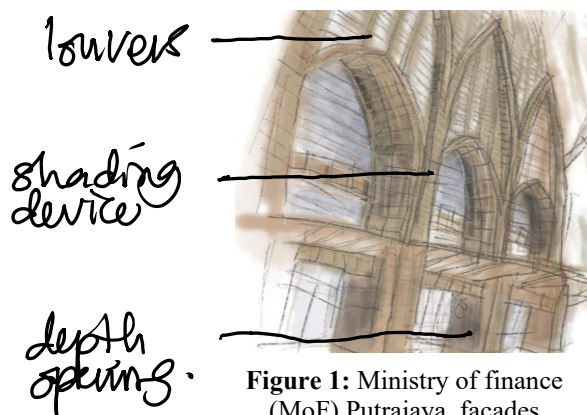
depth
opening.

Figure 1: Ministry of finance
(MoF) Putrajaya, facades
Source: Author,2021

Figure 2: Orientation of MoF building
Source: Google map

Figure 1 depicts the facades of the MoF comprising louvres, shading devices, and depth at the opening as passive design strategies to ensure the building efficiency, but the direction of the window and door facades are facing the East and West increases heat gain and depending on the office management operation.
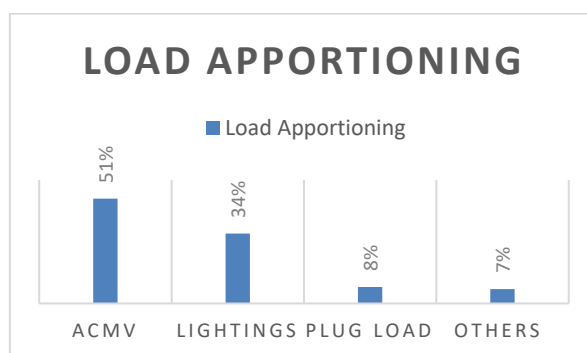
Figure 3: Load Apportioning of the building
Source: Energy management, Case study on Malaysian Government Office Building

Figure 3 illustrates that the largest load apportioning in the building is the Air condition and Mechanical Ventilation System (ACMV) at 51% due to the indoor temperature increasing during the daytime. The MoF building was reported as hot during the daytime, which produced an uncomfortable environment during working hours. The MoF building occupants proposed the management to control the electrical usage of the building through the management programme that saved over 0.5% of electricity.

Figure 4: Diamond building, Energy Commission Building (ECB)
Source: Magazine High Performing Building, Nov 2014

Figure 4 illustrates the second case study on the ECB, a multi-award-winning green building (GBI Platinum and Green Mark Platinum) in the non-residential category. The building shape is unique to prevent direct sunlight and allow the light to enter the building through the light reflecting from the pavement and landscape, as displayed in Figure 5. The design affects the building efficiency by controlling the heat gain of the building facade during the daytime and reducing the use of artificial light and air-conditioning in the building.
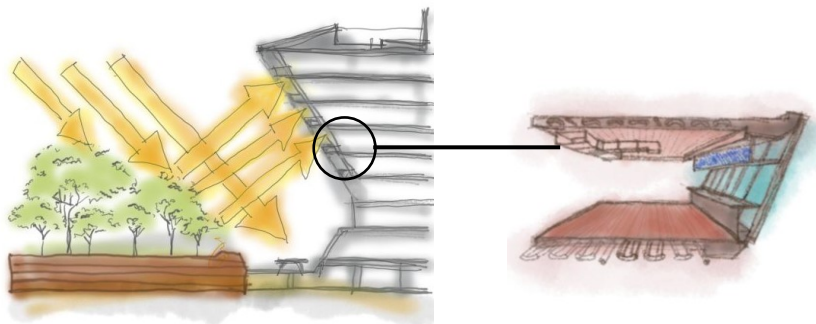
Figure 5: Reflectance of light to avoid direct sunlight

Figure 6: Public Work Department Block G (PWD)
Source: 2017, KCJ Engineering SDN. BHD.

The ECB and PWD were platinum certified by GBI according to Nikpour et al. (2017). The ECB building emphasised the daylighting strategies, which outlined the light shelf and atrium that reflect the diffuse daylighting into space. The ECB acquired an 88% score in GBI, which held the platinum rating of over 86% points. The opening of building orientation occupied the South Segment. Additionally, the building orientation shading system controlled the heat received in the building and enabled electricity savings.

Figure 7: Orientation of ECB and PWD building respectively
Source: Google map

Figure 7 demonstrates that the building corner is located at the east and west sides, designed to receive less impact from direct sunlight. Thus, the design decreases the surface area of the building facing the direct sunlight during the daytime. The condition lowers heat gain in the building and minimises electricity usage of the building during the daytime.

Gene-Harn Lim (2017) discovered that most ECB and PWD occupants preferred daylight in their office working space. The results of artificial lighting suggested that the PWD occupants usually switch off the lighting in the morning (8.30 am to 12.00 pm) and afternoon (12.00 pm to 4.00 pm) due to sufficient daylight from the east-facing windows. The study revealed that ECB and PWD saved energy by 40.9% and 52.8%, respectively.

ENERGY INDEX BASED ON U-VALUE
Various factors control the internal heat of a building that impact building efficiency, such as the material of the building facades to save electricity. The material type of the building facade consists of different U-values that affect the building heat consumption.

The energy simulation performed in the guidebook passive design in the wall insulation section derived an estimation of energy and peak load reduction. The U-value in the creation index goal evaluated the energy savings produced by building material based on Malaysian climate zones. The Wall Simplified Energy Index table lists the U-value as follows:

Table 2: Energy (Electricity) reduction per wall area per U-value reduction for range of based Load scenario

Description	ASHRAE U-value	Wall simplified Energy Index (kWh/year of m2 of wall area)		
		High Night-time Parasit Load	Mid Night-time Parasit Load	Low Night-time Parasit Load
Steel Sheet, 10mm	6.68	77	55	53
Concrete Wall, 100mm	3.40	55	32	28
Brick Wall,115mm	2.82	52	30	25
Brick Wall, 220mm	2.16	50	27	22
Double Brick Wall with 50mm cavity, 300 mm	1.42	48	25	20
Autoclave Lightweight Concrete, 100mm	1.25	47	24	18
Autoclave Lightweight Concrete, 150mm	0.94	45	22	17
Autoclave Lightweight Concrete, 200mm	0.75	45	22	16
Steel/Aluminium Composite Wall with 75mm insulation	0.38	45	21	15

Source: Guideline for Passive Design by CK Tang and Nic Chin

The table demonstrates that the MoF building was constructed using reinforced concrete as the building material held a high U-value. Meanwhile, the ECB and PWD buildings were covered by double-glazed glasses that are tinted, which tends to hold a lower U-value, hence producing less heat conduction through glazing (Green Quarter, 2018).

CONCLUSION
Based on the case study of three buildings, designers must consider building passive methods early in the design process. Moreover, the building orientation

significantly impacts the ability to save electricity. The MoF building lacks building orientation, the building encounters energy management challenges and save only 0.5% of electricity through the office management setup. The result demonstrated the necessity of construction orientations in specific locations. The type of material used on the building facade is also critical in achieving energy efficiency.

The study discovered that building orientation, passive daylight methods, and building material are the most important factors in controlling heat consumption in buildings. Less heat usage improves building efficiency while conserving power.

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A HUMAN DIMENSION MODEL FOR THE URBAN VERTICAL HOUSING SUSTAINABILITY THROUGH INDOOR AIR QUALITY

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Abstract

In urban vertical housing in Jakarta, air conditioning (AC) is mainly used to create comfort in units and spare residents from hazardous outdoor pollution. Residents in urban vertical housing, who have come from the surrounding multi-ethnic area, live in dense conditions. This situation inflicts conflicts of interest that affect indoor air quality (IAQ). This research develops a human dimension model for promoting indoor air quality in dense urban housing using the concept of sustainability, which is an environmental science approach. This study aims to conceptualize the effect of the human dimension in IAQ planning. The method is partial least squares-self equation modelling (PLS-SEM) analysis. The indicator variables of the human dimension related to indoor air quality are room quality, sociocultural factors, open space relief, environmental capacity, economic factors, and room maintenance. This result is a modified model of the fourth pillar of sustainability, according to Hawkes' theory on housing planning. The variable human cultural dimensions are knowledge, perception, behaviour, and participation, which frame the sustainable development concept: the social dimension, environmental dimension, and economic dimension.

Keywords: human dimension model; urban vertical housing; indoor air quality; sustainability concept; housing planning.

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INTRODUCTION

The number of people who live temporarily in Jakarta is increasing. This density has forced the government to make the development of apartments for these temporary residents a priority. However, improving the physical and psychological health aspects of apartments has not been a priority. At the same time, the hazardous of outdoor air pollution caused by traffic jams and social tension between residents and management frequently happens in Jakarta urban vertical housing. Previous studies reveal that those living in apartments are at a higher risk of air pollution than the general population of the city of Jakarta (Tryanni et al., 2013). These studies revealed that the model had not yet overcome IAQ issues to provide healthier vertical housing in urban areas without social capital (Tham, 2016). A model that could show the sustainability of health in vertical housing for assessing indoor air quality is needed. Preliminary studies show that the perceptions of apartment residents can determine the values of social dimensions, environmental dimensions, and economic dimensions, which theoretically can be the basis of the sustainability assessment of their residence. Thus, we design a theoretical model for the sustainability of indoor air quality in urban vertical housing.

Hawkes states that community values (values of society) are the basis of anything built to achieve the quality of life (Hawkes, 2001). The values of society are the essence of being a healthy and sustainable society in terms of social equity, environmental responsibility, and economic viability. The cultural dimension supports the balance of quality of life, and consists of 3 pillars: social dimensions, environmental dimensions, and economic dimensions that regard sustainable planning (Teng, 2019). Maslow focuses on how perceptions underlie the way in which residents and managers interact, behave, and participate in vertical occupancy (Janis, 1998). Tham (2016) helped compile the Hawkes modification model into a healthy and sustainable residential model. This model was used for middle-income vertical housing built by a private company. Based on these thoughts, the research objective was carried out to conceptualize the influence of the human dimension in IAQ planning.

LITERATURE REVIEW

Sustainability is the availability of energy, cycles, and diversity to support population growth (Miller and Spoolman, 2021). The interactions between interdependent factors within an ecosystem that work in balance are needed (Cunninghams, 2012) to determine ecosystem sustainability. The role of humans in building the values of community interaction (values of society) is the basis of whatever is done to achieve a sustainable quality of life (Hawkes, 2001). The existence of a building not only meets the physical needs of humans (Hutchison, 2018) but also provides psychological comfort. Structured psychological theory helps architects recognize the dimensions of their existence towards the effects

of their designs on self-recognition, orientation, self-reflection, and the creativity of residents (Kalantidou, 2013). Spaces designed by expert planners have a psychological impact on residents.

In 2011, Government Regulation Number 20 of 2011 on vertical housing was made. In this regulation, there are elements of social and economic dimensions. In article 2 of this regulation, there are matters related to health, namely, the provision of the basis for constructing apartments to meet healthy housing standards, meet environmental health requirements, and promote healthy living behaviour. Social, economic, and environmental aspects can determine the physical comfort of housing (Luthfiah, 2010). The physical dimensions of comfort in an apartment include (1) aspects of air, sound, lighting, temperature, and environmental comfort; (2) being free of rubbish, having clean materials, and access to physical activities; (3) safety from minor accidents or natural disasters; and (4) comfort in the service of spatial composition, facility performance (Alfata et al., 2015), and the facility for human circulation (Kang et al., 2014). The physical comfort of urban dwellers can be assessed by satisfaction in air quality (Xue et al., 2016), temperature comfort, and sound quality (Zalejska-Jonsson and Wilhelmsson, 2013). Based on the opinions above, the authors conclude that urban dwellers assess physical comfort based on spatial aspects and aspects that accompany the spatial value: cleanliness, health, warmth, noise, and safety.

The psychological comfort dimensions of occupants in urban dwellings are (1) a   passion for life, which is demonstrated by the attractiveness of the residential environment, density, lighting conditions, sound level, and appropriateness of room size; (2) stability, consisting of green space and privacy; (3) pride, consisting of privatization and pride; and (4) security, which consists of mental security and protection from crime and traffic accidents. The psychological dimension of comfort is influenced by the level of the individual's economy (Harianto, 2014). The opinion is that the psychological aspects of high-rise urban dwellings are strongly influenced by the limits of tension, overcrowding, and mental health of individuals (Gifford, 2007).

Hawkes (2001) said the following about urban housing, in his theory of the fourth pillar of sustainability: culture's essential rule in public planning is for humans to feel the value of self-existence to make meaning of their lives. Figure 2 shows the concept of the cultural dimension that supports the balance of quality of life consisting of 3 pillars of the following dimensions: social, environmental, and economical. The three pillars support the quality of life in urban dwellings. The slices of the three pillars of sustainability, adequacy, and responsibility, if implemented, will raise the levels of positive values, aspirations, relationships, diversity, creativity, innovation, and reliability in buildings.

A person has a level of awareness and degree of adaptation that is selectively present in specific environments (Gifford et al., 2010). The adaptation process is based on environmental perception when a difference between design

and reality brings about a reaction. When humans see the composition of an environment, there is a signal that makes them reach a certain conclusion. Behavioural change starts with awareness triggered by knowledge (Barnes, 2014), but knowledge about the environment needs to be accompanied by high commitment (Alford et al., 2002). Maslow uses the terms physiological, security, ownership and love, self-esteem, self-actualization, and self-transcendence to describe patterns that motivate human behaviours.

Miller (2012) states that IAQ is a severe problem in the environmental sciences. According to the Environmental Protection (EPA), indoor pollutants can be 2 to 5 times more dangerous than the pollutants present in outside buildings. EPA (2018) defines indoor air quality as an air quality condition in buildings and their building structures, which is related to the health and comfort of building users. In Indonesia, according to the Ministry of Health Regulation Number 1077 of 2011 on Guidelines for Indoor Air Sanitation, it is a parameter value that indicates the air's physical, chemical, and biological conditions. The physical conditions of the air include humidity, lighting, temperature, and particulates, while the chemical conditions of the atmosphere include SO_2, NO_2, CO_2, CO, and other chemical materials; furthermore, the biological needs of the air are bacteria, fungi, and germ numbers.

RESEARCH METHOD

The apartment is a mass of U-shaped towers with each floor consisting of 44 units with 25 floors plus two ground floors and basements; one tower consists of 1100 residential units. The area per floor is approximately 1500 m²; if 1 unit is occupied by 3 people, 132 people occupy one floor. Therefore, the density per floor is 11.3 m2/person. This amount met the minimum standard in Indonesia of 9 m²/person at the lowest. The apartment is located on a boulevard, which is a public road that can now be passed by private vehicles from outside the area (Figure 1).

Figure 1: The Mass of Towers and Hazardous Pollution from The Main Road and Boulevard

Data collection for PLS-SEM used questionnaires and was assessed with a Likert scale to reflect the attitude or opinion (Barge, 1988). Purposive sampling was used for residents and units. Samples were from towers representing one unit from each floor. To get a sense of the building management as a whole, the population was chosen from residents who had lived in this apartment for at least one year. The samples of managers were five persons per field of work: a human resources employee, a sanitation attendant, a maintenance officer, an engineer, and a customer service employee. The sample of the manager was involved in housing management for one year. Multivariate data analysis was performed by Smart-PLS version 3.2. PLS-SEM (Lay and Anuthra, 2014).
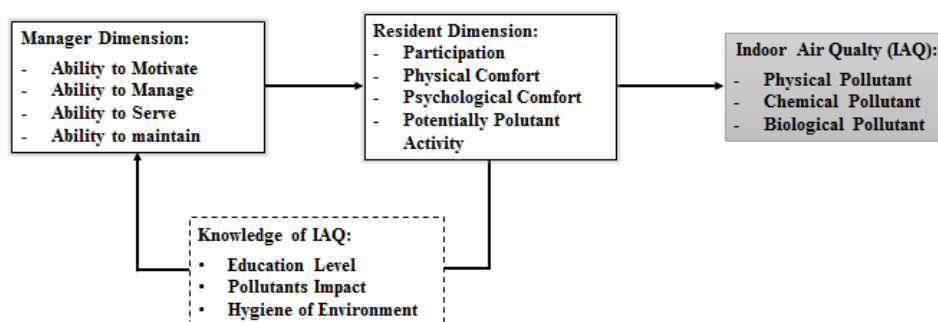
Figure 2: The Conceptual Framework of The Model

Figure 2 shows the conceptual framework of the model proposed. It shows that realizing the effectiveness of IAQ depends on the performance of the residents' dimension, which is supported by the residents' knowledge: education level, knowledge of pollutants, and knowledge of hygiene. The residents' dimension that influences the effectiveness of IAQ is determined by the fulfilment of physical and psychological comfort of the living space, resident activities that cause indoor pollutants, and occupant participation in maintaining the cleanliness of the unit and air circulation through openings and ventilation devices (Nurwidyaningrum et al., 2020). Three abilities determine the managers' dimension that influences the effectiveness of IAQ. The ability to regulate unit spaces and shared spaces (social and public), the ability to check the maintenance of space and ventilation equipment, the ability to provide open space relief, economic ease, sociocultural sustainability and the adequacy of environmental support, and the ability to motivate changes in behaviour patterns that are better for the common good.

RESULTS AND FINDINGS

The following is a description of the results of the questionnaire. The managers stated that they had managed well and cleaned the rooms for the residents' social and public spaces. However, 23% of the management respondents think that they have not managed the public space properly, for example, in the parking arrangement. The managers (70%) believed that open space relief had been fulfilled. Forty-nine percent allowed residents to engage in economic activities in residential areas. Seventy-three percent of them had tried to greenify the building environment. Additionally, 87% argue for the importance of sociocultural life for residents. In general, managers have a good perception of their service capability, but they acknowledge that living in vertical housing cannot be economical. The manager behaviour related to IAQ is the inspection of buildings and the maintenance of ventilation equipment that is required for it to work well. Most of them (87%) stated that routine control is always carried out. Questionnaire data show that as many as 68% of managers said they have campaigned for a healthy life.

Furthermore, most residents generally feel that the physical housing conditions are adequate for personal activities (90%), but they think the unit is still not large enough for family activities (61%). Regarding psychological comfort, respondents stated that they felt enough open space relief (87%). Regarding freedom of activities related to sociocultural practices, 62% of residents said that they could carry out these activities even though they still felt uncomfortable. The explanation above shows that most residents feel that their physical and psychological needs are satisfied. However, there are still complaints about family activities, lowcost lifestyle and the ease of sociocultural activities. This fact shows that satisfaction with physical conditions also

influences psychological conditions, which then affects obedience to the program and the manager's rules (Moersidik et al., 2012; Wiranegara et al., 2013). Additionally, the residents' health participation rate showed that 56% of respondents cleaned furniture routinely, but some did not. Most respondents said they tried to choose fragrances without chemicals (86%). Most also stated that they always checked the condition of the stove and gas to prevent leakage (80%). Additionally, almost all respondents said they opened the window in the morning every day (96%). This behaviour showed that practically all residents have an excellent healthy lifestyle, and these results could be optimized by motivation from managers to follow rules (Kyrö et al., 2012).

The data show that most building managers have a lower knowledge and education level than residents. The level of management who have an education at the undergraduate level is only 49% lower. Ninety percent of residents have an undergraduate education level. Regarding knowledge about indoor pollutants, residents have a better knowledge rate of 76% compared with that of managers, which is 21%. This value gap causes residents to feel uncomfortable. Residents' expectations are higher than those of managers. The lack of IAQ knowledge could cause the loss of this optimization (Müller-Eie and Bjørnø, 2017). The description above shows a gap in fulfilment between managers and residents in this opinion (Taiwo et al., 2021; Rabe et al., 2021). The managers argued they had worked appropriately (70-90%), but the residents stated that they were not satisfied (10-40%). This means that they should be communicable about particular rules and programs to achieve unity management (Roland et al., 2018).
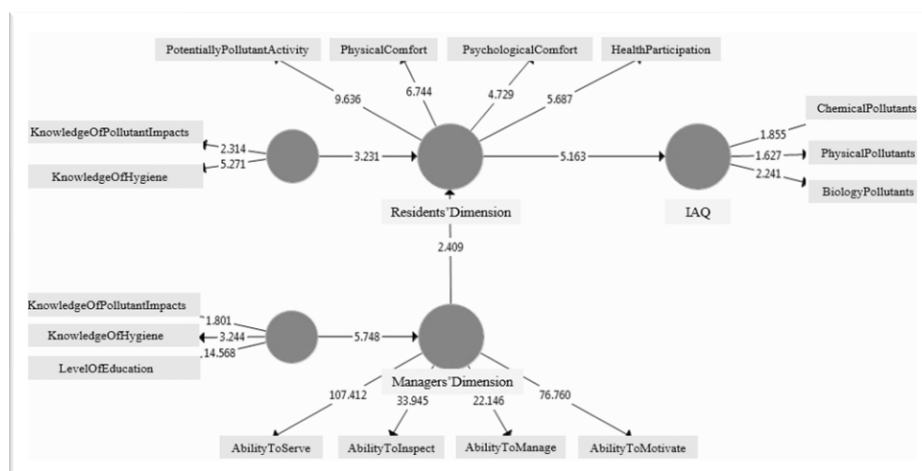
Figure 3: The Construct of Smart-PLS that Achieves the Effectiveness of IAQ between Residents and Managers in PLS-SEM (Nurwidyaningrum et al., 2018)

Figure 3 is the optimal PLS-SEM construct model for the unity of residents' and managers' dimensions of IAQ in urban vertical housing. This figure shows that the residents' dimension directly affects the conditions of the IAQ in the unit, and the managers' dimension plays a vital role in encouraging the residents' dimension to produce healthier IAQ. In this construct, knowledge is a variable suppressor. Residents' and managers' knowledge strengthens the influence of residents' dimension on IAQ (5.163), and the T-outer loading value meets the requirement >1.96. Managers' knowledge is essential to strengthening the value of IAQ (5.748). The knowledge variable is an influencing factor in making IAQ effective. The calculation result of PLS-SEM is 19% for IAQ. This means that the human dimension in urban vertical occupancy has affected the IAQ by 19%, in addition to the technical influence (Razzaghian et al., 2016). These results indicate that to realize healthy housing, there is a need to promote an excellent cultural dimension between residents and managers in order for them to pay attention to aspects of physical and spiritual health to develop a sustainability model. PLS-SEM analysis was used to develop the model of the human dimension for the sustainability of urban vertical housing through IAQ. Then, the variables in Figure 3 entered into the fourth pillar of sustainability of the Hawkes principle (Gang, 2016).
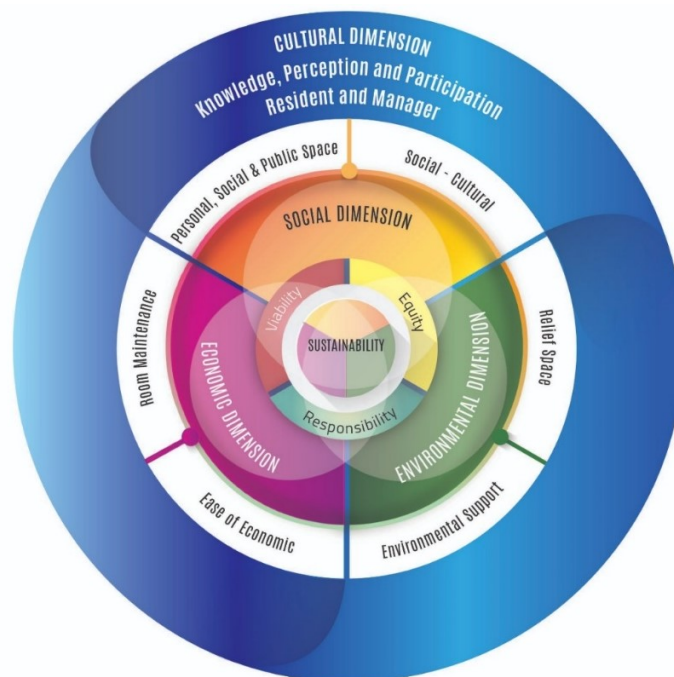
Figure 4: The Model of The Human Dimension that Supports IAQ in Urban Vertical Housing

Explanation of the concept model (Figure 4) is a cultural dimension that includes knowledge, perception, behaviour, and participation (Maslow, 2015). The human dimension of residents and managers will interact well based on specific knowledge (Muller-Eie, 2017). Then, this knowledge influences human perception, behaviour, and participation. The perceptions of residents of managers affect their behaviour and cause them to learn from previous behaviours to participate better and continue improving their ways of life to reach the expected point of equity.

Achieving sustainability of health in urban vertical housing is characterized by a balance between 3 dimensions: the social, the environmental, and the economic. In order to achieve residents' health goals, the social dimension needs to pay attention to their satisfaction with personal space, social space, public space, and sociocultural life. The environmental dimension for IAQ health needs to emphasize the space for a pleasant atmosphere and the support of a green environment (Leh, 2018). The economic dimension encourages the maintenance of space and equipment and gives access to the development of the financial capacity of its inhabitants. The three circles of social, environmental, and economic dimensions in the concept of sustainable development show a quality of life that continues with the principles of equity, responsibilities, and viability.

The residents and managers achieved unity when they had the same perspective in perception, behaviour, and participation. Both of them need to have the proper knowledge about IAQ. In environmental science, sustainability is characterized by the balance of the social dimension, the environmental dimension, and the economic dimension (Teng et al., 2019; Brown et al., 2015). The slices of the 3 (three) circles of the social, the environmental, and the economic dimensions show probably friction problems. Therefore, to achieve healthy and sustainable vertical housing, residents and managers maintain the balance of the three social, environmental, and economic dimensions by emphasizing satisfaction with residential spaces, sociocultural activities, open space relief, environmental support, ease in the economy, and maintenance of space.

Compared to that of Hawkes', this model is improved by proposing useable IAQ practices. The variable indicators of the cultural dimension transform from wellbeing, creativity, diversity, and innovation to knowledge, perception, and participation — the spirit then shifts from community wellbeing to housing planning. Additionally, social, economic, and environmental dimensions adapt to spaces of social-cultural, ease of room or building maintenance, and relief of healthy areas supported by the environment around the building. These will be consistent with IAQ completeness in creating healthy housing.

CONCLUSION
According to the model, apartment managers should survey residents' needs and satisfaction regularly (e.g., once a year), including an appraisal of the health condition of the residents so that they could improve the quality of service appropriately. It would increase the manager's capacity or competency occupancy management and knowledge about changing dynamic urban lifestyles. Creative and experienced managers have a management program that satisfies residents. Creating programs such as these can increase residents' knowledge and encourage the participation of residents to help maintain the sustainability of vertical residential management. In future studies, a healthy and sustainable urban vertical residential model emphasizing the economic dimension should be examined. Furthermore, it should explore the value of long-term routine financing for the physical management of housing and its impact on the social dimension.

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QUALIFYING AND QUANTIFYING THE INTANGIBLE FACTORS THAT ENHANCE IN INFRASTRUCTURE ASSET VALUATION

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Abstract

Infrastructure asset are included as a special property when one is conducting a valuation. The uniqueness of an infrastructure asset due to its specific functions and operations that are differ from other infrastructure asset. Thus, the tangible and intangible factors included for valuation are also difference and specialize according to each infrastructure asset. The issues of intangible factors that enhance in infrastructure asset valuation are arisen since the investor and stakeholders are concern in getting to know how much the asset are generating a profit compare to its expenses in operating the asset especially a public asset. This research aims to evaluate the application of intangible factors in infrastructure asset valuation. As intangible factors are unforeseen factors, thus this research elaborates on detailed intangible factors and how to identify the factors that influence to the value. The methodology adopted in this research is based on qualitative analysis by in depth interview with the experts that specialized in special property valuation. The research findings are derived from the content analysis. Based on the interview expert's session, this paper has also benefit in the form of knowledge and to the practitioner in implementing the intangible factors in infrastructure asset valuation.

Keywords: Intangible factors, special property valuation, infrastructure asset valuation, CIQ Complex, Malaysia

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INTRODUCTION

According to Nur Farah Hanna et. al. (2021), infrastructure assets involve mutually infrastructure and assets that operates and functions by completing each other and are commonly used to benefit to the society. Thus, in contributing to the society, the infrastructure assets operate with optimum functionality but with minimum income generation as the infrastructure assets are public assets. Referring to Asset Management Manual in World Road Association (PIARC), infrastructure asset valuation is highlighted because it considers the long-term financial planning and budgeting that influence to investment decision making. Weldemicael et al. (2017) added that asset valuation is the process of conveying monetary value to an asset. Infrastructure asset valuation is vital factor in the strategy planning for asset long term preservation, maintenance, restoration and replacement.

Thus, the issues of valuing infrastructure assets are highlighted because the infrastructure assets owner are categorised either government or private sector. The results from valuation with specific methods chosen as a tool will affect the owner in terms of the final value reach from the calculation of either in market value, rental or rating purposes. Hence, it is very essential for the valuer to well understand in order to implement the most suitable method in infrastructure assets valuation. By associating infrastructure asset as a special property, various valuation methods are adopted to value such kind of property. It is based on the special property types, functions and factors that affect the value. In some cases, the element of intangible value is highlighted because it does contribute to the final value of the special property.

International Valuation Standard (IVS, 2013) address only real property interest, infrastructure asset and plan equipment can be described as specialized public service assets. Infrastructure asset is known with their specialized features by design, specification or location that reliable comparisons can rarely be made with the prices of similar asset in the market. Generally, the infrastructure asset or other special property are best valued by using depreciated replacement cost method (DRC) (Ivannikov and Dollery, 2018; Molland, 2008). MVS (2019) supported that the current best practice to value a specialised property is by using DRC basis. DRC refers to the present cost of substituting an asset with a new equivalent asset less deductions for physical deterioration, functional obsolescence and economic obsolescence. It can be concluded as the replacement cost to the new asset and considering the deductions due to the obsolescence of the physical, functional and economic aspects. DRC calculation is based on the land value, building or construction cost and deduct with the depreciation. Thus, the calculation is based on the physicality of the infrastructure asset. However, there is another issue in the long-term run if the valuation is considering other elements such as concessions period, operation cost, income flow, holding cost, discounted cash flow and payback period. Then, discounted cash flow analysis

(DCF) is another approach that was highlighted to counter this problem. DCF includes all the costs and expenses by considering a specific time frame with further calculation of internal rate of return (IRR).

In contrast, there is also another aspect of intangible and social benefits that need to be measured in determining the value of infrastructure asset. This paper fills the gap in terms of the intangible elements that are unseen but actually influence to the value. Thus, this research is conducted because rather than highlighting on the tangible asset included in the calculation, there are actually other factors in the form of intangible factors that influence the functions and operations of the infrastructure asset. Indirectly, the intangible factors are influencing to the value. Thus, this research aims to evaluate the application of intangible factors in infrastructure asset valuation.

HOW TO VALUE INFRASTRUCTURE ASSET?
Special property valuation is a property with specialised nature or functions and it is rarely transacted (Malaysian Valuation Standards, 2019). Infrastructure asset is included as one of a special property. This is due to special or specific construction, arrangement, size or location involved for the specific property. Thus, due to the specialised property condition, then the valuation procedure are different from another special property. It is highly depending on the functions and operations of the special property.

Customs, Immigration and Quarantine Complex (CIQ Complex) as an example of infrastructure asset, this asset functions as the main checkpoint at the cross border of Malaysia-Singapore. Thus, in conducting a valuation, first step is to identify the asset functions and operations that must meet on subsection of specialised property definition in MVS (2019). Further details on the construction, arrangement, size and specification of the property proves that there is no market for those unique buildings. Other than that, due to the operational and business reasons of CIQ Complex that leads to no market for such buildings there. After analysing the items or factors that influence to the value of the special property, then decision can be made in using the right method of valuation.

In the case of CIQ Complex, this infrastructure asset belongs to the government, the land value and building cost invested are very costly. However, in the perspectives of investor, they want to know whether the investment will benefit to the society. Then, the intangible benefit to the society will added value to their investment and to the value of the infrastructure asset. How this new project development will save people time in crossing the Malaysia-Singapore boarder with less hassle, effective screening process, save people's money and save fuel due to less time stuck within the boarder. These are the intangible benefits from the project development and it will encourage more people to use the infrastructure asset specifically the CIQ Complex in this case study. Thus,

this research elaborates the valuation approaches for infrastructure asset by considering both tangible and intangible factors that influence to the valuation.

INTANGIBLE ASSET VALUATION APPROACH

Based on the previous research, there are methods of valuation for intangible assets. This is due to the generic intention of getting to know on how to translate the value of the intangible asset. As supported by RICS Valuation, Global Standards referring to VPGA 6, valuation of intangible assets under Part 5 of Valuation Application, intangible asset valuation requires a valuer to have a comprehensive information and thoughtful on such issues such as the owner's rights to the asset; what happen in the past and the current activities conducted within the asset; and the state of subject industry including the economic and political factors. Based on previous research, there are three main methods of valuation adopted for intangible assets. The approach are cost approach, income approach and market approach (Souza, 2017; Reily, 2019; Visconti, 2020; Chartered Global Management Accountant (CGMA), 2012; Junainah and Suriatini, 2019 and Parrington, 2016). Thus, the intangible asset valuation approach applied in various countries has been critically reviewed and the findings on intangible asset valuation approach are summarised in Table 1.

Table 1: Summary Review of Intangible Asset Valuation Approach

No.	Intangible Asset Valuation Approach	Details	References
1.	The cost approach	• Replacement cost new less depreciation method • Reproduction cost new less depreciation method	CGMA (2012); Paneth (2016); Reilly (2019); Visconti (2020).
2.	The income approach	• Profit split method • Incremental income method • Residual income method • Multiperiod excess earnings method	CGMA (2012); Paneth (2016); Reilly (2019); Visconti (2020).
3.	The market approach	• Relief from royalty method • Comparable uncontrolled transactions (sales) method • Comparable profit margin method	CGMA (2012); Paneth (2016); Reilly (2019): Visconti (2020).

Based on Table 1., the methods for intangible asset valuation are summarised consist of the cost approach by considering replacement cost and reproduction cost. As for income approach, the recognized methods are profit split method, incremental income method, residual income method and multiperiod excess earnings method. Finally, the market approach is detailed through relief from royalty method, comparable uncontrolled transactions method and comparable profit margin method. Trough analysing the intangible asset valuation approach, the next subtopic elaborates the tangible and intangible factors that enhance to infrastructure asset valuation in the case of CIQ Complex.

SUMMARY OF THE FINDINGS FROM PREVIOUS RESEARCH

According to the previous research (Nur Farah Hanna et. al., 2021), the valid items for tangible and intangible factors are detailed as in Table 2. Thus, these items have gone through a process of qualifying the right factors that influence to the value in infrastructure asset valuation. The next phase is to quantify the items for tangible and intangible factors and working on translating the items to value.

Table 2: Summary of Previous Research Findings

No.	Early Research Hypothesis	No.	Research Findings
	Tangible factors:		**Tangible factors:**
1.	Smart technology	1.	Land
2.	Land	2.	Buildings
3.	Buildings	3.	Plant and machinery
4.	Plant and machinery	4.	Infrastructures
5.	Infrastructures		
6.	Utilities		
7.	Weight Scales		
8.	Traffic management system		
	Intangible factors:		**Intangible factors:**
1.	Safety	1.	Safety
2.	Mobility	2.	Mobility
3.	Economic advancement	3.	Economic and Social value
4.	Sustainability	4.	Sustainability (Environmental quality)
5.	Social value		
6.	Environmental quality		
7.	Intellectual property		
8.	Image/ goodwill		
9.	Legal ownership		

Source: Nur Farah Hanna et. al. (2021)

Based on Table 2., the early research hypothesis of tangible and intangible factors are recognised through critical literature review from previous

research. The recognised factors then are investigated through in-depth interview with the experts to get their visions and remarks regarding the factors that influence to infrastructure asset valuation. The detailed tangible factors are listed in Table 3. Next, the detailed intangible factors are listed in Table 4.

Table 3: Detailed Tangible Factors

No.	Tangible Factors	Details	Authors
1	Land	Vacant land value	Chen et. al. (2005); Roubi (2004)
2	Buildings	Central office	Lutzkendorf and Lorenz (2011); Roubi (2004)
3	Plant and machinery	Equipment fittings, installations, apparatus and tools	Olawore (2011); Mohd Nasir et. al. (2012); Roubi (2004)
4	Infrastructures	Pavement, bridges and drainage structures	Alyami (2017)

Source: Researcher's Fieldwork (2020)

Table 4: Detailed Intangible Factors

No.	Intangible Factors	Details	Authors
1	Safety	Resilience and Risk mitigation	Amekudzi-Kennedy et. al. (2019); Dojutrek and Labi (2012); Weldemicael (2017); Juan Diego et. al. (2015) and Prena Singh (2018).
2	Mobility	Congestion mitigation, close distance to transit and traffic efficiency	Amekudzi-Kennedy et. al. (2019); Dojutrek and Labi (2012); Juan Diego et. al. (2015) and Prena Singh (2018).
3	Economic and Social Value	Demand drivers and service contributed to the community	Amekudzi-Kennedy et. al. (2019); Dojutrek and Labi (2012); Frischmann (2012); Juan Diego et. al. (2015) and Prena Singh (2018).
4	Sustainability (Environmental Quality)	Energy efficiency, functionality, serviceability, durability, indoor air quality, health friendliness, recyclability and Positive externalities, environmental risk	Amekudzi-Kennedy et. al. (2019); Lutzkendorf and Lorenz (2011); Dojutrek and Labi (2012); Frischmann (2012)

Source: Researcher's Fieldwork (2020)

As the result, from 8 identified tangible factors in the early stage of research, there are 4 tangible factors that really influence to infrastructure asset valuation. This is because, smart technology, utilities, weight scales and traffic management system are actually fall under plant, machinery and equipment (PME). It is supported by MVS (2019) where the definition of PME also mentioning regarding items that are assemble in the form as part of utilities, installations of building services, or systems related to machines or technology that installed for specific purposes. As for intangible factors, there are 9 identified factors at the early stage of this research. Through in-depth interview with the experts, it results in only 4 verified intangible factors that influence to the value. 2 of the early hypothesised factors are merge with other factors as there are inter-related. The factor of social value is combined with economic value. Same goes to another factor that is environmental quality and image/goodwill that actually result in as part of sustainability factor. The other factor that is intellectual property was withdrawn from the list due to its factor that is not really influence to the infrastructure asset valuation. After qualifying the items for tangible and intangible factors, this paper is focusing on quantifying the detailed intangible factors. It means that, this research will further investigate how to translate the intangible factors and turn it to value.

RESEARCH METHODOLOGY

Research methodology is very significant in achieving the aims of the research. The research methodology stage develops systematic research design and techniques to be implement in the research. The study is conducted and analysed based on qualitative analysis. In-depth interview with the experts specialized in intangible asset valuation, green building, registered valuer, cost-benefit analysis experts, person that managing the operational and functional of CIQ Complex and valuer specialize in special property are the target group of experts for interview session. Overall, ten experts are chosen and interviewed. The experts are chosen according to their great experience with the range of experience between 8 to 25 years. The in-depth interview is conducted on face-to-face with the experts and some of the experts are being interview online basis through Webex platform. All of the experts successfully sharing their opinions and comments on the tangible and intangible factors of CIQ Complex and explain the details regarding the factors that effect to the value. The questions to the experts are related to the expert's background as in Section A. The details of years of working experience and their expertise type were asked in the early part. On the next part of Section B, it is regarding the weaknesses of the valuation method for infrastructure asset valuation. Next, the detailed list of tangible and intangible factors is listed in the questions and the experts need to respond to each factor. The experts will answer either they are agree or disagree that the factors listed

will influence to the infrastructure asset valuation. Thus, the agreed factors will remain and will proceed with further analysis. However, based on the discussions with the experts, some factors that are not accepted are merged with other factors. Based on further discussions with the experts, the research result in either accepting or rejecting the factors that influence to infrastructure asset valuation. Thus, the results are not suitable to be presented in percentage form.

FINDINGS AND DISCUSSIONS

The findings of this research contribute to the knowledge of how to qualify and quantify the factors that influence to the infrastructure asset valuation. Based on the results, all of the experts opined that the favoured valuation method for infrastructure asset valuation is cost method. This is due to cost method that is appropriate to use to value a public infrastructure asset. Through cost method, the land value are considered through comparison method to get the land value per square feet. Other than that, is to get the building cost, plant, machinery and equipment cost and considering the depreciation for each cost item. Thus, further analysis is done to quantify the factors into value. According to the data analysis, Table 5 is the final findings of the research. The table illustrates the verified factors and how to identify these factors in translating it to value.

Table 5: Final Findings of the Research

No.	Research Findings	How to Quantify the Factor that Influence to the Value	Value
	Tangible factors:		
1.	Land	Depreciated replacement cost method	Economic (monetary)
2.	Buildings	Depreciated replacement cost method	Economic (monetary)
3.	Plant and machinery	Depreciated replacement cost method	Economic (monetary)
4.	Infrastructures	Depreciated replacement cost method	Economic (monetary)
	Intangible factors:		
1.	Safety	Cost approach or market approach	Economic (monetary)
2.	Mobility	Cost approach or market approach	Economic (monetary)
3.	Economic and Social value	Social benefit	Social (benefit)

4.	Sustainability (Environmental quality)	Cost approach or income approach	Environmental Quality (monetary)

Source: Researcher's Fieldwork (2020)

According to Table 5., the identified factors are categorized to the best approach in quantifying the factors that influence to the value. Overall, for tangible factors, it results in depreciated replacement cost method as the best approach to quantify the factors and translate it to the value. While for intangible factors, the findings are different and there are options of either to conduct cost approach or market approach to translate the intangible factors to value. However, as for economic and social value factor, the approach to translate to value is by referring to social benefit. Thus, these three approaches are deemed applicable to intangible asset valuation, that are cost approach, market approach and income approach.

Apart from that, the approach in translating the intangible factors to value can be divided to three elements, that are in terms of economic, social benefit and environmental quality. This concept is related to the cost-benefit analysis (CBA). CBA includes an organised classification of impacts that are benefits (pros) and costs (cons), and the value can be monetarised in specific currency value. A CBA is included as a subjective calculation tool. This is because the data added from cost and benefits considerations are influence by the choice of suitable data to support and estimate in the calculation. Through this concept, the economic and environmental quality element can be monetarised. Meanwhile, the element of social is referring to the benefit of the social and cannot be translated to value.

The costs involved in CBA include direct costs (workers involved in manufacturing, manufacturing expenses, raw materials or inventory); indirect costs (electricity, overhead costs from management, rent, utilities); intangible costs of a decision (impact on customers, employees or delivery times); opportunity costs (alternative investments or buying a plant or building); and cost of potential risks (regulatory risks, competition and environmental impacts). Besides, as for revenue, it might include revenue and sales increases from increased production or new product; intangible benefits (improved employee safety and morale, customer satisfaction or fast delivery); and competitive advantage (market share gained). Thus, according to the research findings, there are 4 identified intangible factors for CIQ Complex valuation as agreed by all experts. Each of the intangible factors is detailed in terms of the specific items referring to the factor and was derived by how to translate the items to value.

Due to infrastructure asset as part of special property, thus it is rarely transacted and it is hard to find the comparable data. This is supported by all of the experts during the interview. In terms of intangible elements being included

in infrastructure asset valuation, all of the experts agreed that the cost method that they adopted did not include the intangible elements. However, experts 3 and 8 added that the intangible elements are already included in the price per square feet for the built-up area of the infrastructure asset. Thus, they opined that the intangible elements are already influence to the value by considering the building materials attached to the infrastructure asset. This leads to disagreement of experts 3 and 8 towards the statement of that the results from valuation findings did not picture the real value of the asset. This is because, the price per square feet for the built-up area of the infrastructure asset already include the element of building materials which also influence to intangible factors that are environmental quality and sustainability. It is applicable especially for green building where they have all the criteria that relate to the sustainability in terms of energy saving and indoor air quality. Thus, the overall findings of the research result in the verified tangible and intangible factors incorporated in infrastructure asset valuation.

CONCLUSION

As a conclusion, the main research objectives are achieved where the best practice of valuation method is identified. Besides, the identified tangible and intangible factors of infrastructure asset valuation are investigated through in-depth interview with the experts. It has result in the most significant factor that influence to infrastructure asset valuation. Four tangible that are land, buildings, plant and machinery and infrastructures are the results for tangible factors that influence to infrastructure asset valuation. Another four intangible factors are the result of this research. The intangible factors are safety, mobility, economic and social value and sustainability (environmental quality). Other than qualifying the factor, this paper has also identified the suitable methods to quantify the tangible factors which by using depreciated replacement cost method as agreed by all experts. However, as an added value in this research, further investigation is done to quantify the intangible factors that influence to infrastructure asset valuation. The results are also presented of either the factors can be monetorised or it will benefit to the society. This research has contributed to the body of knowledge as well as practitioner can apply the output to the real practice.

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IDENTIFYING URBAN DESIGN PRINCIPLES AND ITS ATTRIBUTES FOR WATERFRONT TRANSIT-ORIENTED DEVELOPMENT (WTOD)

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Abstract

The booming development of transit-oriented development (TOD) worldwide, especially in high-density urban areas, has shown that many cities have started to transform their urban spaces into more sustainable and liveable cities. TOD integrates the mixed-use development around the public transport stations and promotes a pedestrian-and bicycle-friendly environment as a city lifestyle. However, such developments often lack integration with the contextual condition of the surrounding area, which in the case examined in this study is the waterfront. Many cities in developed countries such as Singapore, U.S. and Canada have started to reintegrate their TODs with the water bodies. Recent trends show that TODs are widely established in areas near the water body such as dockland and waterfront, as part of urban regeneration. Various urban design principles of waterfront transit-oriented development are available, but most of them are scattered across many documents. Thus, this research aimed to identify the urban design principles for waterfront transit-oriented development. The principles were developed using a qualitative method that included content analysis of journals, reports, and guidelines on transit-oriented development (TOD), waterfront development, and waterfront transit-oriented development (WTOD). In the end, the urban design principles of WTOD can guide professional stakeholders such as architects, planners, engineers, and others relevant to the field to reintegrate the TOD with the waterfront in future planning.

Keywords: waterfront transit-oriented development, transit-oriented development, waterfront development, urban design

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INTRODUCTION

Waterfront and transportation have continuously developed along with cities since the beginning of civilization. Both have continuously developed along with cities since the beginning of civilization. Hence, many urban centres around the world are located near the water bodies. As urban populations have increased, the usage amount of transportation has also increased accordingly (Rahmat et al., 2016). Later, transit-oriented development, or TOD was introduced as one of the solutions to support the urban growth (Ramlan et al., 2021).

TOD is defined as a new compact, green, mixed use and sustainable development developed along with the transit station, in which the transit station is within the walking distance centres the TOD area. Generally, a TOD neighbourhood has a 400m to 800m radius, which represents the pedestrian scale distances (5-10 minutes' walk) (Azmi et al., 2021). It is mainly aimed at advocating the usage of public transportation and walking as a lifestyle in a city, thus reducing the dependence on private vehicles. In other words, it offers a safe and pleasant place to walk and bike around with a variety of local goods and amenities nearby (Straatemeier, 2013).

Meanwhile, the term 'waterfront' here represents the water edge area, where the city meets the water body. Each waterfront development has unique development approaches according to its geographical location, and this is one of the most important factors that influence the growth and image of cities (Redzuan, 2018). Following the notion of TOD and waterfront, the term of waterfront transit-oriented development (WTOD) used in this research can be defined as a TOD that located in a waterfront area.

TOD became popular years later once it was introduced by Peter Calthorpe in the late 1990s (Calthorpe, 1993). Likewise, waterfronts also started to redevelop and reconnect to cities for public use through mixed-use development. Many developed cities have adopted TOD as the key driver in urban regeneration. Realizing the importance of integrating the waterfront with TOD, developed countries such as U.S. and Canada (in cities such as Poughkeepsie, Vancouver, and Toronto) have started to integrate the waterfront into their TOD guidelines through the development of the waterfront TOD guidelines (Metropolitan Transportation Authority, 2017; Vancouver City Council, 2009).

The policies regarding the TOD are very general and not specific according to the current contextual condition, which in this case, is on the waterfront areas. Neither of the TOD design guidelines emphasizes the incorporation of the waterfront into the TOD design. Hence, this research aimed to identify the urban design principles of WTOD. The research objectives encompass identifying the principles of TOD and waterfront and generating the urban design principles of WTOD. This research will cover on the TODs that are

established and located on the waterfront area and only focus on those which are located in a waterfront area.

LITERATURE REVIEW

This section will cover studies on the TOD terminologies, the principles of TOD and waterfront development and the underpinning theory used as the basis of this research. These topics are important to identify the urban design principles and its attributes for WTOD.

TOD terminologies

Although the term of TOD has been used widely around the world, not all cities have employed the same term to describe their developments around transit areas. This phenomenon applies especially to European and few Asian cities such as Copenhagen, Amsterdam, Singapore, Tokyo and Hong Kong. According to studies, the integration of transport and planning development has started before the concept of TOD was introduced in the 1990s. (Chor, 1998; Pojani & Stead, 2015; Straatemeier, 2013).

Examples of terms related to TOD that have been used worldwide are as follows:

   i.   Europe – Integrated Planning and Transport Network
  ii.   Singapore – Integrated Land Use and Transport
 iii.   Hong Kong – Rail + Property (R+P) Model
 iv.   US and other cities – Transit-Oriented Development (TOD)

Despite these differences in terms used, the aim and objectives emphasized through the guidelines are the same, which is to create and prioritized pedestrian environment, reduce private automobile dependency and encourage the use of public transport.

Principles of TOD and waterfront development

As mentioned previously, TOD planning is different according to the region and cultural context. Calthorpe (1993) defined seven principles of TOD as the guideline in developing TOD. The principles outlined include:

   i.   *organise growth on a regional level to be compact and transit supportive,*
  ii.   *place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops,*
 iii.   *create pedestrian-friendly street networks which directly connect local destinations,*
 iv.   *provide a mix of housing types, densities, and costs,*

   v.   *preserve sensitive habitat, riparian zones, and high-quality open space,*
   vi.   *make public spaces the focus of building orientation and neighbourhood activity, and*
   vii.   *encourage infill and redevelopment along transit corridors within existing neighbourhoods.*

The TOD guidelines, according to Calthorpe (1993), are designed to provide direction and policies for all levels of planning: regional, comprehensive, specific area, and zoning ordinances. This strongly suggests that the principles of TOD defined by Calthorpe are not intended as a universal model but are meant to be used as a reference guideline to help researchers and other professional bodies to design TOD guidelines according to their regions and cultural contexts.

Since then, various TOD guidelines have been developed by many developed countries around the world, especially in the U.S., Portland, Canada, Netherland, China and so on. According to studies, there are seven TOD dimensions: physical design (urban design), transportation, environment, social community, economy, collaboration and accessibility (Straatemeier, 2013; van Lierop et al., 2017).

However, only the urban design aspect of TOD will be discussed further in this research as according to studies, it is the most important element in developing a successful TOD (Jacobson & Forsyth, 2008). Studies indicated that the urban design aspect of TOD consists of density, mixed use, built form, accessibility, connectivity, pedestrian friendly and identity (Loukaitou-Sideris, 2010). These principles will be later employed to identify the urban design principles of WTOD. In line with urban regeneration, various waterfront urban design guidelines have been implemented to reattract people to the waterfront.

Underpinning theory: An integrative theory of urban design

The knowledge base of urban design theory is integrative, as it consists of substantive and procedural elements. Substantive elements include urban form and space and urban activities. On the other hand, procedural elements include intuitive, scientific, functional, and artistic methods. These integrated rules and urban design principles establish the physical environment of a city (Bahrainy & Bakhtiar, 2016).

Although urban design supports integration of principles, most urban design principles are addressed separately by prominent urban design thinkers such as Lynch (1960) – Legibility, Norberg-schulz (1980) – Meaning, Jacobs (1961)(1992) – Vitality, and Sitte (1965) – Good Form (Abdul Latip, N.S. 2011). Regardless of that, they emphasised the significance of establishing the urban experience throughout all urban space to reintegrate the urban form with the surrounding context. On a side note, these principles have been discussed together as a whole by Ernest Sternberg (2000).

Thus, Ernest Sternberg's Integrative Theory of Urban Design is more appropriate to be applied, as the author discusses the concept as a whole, as opposed to other authors who discuss each principle separately. The theory reflects the integration of urban design principles, which are good form, legibility, vitality, comfort and meaning (Sternberg, 2000). The principles will be employed as the basis of developing the urban design principles for WTOD. This will allow the relevant attributes to be categorized under each principle.

METHODOLOGY

This research employed a qualitative method, using case studies and content analysis of journals and reports from researchers that are relevant to research. The term of 'WTOD' is still scarce, as only few cities have implemented the WTOD guidelines for TODs located on the waterfront. Thus, in order to develop the urban design principles for WTOD, the identification of WTOD urban design principles were derived from the TOD urban design principles, waterfront urban design principles, and WTOD urban design principles.

Fourteen (14) case studies worldwide that are suitable to the context of WTOD were selected and reviewed. The case studies are from TODs in the U.S. (Poughkeepsie, Portland, and Austin), Canada (Vancouver and Toronto), Sweden (Stockholm), Denmark (Nordhavn), The Netherlands (Amsterdam), Singapore (Punggol), Japan (Tokyo), Australia (Brisbane and Perth) and New Zealand (Auckland).

The urban design principles of TOD, waterfront development and WTOD from the case studies were analysed. Later, the principles were categorised based on Ernest Sternberg's Integrative Theory of Urban Design, which incorporated urban design principles such as (1) good form, (2) legibility, (3) vitality, (4) comfort, and (5) meaning. The next part will discuss the analysis on the urban design principles of WTOD based on the Integrative Theory of Urban Design.

DISCUSSIONS

Since TOD was introduced by Calthorpe (1993), many developed countries perceived TOD as a smart growth strategy and key driver in urban regeneration to mitigate urban sprawl and promote new development near the transit. Many cities have started to acknowledge the integration of TOD with its contextual surroundings, which in this case, the waterfront (Knowles et al., 2020).

WTOD guidelines have only been implemented in four cities, namely Vancouver, Toronto, Poughkeepsie, and Punggol. There are studies that discussed the waterfront aspect along with the TOD principles in their TOD guidelines. This can be seen in TODs located in Amsterdam (The Netherlands), Stockholm (Sweden) and Perth (Australia) (Metropolitan Redevelopment Authority, n.d.; Stockholm City Council, 2010). TODs in three cities, which are

Tokyo (Japan), Portland (U.S.) and Auckland (New Zealand) have been found to discuss the TOD aspects in their waterfront development guidelines (City of Portland Bureau of Planning and Sustainability, 2010; Waterfront Auckland, 2014).

Meanwhile, there are also some cases where the waterfront aspect has been discussed separately (Department of Infrastructure and Planning, 2010; Urban Design Division, 2016). Cities without the WTOD guidelines have implemented the TOD and waterfront development guidelines separately. This can be seen in TODs located in Austin, Texas (U.S.) and Brisbane (Australia). There are WTODs that located on a bay, a coast, a lake, a riverbank, and a canal/waterway. According to studies, different types of waterfront have different approaches that fit to the surrounding context (Redzuan, 2018).

Table 4: Analysis of the urban design principles of TOD, waterfront development (WD) & WTOD guidelines based on the Integrative Theory of Urban Design

UD Principle	UD Attributes	Vancouver (CA) WTOD	Toronto (CA) WTOD	Poughkeepsie (US) WTOD	Austin, Texas (US) TOD	South Waterfront, Portland (US) WD	(US) WD	Nordhavn (NL) TOD	Amsterdam (NL) TOD	Stockholm (SE) TOD	Punggol (SG) WTOD	Tokyo (JP) WD	Brisbane (AU) TOD	Brisbane (AU) WD	Elizabeth Quay (AU) TOD	Perth City Link (AU) TOD	Wynyard, Auckland (NZ) WD
Good Form	Density	/	/	/	/	/	/	/	/	/	/	/	/		/	/	
	Building height & scale	/	/	/	/	/	/	/	/	/	/	/	/		/	/	/
	Building orientation	/	/	/	/	/	/	/	/	/	/	/	/		/	/	/
	Building frontage	/	/	/	/		/	/	/	/	/	/	/		/	/	/
	Climate responsive	/	/	/	/	/	/	/		/	/	/	/		/	/	/
	Building architecture	/	/	/			/	/	/	/	/	/	/		/	/	/
Legibility	Connectivity — Pedestrian walkways	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Connectivity — Cycling pathways	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Connectivity — Streets	/	/	/	/	/	/	/	/	/	/	/	/		/	/	/
	Acces — Ground level porosity										/						
	Acces — Visual access	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/

	Transit access	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Pedestrian access	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Parking & services	/	/	/	/	/	/	/	/	/	/	/		/	/	/
	Direct access to water	/	/	/		/	/	/	/	/	/	/		/	/		/
	Waterfront link to the city	/	/			/	/	/	/	/	/	/		/	/	/	/
Vitality	Mixed use	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Comfort	Seating	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Shading	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Greenery & landscaping	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Street furniture	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	Lighting	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Meaning	Identity	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/

According to Sternberg (2000), the 'good form' principle is pertinent in the integrative theory of urban design. As shown in Table 1, density, building enclosure, building orientation, building frontage, climate responsive, and building architecture styles are the attributes that are extensively discussed by most studies. However, studies related to waterfront development guidelines has been found not to discuss the attributes of 'good form' especially in Brisbane (Brisbane City Council, 2013). However, this is widely mentioned in the city's TOD guidelines. Although the attributes are not mentioned in the waterfront development guidelines, they are highlighted in the TOD guidelines or vice versa.

The 'legibility' aspect is also considered as an important principle that makes a good urban design of a city. In the context of waterfront development, Abdul Latip, N.S. (2011) stated that the legibility is associated with people's understanding of the city structure in getting near the water's edge. As this research has focused on integrating the waterfront and TOD, the legibility aspect both in the context of TOD and waterfront are studied to develop the urban design principles of WTOD. According to some studies, the attributes of legibility are classified into two categories, which are connectivity and accessibility.

Based on Table 1, pedestrian walkways, cycling pathways, and streets are commonly discussed in most studies concerning the connectivity principle. Studies have shown that these attributes provide important linkages and enhance the walkability in the waterfront and TOD area.

Meanwhile, studies on the accessibility showed the attributes related to visual access, transit access, pedestrian access, parking and services, direct access to waterfront and waterfront link to the city are widely discussed in most of the studies. The principles related to accessibility not only provide a clear direction or path, but also offer a sense of welcome to the users, enhance comfortability

and instil a feeling of safety, especially when they are near to the water or any parts of the TOD area (Fang & Xi, 2017). On a contrary, the ground level porosity attribute is only discussed in the studies of WTOD in Singapore. According to Urban Redevelopment Authority (2019) a high degree of ground-level porosity is to be maintained to improve wind flows and views, as well as convenient public access through the precinct. No physical enclosures or boundary walls should be permitted around the site to ensure high pedestrian accessibility. Regardless of that, its importance remains acknowledged in developing the urban design principles of WTOD as ground level porosity is considered an important aspect when developing the TOD located on the waterfront in Singapore.

Another important principle in the Integrative Theory of Urban Design according to Sternberg (2000), is 'vitality'. According to Jacobs (1961), the vitality of a city is influenced by its physical diversity. Diverse development comprises a mixture of uses such as residential, commercial, industrial, institutional, and those related to transportation within a desirable walking distance. As shown in Table 1, the presence of mixed use has been extensively discussed by most studies. According to Sung & Lee (2015), a mixed of activities that are located nearby the transit and waterfront area will eventually encourage walking and cycling within the city.

'Comfort' is another principle that is important in the Integrative Theory of Urban Design. According to Carmona et al. (2003), environmental factors, physical comfort, and social and psychological comfort are components of successful public spaces. Based on Table 1, seating, shading, greenery and landscaping, street furniture, and lighting are the attributes that commonly discussed in many studies. Clifton et al. (2008) stated that the shade provides by the tree canopy, for instance, brings a sense of enclosure, which eventually provides comfort, particularly in hot climates. Environmental conditions in public spaces and buildings, such as microclimate, sunlight, shelter, air circulation, and lighting are vital in creating a comfortable space in a hot and humid country like Malaysia (Rahman et al., 2015).

The aspect of 'meaning' is also described as important as the previous principles in the integrative theory. In this research, meaning does not necessarily associated with history and tradition. Concerning the waterfront and TOD, meaning can also be derived from the combination of both physical and experiential attributes without any historical involvement. Referring to Table 1, the attribute of identity has been significantly highlighted in the studies. People create meaning based on their experiences in which is influenced by the physical settings and activities that occurred, to give themselves the sense of identity. Additionally, designing a good urban place requires the combination of all urban qualities – 'good form', 'legibility', 'vitality' and 'comfort' (Jacobs & Appleyard, 1987).

Density without liveability could bring back the 19th-century urban poor. Without small-scale, fine-grain development, public places would lead to vast and overscaled cities. An aesthetic place is meaningless without activities that occur within it. Activities give meaning to space and shape the experiences within it. A diverse and densely developed urban structure would create an urban setting that is more meaningful that could enhance the meaning among the users.

FINDINGS

Based on the case studies, it can be inferred that all the outlined principles and attributes can be applied within the context of Malaysia, as current urban development patterns show neither significant differences from other cities across the continents. This research establishes five (5) significant findings:

(i)   Only a few cities have adopted the waterfront development guidelines into their TOD guidelines.
(ii)   It is important to consider the waterfront development guidelines when developing the urban design principles of WTOD, especially if a city has not included the waterfront aspect in its TOD guidelines or vice versa.
(iii)   Different WTODs are relevant to specific types of waterfronts. Hence, not all urban design principles are suitable for all TODs located on the waterfront.
(iv)   Each WTOD is different, making suitable approaches differ according to the type of waterfront. This is significant in developing the urban design principles of WTOD.
(v)   For WTOD areas in which development is too dense and there is limited land for development, ground-level porosity has been found to be the best alternative to improve the wind flows and provide convenient public access through the area.

CONCLUSIONS

This research developed the urban design principles of WTOD. Based on the findings from the analysis of 14 case study WTODs across four continents, it can be concluded that achieving contextual integration between the WTOD and water body necessitates the integration of urban design principles classified as good form, legibility, vitality, comfort, and meaning.

For good form, the attributes include density, building height and scale, building orientation, building frontage, climate responsive, and building architecture. In terms of legibility, the attributes are categorized under two aspects, which are connectivity and accessibility. For the connectivity aspect, the attributes that are greatly discussed include the pedestrian walkways, cycling pathways, and streets. The accessibility aspect stresses ground level porosity, visual access, transit access, pedestrian access, parking and services, direct access

to water, and waterfront link to the city. Meanwhile, the attribute of mixed use is greatly emphasized in conferring the vitality aspect. Seating, shading, greenery and landscaping, street furniture, and lighting are the significant contributors to comfort. Finally, the establishment of place identity through the combination of physical and experiential attributes is eminent in pertaining to the principle of meaning. The integration of principles of good form, legibility, vitality, and comfort is what gives meaning to a place.

The presence of principles and attributes could influence and facilitate authorities, developers, consultants, and urban caretakers (building owners) to plan, design and manage buildings and spaces along the waterfront that contextually integrate TOD and its water body. The urban design principles of WTOD may also influence the economic value of a country and improve the image of a city by promoting a healthy and sustainable living lifestyle for the people.

ACKNOWLEDGEMENTS

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THE INFLUENCE OF THE SENSORY STIMULI ASPECTS FOR THE EFFICIENT USE OF URBAN SQUARES IN IRAQ

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Abstract

This study aims to examine the impact of user sensory stimuli aspects (comfort, passive and active engagements, relaxation, and discovery) on the efficient use of urban squares in Erbil, Iraq, through public interaction. A questionnaire survey (298 respondents) was employed to collect users' opinions and was validated through expert interviews (13 interviewees) and field observations. PLS-SEM was used as the research method in this study to analyse the influence structure of the 298 respondents. The predicted model of the research can contribute to the body of knowledge among academics and practitioners. Findings revealed that the aspects of sensory stimuli have a significant influence on the efficient use of urban squares. For the efficient use of urban squares, comfort showed the greatest influence on social interaction.

Keywords: social interaction, sensory stimuli, PLS-SEM, urban square, Erbil, efficient use.

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INTRODUCTION

Urban squares are frequently used by people of all ages throughout the world's cities, especially when commercial buildings are densely packed. These locations are also designated for public activities. Globally, the continuous growth of city centres increases the demand for more effective urban spaces to serve the public and their social activities (Acar et al., 2020; Mandeli, 2019). The presence of an urban square is critical for public life, even more so in densely populated cities such as Erbil. However, urban square design has been reported to be mainly ineffective in meeting people's needs (Hatefishoja, Islami, & Rezaei, 2020; Zamanifard, Alizadeh, Bosman, & Coiacetto, 2018). The majority of studies examined physical aspects of the built environment in order to determine the most efficient use of successful urban squares. Nevertheless, studies that focus on sensory stimuli dimensions in order to optimise the use of urban squares in city centres are still insufficient. This study examines four major dimensions of sensory stimuli: comfort, discovery, active and passive engagement, and relaxation of users as they relate to social interactions and the efficient use of an urban square in Northern Iraq. The present study also aims to estimate the effect of the sensory stimuli in Erbil Square on social interaction in order to determine the most influential factor in enhancing social interaction in city centres. Comfort, active and passive engagements, discovery, and relaxation aspects are analysed through a questionnaire survey, supported by semi-structured interviews and field observations. The effects of these aspects are assessed using the partial least squares-structural equation model (PLS-SEM) and data from the questionnaire survey.

The relationship between sensory stimuli and user interaction in an urban square

Sensory stimuli in the form of spaces and their surroundings will cause us to walk and activate memories associated with those locations (Treib, 2008, Chapter 12). People are more likely to stay in an urban square if there is a comfortable place to sit, particularly if there is some protection from the elements (Mehta, 2014). People influence and are influenced by the environment, and for this contact to occur, it must be perceived that triggers in the form of sight, sound, smell, or touch will offer clues about the environment. "Sense" refers to the response of a person's sensory systems towards environmental stimuli. Pleasure resulting from a sensory insight in public space is influenced by various sensations experienced in the environment (Sulaiman, Abdullah, & Othman, 2019).

Non-visual aspects of sensation and perception are often underdeveloped and underutilised, despite adding to the richness of experience (Mehta, 2014). Pleasant sounds (waterfalls, fountains, etc.) can mask unpleasant sounds such as traffic noise (Carmona, Tiesdell, Heath & Oc, 2010). Previous studies (Carmona et al., 2010; Zamanifard et al., 2018) addressed the notion that

comfort, as well as active and passive engagements with the environment, are essential aspects of creating a good urban square as a public space. The user's presence in the urban square in witnessing, experiencing, and conversing with the community is referred to as passive participation (Nday & Manu, 2018).

Active engagement involves making the direct experience of the public in urban squares more enjoyable. To be an ideal urban square, it must provide opportunities for contact and spontaneous social interaction. By contrast, passive engagement with the environment refers to an encounter with an environment without actively participating in it, resulting in a sense of relaxation (Askari, Soltani, & Ahmad, 2015). In other words, the passive engagement design criterion necessitates an encounter with the environment but does not require active participation. As Carmona et al. (2010) explained, this can be accomplished through the incorporation of aesthetically pleasing design elements such as fountains, views, public art, and performances into the design of public spaces adjacent to pedestrian flow.

Previous research related the relevance of comfort in urban squares to a variety of elements, including safety (Mehta, 2014; Wang, Brown, & Liu, 2015; Yung, Conejos, & Chan, 2016), the effect of lighting (Ekdi & Çıracı, 2015; Nasar & Bokharaei, 2016), and noise aspects (Lam, Ng, Hui, & Chan, 2005) that would affect the comfort of users and their activities in these areas. Based on previous studies (Carmona et al., 2010; Shaftoe, 2008), people's comfort directly correlates with their feeling of safety inside the urban square. Concerning the benefits of public spaces, Yung et al. (2016) stated that the critical role of safety is to enhance social interaction and people's sense of community. Besides, a study by Zamanifard et al. (2018) found that the user's comfort in the urban square can be affected by other users' activity inside or outside the space. This activity has an effect on land use, pedestrian mobility, noise and odour, and automobile movement. Comfort, protection, efficient lighting, and a peaceful atmosphere all contribute to older people's stay in public open spaces (Zakariya, Harun, & Mansor, 2017).

The urban square should be viewed as a public space within a community, a place to unwind and enjoy the urban familiarity of the city, a location for a variety of different activities ranging from outdoor dining to space entertainment, and a place for social interaction (Van Hecke et al., 2018). In other words, no one goes to a public place to rest; they sit while eating or relaxing instead (Kim, 2018). Moulay (2017) focused exclusively on neighbourhood open spaces, which are regarded as the foundation of public space programmes, as they enable people from all walks of life to recreate, congregate, relax, and socialise on a regular basis within their residential community. In his research, Shaftoe (2008) discussed how people are fascinated by the possibility that there is more to spaces than meets the eye and that stepping through them will reveal a more interesting discovery.

Social interaction in the urban square
Interactions in everyday life between people from different ethnic groups foster social cohesion because they serve as the foundation for bonds between individuals (Peters, Elands, & Buijs, 2010). Social connection is also characterised as a process of mutual stimulation and interaction between at least two people (Hari & Kujala, 2009). In this case, social interaction does not apply to society as a whole; instead, it refers to creating users in the urban square through perception, activity, behaviour, and experience (Dias & Ramadier, 2015).

The urban square is a site of diverse interactions, experiences, and relations between multiple stakeholders whose decisions and activities influence the locations' qualities (Zamanifard et al., 2018). Social interaction in the urban square can be stimulated by watching others, having a short conversation, and sharing information, which results in a wide range of interpersonal relationships (Carmona et al., 2010). Few studies of the functional dimensions often come under what is generally referred to as "public space environmental attributes." In this sense, aspects of the urban square are described as a collection of processes and practises that ensure an urban square can perform all of its legitimate functions while managing the interactions and effects of these multiple functions in a manner that is acceptable to its users (Carmona, 2018; Zamanifard et al., 2018).

However, cities have struggled to design urban environments that promote social cohesion and sustainability due to a lack of public engagement (Moulay et al., 2017; Zakariya et al., 2017). This occurs despite the fact that urban squares are frequently constructed and designed to serve as alternatives for social activities (Moulay et al., 2017). Besides that, public spaces are frequently associated with social sustainability due to the increased social contact among urban residents (Zakariya et al., 2017), encouraging them to engage in social activities with their families, friends, and the larger public. This involves identifying with the culture and society as a whole (Emanuel, 2017). These events assist in bringing people together, reducing negative social activity, and providing significant sociocultural benefits, such as group satisfaction and crime reduction (Moulay et al., 2017).

This study investigated a model that incorporates variables as primary sensory stimuli for the efficient use of urban squares through social interaction (Figure 1). The objective of this study is to verify the effectiveness of the sensory stimuli aspects (comfort, passive and active engagements, relaxation, and discovery) on social interaction in the urban square.
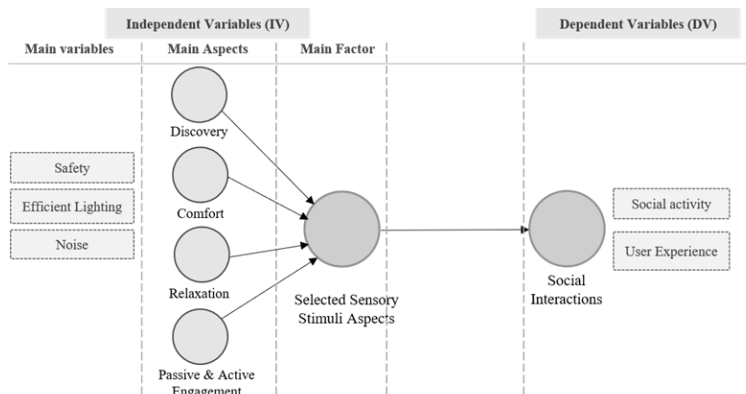
Figure 1: An integrated model of this study.
Source: Author

METHODS
Summary of Data collection technique
While other studies have collected data through observation and in-depth interviews, this study discovered that a questionnaire survey is the most effective method for examining the effects of user comfort, relaxation, discovery, and engagement on the efficient use of urban squares through social interaction. However, to enhance the reliability of the data, the study used in-depth interviews and observations as a secondary technique to corroborate survey results. To ensure a representative sample size and thus the reliability and validity of the results, a randomly selected group of 298 respondents from passers-by who frequently used the study area was chosen. A semi-structured interview with 13 former and current experts in urban design, architecture, planning, and landscape architecture was conducted to validate the survey results. Furthermore, the observation was conducted to document the facts about the research region's situation as well as the pattern of people's needs across various age groups.

Selection of Location
The study area for this research was Erbil Square in northern Iraq's Erbil City Centre. The Erbil Square is located in front of the Erbil Citadel, the city's most recognisable landmark and a UNESCO World Heritage Site (see; https://whc.unesco.org/en/list/1437) (Figure 2). Erbil Square is a significant urban space that facilitates a diverse range of social interactions and is generally safe (Ali, Ja'afar, & Sulaiman, 2020; Ibrahim, Mushatat, & Abdelmonem, 2015). The square is served by the city's primary public transportation system and is a relatively pleasant location for the public to congregate, sit, stroll through the city centre, shop, take photos in front of the historic citadel, and seek other forms of entertainment (Al-Hashimi, 2016).
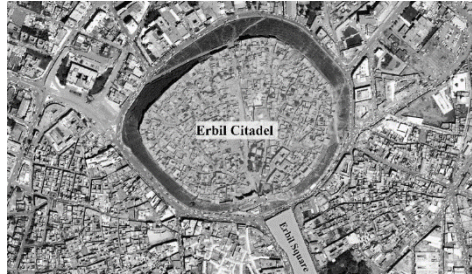
Figure 2. Erbil Square location in the south of Erbil Citadel in the city centre of
Erbil, northern Iraq
Source: Author

The study variables

As illustrated in Figure 1, this study examines several independent variables
related to sensory stimuli and dependent variables related to user interactions with
the urban square. Comfort, passive and active engagements, discovery, and
relaxation were selected as independent variables based on previous research and
field observations of the urban square. Based on the analysis of previous studies,
the aspects of social interaction (social activity and user experience) selected as
the dependent variables were "activity type," "social contact," "interesting,"
"enjoyable," and "pleasing." Based on the literature, this study explored a number
of variables based on prior research for efficient urban squares (Table 1). The
purpose of this study is to determine the effect of sensory stimuli variables on the
efficient use of the Erbil Square via users' social interaction.

Table 1: Variables used to analyse efficient use of urban square and associated aspects

Main variable	The Selected Characteristics		The measured items in survey
Aspects of Sensory Stimuli	Comfort	Efficient Lighting	The place is Lighted enough at night I feel the natural lighting is appropriated in this square.
		Safety	Feel safe in the place Feel very restful in a place It is free from negative activities
		Noise	The square is quiet from activities inside the place Noise from Heavy traffic around the place
	Relaxation		Space where we can meditate Can breathe fresh air in place
	Passive engagement	Attendance	Verity of entertainment activities in the place
		Watching	Possibility to capture many images because of a lot of surrounding scenes

Main variable	The Selected Characteristics		The measured items in survey
	Discovery		It reminds me of sweet memories
			The place reflects the city identity
Social interaction	Social activity	Activity type	times have been visiting the place
			have friends in the place
		Social contact	Meet & communicate with people from different social & cultural classes
			easy to start a conversation with unknown people inside the place
			Attendance to place
	User experience	interesting	The square is a public recreational space
		enjoyable	The square is a suitable place to spend leisure time
		pleasant	Participate in the public space.

Method of Analysis
In this study, PLS-SEM was used to identify the causal relationships between variables. The analysis was done using PLS-SEM to minimise prediction errors (Hair, Risher, Sarstedt, & Ringle, 2019). The study adopted SmartPLS software as the main tool to address the PLS-SEM method techniques (Ramayah, Cheah, Chuah, Ting, & Memon, 2018). However, this software was used to analyse the quantitative approach (survey questionnaire) to answer the hypothesis in this study. This study addressed the path coefficient analysis of the model to identify the effect of the sensory stimuli aspects on social interaction and the importance of these aspects to enhancing the efficient use of the urban square.

RESULTS AND DISCUSSIONS
The path coefficients for all sensory stimuli variables explained 26.2% of the variation in the social interaction of the urban square's environmental attributes (R-squared = 0.262).

The findings indicate that the sensory stimuli aspects significantly influence Erbil Square's efficient use for social interaction. According to Table 2, these variables are classified into four categories. The comfort variable's path coefficient is highly significant and predicts social interaction ($\beta = 0.251$, $t = 10.688$, $p < 0.01$). In other words, comfort as sensory stimuli aspect has a more positive effect on social interaction with the highest absolute value for the most efficient use of Erbil Square.

Table 2: Standardised coefficients (path coefficients) of the sensory stimuli

IV[1] » DV		Coefficients β	T Value	P Values
Comfort » SI[2]		**0.251**	10.688	**0.000**
Second Order (Comfort's Sub-variables)	Safety » SI	**0.151**	10.433	**0.000**
	Efficient Lighting » SI	**0.110**	9.439	**0.000**
	Noise » SI	**0.056**	8.283	**0.000**
Relaxation » SI		**0.137**	9.804	**0.000**
Active & Passive engagement » SI		**0.131**	9.144	**0.000**
Discovery » SI		**0.114**	9.500	**0.000**

*** $p < 0.01$ ($t > 2.58$), ** $p < 0.05$ ($t > 1.96$)
IV[1]: Independent Variables, DV: Dependent Variables
SI[2]: Social Interaction

The first variable in the comfort aspect is safety. The path coefficient values of safety have a significant positive effect on social interaction (*coefficients β = 0.151, t = 10.433, p < 0.01*). According to the survey results, 69.5% of users report feeling safe in Erbil Square. The finding implies that a sense of security-induced comfort may have a significant impact on social interaction and the efficient use of the urban square. The interviews corroborate this finding, indicating that the urban square may not be entirely free of negative activities. The interview with experts added that while certain negative activities, such as selling unregulated mobile phones or watches, are not dangerous, they are also undesirable. According to the observation, some individuals use a seating bench to sell their merchandise, while others, such as homeless individuals, use it as a place to sleep. This indicates that, while this was a harmless practise, it was inconvenient for many visitors to the urban square and harmed Erbil Square's success, necessitating additional oversight by public authorities to regulate these activities.

Efficient lighting in the second comfort dimension shows a significant positive effect on social interaction (*coefficients β = 0.110, t = 9.439, p < 0.01*). A well-lit space, in particular, can provide and emphasise a sense of comfort, safety, and reachability at night, while also reducing any negative activity. The following sentences, quoted from the experts, support the results:

"Through my observation, most Erbil Square visitors prefer to gather or stay in the middle of the square or to the south of it, especially at night, where most activities happen, and these area parts are well-lighted (9). In contrast, they are less interested in the north part, specifically the north-east, because it is less lighted and fewer business activities occur there (5,9)" (interviewee 5,9).

The majority of Erbil Square is illuminated at night, as users feel more secure in a lit area, and people prefer to be near the action. However, observation revealed that a few sections are poorly lit at night due to broken lights and a lack of proper maintenance, discouraging users from visiting that area at night. As a result, users will feel unsafe at night, highlighting the critical nature of the lighting experience for user interaction. Additionally, businesses and activities are necessary to enhance the users' sense of security and comfort in Erbil Square. However, due to the direct and intense sun rays, a sunny day can be uncomfortable for visitors as well, and people may avoid the urban square during these hours (between 11 a.m. and 5 p.m.). The urban square should consider adding shade to certain areas, similar to what private businesses provide on Erbil Square's east side.

As a follow-up to the preceding, the finding shows statistically significant but weak path coefficients of the noise variable (one of the comfort aspects) impacting on social interaction ($\beta = 0.056$, $t = 8.283$, $p < 0.01$). It can be explained, for example, that noise has a less significant but still substantial effect on social interactions and efficient use than safety and efficient lighting does on the comfort dimension. This can be explained by the fact that the abundance of attractive features in Erbil Square makes it more desirable for users to visit the space, despite the presence of some background noise.

The observation revealed that the majority of the traffic noise originates on the square's west and south sides. The road on the west side of Erbil Square is a major thoroughfare in the city centre, and it is frequently congested (Figure 3). This street is less than thirty metres from Erbil Square's central area. To put it another way, a quiet place is always a comfortable place, and thus, social interaction should be incorporated into any urban square, but not at the expense of all users. The Erbil Square hosts a variety of activities and performances, and some of these events may be noisy (music and festivals).

Figure 3: The Traffic Around the Erbil Square in Middle of Day.
Source: Author

Continuing with the sensory stimuli aspect of the study, the relaxation aspect demonstrated a significant positive effect on social interaction (Table 2), with an absolute value of $\beta = 0.137$, $t = 9.804$, and $p < 0.01$. The findings indicated

that Erbil Square is more of a resting place than a place for meditation, owing to its location in Erbil's city centre, one of the most crowded areas. The expert interview substantiated the conclusion and discussed how Erbil Square is a hub of activity and cannot be used for meditation by a large number of users. In addition, the observation supports this finding, demonstrating that the activities in Erbil Square and the congested streets surrounding it may make it unsuitable for meditation or getting some fresh air.

Passive and active engagements were found to have a significant positive effect on social interaction in Erbil Square (*coefficients β* =0.131, *t* = 9.144, *p* < 0.01), as shown in Table 2. Thus, passive and active engagements are necessary to increase social interaction in the urban square. Correspondingly, the interview with experts stated that both active and passive engagements (variables of sensory stimuli aspect) are essential for the efficient use of urban squares:

"… Providing different activities can encourage people to participate and engage in the Erbil Square and increase the sense of interest and anticipation of attending the place…" (Interviewee 7)

According to the statement above, the urban square can facilitate social interaction if it considers the needs of different genders and ages. The findings indicate that an increase in entertaining events on the urban square, such as annual festivals, open markets, and taking photographs of the surroundings, may have a beneficial effect on social interaction in Erbil Square.

According to Table 2, the discovery variable is the final variable in the sensory stimuli aspect (*coefficients β* =0.114, *t* = 9.500, *p* < 0.01). In Erbil Square, the results indicated a significant positive relationship between the discovery variable and social interaction. More precisely, the history of Erbil, the historical citadel, the heritage market "Souq," and the social environment in which multi-cultural people coexist define the Erbil identity; all Erbil Square users believe that the urban square reflects the city's identity. Generally, analysis of interviews and field observations indicates that sensory stimuli are classified into categories and subcategories, as shown in Table 3. The observation demonstrates that users prefer Erbil Square over other locations because the urban environment enables them to view the majority of Erbil's elements (Figure 3). This means that the advantage of the square can stimulate people's memories, thereby affecting user interaction within the space.

According to Table 3, interviewees identified significant markers for sensory stimuli that may contribute significantly to the efficient use of urban squares. These indicators, which include easy walking, night lighting, and a safe and welcoming environment, all contribute to Erbil Square's effective use for social interaction and user experience. Apart from that, a constant theme of discovery and enjoyment is the development of a vibrant atmosphere and seasons.

Table 3: Categories and Subcategories of Sensory Stimuli

Sensory Stimuli Aspects	Indicator
Efficient Lighting	The urban square areas should be well-lit all the time.
Safety	The urban square user should feel safe inside the urban square, and the location should be protected from all negative activities.
Safety	It should be easy to walk around in the urban square.
Noise	The urban square should be protected from external environmental disruptions, such as noise and other kinds of pollution.
Noise	The square should be surrounded by trees to protect the internal urban square area from external pollution.
Relaxation	The urban square should have places where users can meditate and relax.
Passive and Active engagements	The urban square should be able to allow different activities that encourage users to participate and engage with the environment.
Discovery	The design of the urban square should reflect the identity of the space environment.

Source: Interviews and Field Observations

CONCLUSION

Among other sensory stimuli aspects (relaxation, active and passive engagements, discovery), comfort had the highest significance and was predicted ($\beta = 0.251$, $t = 10.688$, $p < 0.01$) in social interaction. To enhance the urban square's comfort factor, its first level of mandatory activities, such as seeing, listening to, and being seen by others, should not be excessively large. This implies that one's distances and spaces must allow noticeable sight and visibility. People will use the urban square more often if they feel secure, comfortable, and relaxed while walking and sitting in it (night lighting, a safe and welcoming environment, and prohibiting traffic from driving near to the urban squares to reduce noise). The findings indicate that when architecture addresses the constant, seasonal, and vibrant use of space by tourists, the efficiency of an urban square in terms of exploration increases. Urban squares, for example, attract people when they are vibrant, colourful, clean, and exciting. As previously stated, relaxation is a critical aspect of sensory stimuli. It is accomplished primarily through the provision of suitable locations for sitting down, relaxing, eating, drinking, and conversing.

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ENERGY EFFICIENCY AWARENESS AND PRACTICES BASED ON ISLAMIC PERSPECTIVES

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Abstract

Currently, the main environmental concerns encountered by most countries are energy and its consumption. A green lifestyle and energy efficiency (EE) could reduce daily energy consumption. Nevertheless, low awareness and knowledge of EE prevent proper green lifestyle practices to save energy and the environment. Thus, the study aims to examine building occupants' EE and energy conservation awareness and practices based on Islamic perspectives. The study objectives are to examine the level of EE awareness and practices among Malaysian building occupants and incorporate the potential of Islamic teachings from al-Quran concerning energy consumption and conservation in the EE awareness campaigns. The study used the qualitative research method, which involved a literature review, observation, and narrative study. As a result, the significant relevance of EE awareness and practices along with Islamic teachings is explained further in this study. Moreover, instilling knowledge, creating awareness and encouraging occupants to implement EE practices, which consequently reduce energy demand and energy consumption, hence, mitigating the detrimental environmental impacts. The study is crucial in raising public awareness of the Islamic perspectives linked with energy conservation and provides a framework for future development plans that embody EE elements aligned with Islamic teachings.

Keywords: energy efficiency, energy conservation, Islamic perspectives

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INTRODUCTION

Climate change and various other environmental issues are alarming. Immediate actions should be taken to prevent the worst consequences. Proper solutions at a global scale are necessary but several strategies can still be implemented in daily lives to minimise environmental impacts. The global energy consumption has grown by 30% and approximately 7.8 million were registered as electrical users under Tenaga Nasional Berhad (TNB) Malaysia, with home users accounting for 82%, 17% were commercial users, 0.4% were industrial users, and 0.6% were other users (TNB, 2014).

The Association of Water and Energy Research stated that EE improvements could mitigate environmental issues, boost economic development, and reduce energy demand and consumption (S. Mekhilef et al., 2012). Nonetheless, Abdul Majid and Ibrahim (2011) listed three major EE challenges: issues regarding architectural design, appliances or services (technological efficiency) and behavioural concerns. Although human behaviour is an issue in improving EE, behaviour-based approaches are a rewarding strategy for EE and energy conservation (Twumasi, Elvis et al., 2017). Sustainable ecology ideas are related to 'nature and technology', where individuals are conscious of the need to protect the environment despite their actual behaviours (Bakar et al., 2017).

Finlay and Palmer mentioned that the ecological worldview of 11 main global religions could encourage effective environmental policies development. Meanwhile, Jaelani et al. (2017) suggested that incorporating religion in organisations that outline development and the environment promotes conservational approaches including humanity programmes. Considering that human behaviour is closely connected to energy usage, reducing energy consumption could be more effective once occupants are aware and understand the concept of energy and EE (Zhao, Song & Wang, 2019; Kasavan, S. et al., 2021).

The study examined building occupants' EE and energy conservation awareness and practices based on Islamic perspectives. The study objectives include: (1) To study the level of EE awareness and practices among Malaysian building occupants and (2) To incorporate the potential of Islamic teachings from al-Quran regarding energy consumption and conservation in EE awareness campaigns. Hence, the study is essential in raising public awareness of the importance of Islamic teachings incorporated with EE practices to minimise energy consumption and encourage energy conservation. Moreover, the study enhances the literature by constructing a framework for future development plans that embody EE elements aligned with Islamic teachings.

RESEARCH METHODOLOGY

The study applied the qualitative research method by reviewing past literature on users' awareness and EE practices in buildings. Secondly, an observation was conducted on building occupants' current behaviour and practices on energy consumption. Thirdly, a narrative study was performed on Quranic verses to incorporate Islamic teachings into energy use, EE, and energy conservation. Fourthly, the study conducted a content analysis of energy concepts, use, EE, and energy conservation based on Islamic perspectives. Data triangulation involved incorporating Islamic perspectives with EE knowledge and practices. Lastly, conclusions were drawn from the findings and discussions.

SYSTEMATIC LITERATURE REVIEW

Scope	Energy efficiency	Obstacles in Implementing Energy Efficiency	Incorporation of Islamic Perspectives into Energy Use & Energy Efficiency
Objectives	- To study the level of EE awareness and practices among Malaysian building occupants.	- To study the level of awareness and practices of energy efficiency (EE) among building occupants in Malaysia.	- To incorporate the potential of Islamic teachings from al-Quran regarding energy consumption and conservation in EE awareness campaigns.
Keywords	Energy efficiency, Energy conservation, Islamic perspectives.		
Author(s) & Year	Murray G. Patterson (1996), International Energy Agency (IEA) (2014), Reshmi Banerjee (2015).	Cleary & Palmer (2020), Gillingham & Palmer (2014), Sorell et al. (2014), Thollander et al. (2010), Galarraga et al. (2011), Castellazi et al. (2017), Gupta & Gregg (2017), (Langlois-Bertrand et al. (2015), Bithas and Nijkamp (2017), D'oca et al. (2018), Cattaneo (2019), (Lah (2015), Frederiks et al. (2015), Gupta & Gregg (2017), Labanca & Bertoldi (2018), Gillingham & Tsvetanor (2018), Biresselioglu et al. (2018), Ebrahimigharehbaghi et al. (2019).	Finlay & Palmer (2003), Jaelani et al. (2017).
Discussion	**Definition of Energy Efficiency** - Consuming lesser energy to achieve the same number of tasks, services or useful output (Murray G. Patterson, 1996). - An action that provides more services for the same or less amount of energy input [International Energy Agency (IEA), 2014]. - The assessment on the amount of energy needed in providing the same degree of	**Energy Efficiency Gap** - Consumers tend not to invest in purchasing energy-efficient appliances despite the potential to save money (Cleary & Palmer, 2020). - Cleary and Palmer (2020) stated that theoretically, *'energy efficiency gap'* denotes investment in energy efficiency should be larger than the present condition. - The gap in EE is mainly due to the impediments to EE policies and	**Importance of Ecological Worldviews** - **Finlay and Palmer (2003)**: ➢ Examined the ecological worldviews of eleven major global religions and investigated how the matter facilitates in the development of effective environmental policies. ➢ World religions could become powerful and influential contributors in various conservation programmes

comfort, performance or convenience by a similar type of product, building or transportation with technological change (Reshmi Banerjee, 2015).

Significance of EE Implementation (Reshmi Banerjee, 2015)

- The EE promotes monetary safeguarding and greater savings on monthly utility bills.
- The EE minimises the environmental and social impacts regarding energy production and consumption (acid rains, air pollution, loss of wilderness areas and global warming).
- The EE mitigates global warming and preserves the ecosystems by reducing greenhouse gas emissions, improving EE technologies and practices, reuse or recycling products.
- The EE increases the life of equipment and lowers maintenance costs by reducing operating hours and at a lower capacity.

practices (Gillingham & Palmer, 2014).

Categories of EE Constraints

- **Economic constraints:** Obstacles in obtaining credit, shortage and unreliable funding, comprising a significant risk for investors and financial institutions (Sorell et al., 2014; Thollander et al., 2010; Galarraga et al., 2011; Castellazi et al, 2017; Gupta & Gregg, 2017).
- **Institutional impediments:** Contradictory guidelines in the administrative bodies, weakness of policy coordination (Langlois-Bertrand et al., 2015; Bithas and Nijkamp, 2017; D'oca et al., 2018, Cattaneo, 2019).
- **Behavioural obstacles:** Low awareness in EE including non-energy advantages, insufficient knowledge or behavioural aberration in interpreting information, lack of confidence, consumers' attitude and lifestyle (Lah, 2015; Frederiks et al., 2015, Gupta & Gregg, 2017; Labanca & Bertoldi, 2018; Gillingham & Tsvetanor, 2018; Biresselioglu et al., 2018, Ebrahimigharehbaghi et al., 2019).

globally through narrative, rituals, education, religious advice, civic engagement and campaigning.

- **Jaelani et al. (2017)** :
➢ Addressed how religion could be incorporated in organisations that emphasise the environment and development to promote multiple conservation approaches and organise humanity campaigns in general.
➢ As Muslims, Quran verses constantly act as a reminder to encourage practicing energy conservation and EE.

FINDINGS AND DISCUSSION

Observation at one local higher institution demonstrated low EE awareness, thus weak EE and conservation practices among occupants. Figure 1.0 illustrates the occupants' behaviour in keeping the windows open while operating air-conditioning. Moreover, occupants tend to keep the electrical lightings on despite bright and sufficient daylight. This explains the low awareness and knowledge of the impact of energy on building management and the environment. this lack off EE knowledge and practises among occupants will eventually have an impact on the high energy demand in faculty buildings, raising the energy cost of utility bills. Besides, towards the environment, inefficient use of energy will contribute to an increase in carbon emissions into the atmosphere, resulting in many environmental issues such as global warming, climate change and extreme natural disasters.

Figure 1.0: Lack of awareness and knowledge in EE practices among students

Various environmental concerns have prompted many studies to investigate the role of religious teachings in forming environmental views. For instance, Islam could play a vital role in resolving problems between development and the environment. Table 2 describes the moral values learnt from the Quranic verses and the Tafsir or explanations and the incorporation of the verses with energy concept issues.

Table 2: The EE principles and how Islamic teachings can be integrated for greater impact on the EE Campaign

The EE Principle on knowledge and practice	Source of Islamic Principle	Explanations
Justice must be served for the benefit of all. - By establishing a framework on energy policy, production and	**Al-Quran - Surah Al-Nisa', (4:135):** "O you who have believed, be persistently standing firm in justice, witnesses for Allah, even if it be against yourselves or parents and relatives. Whether one is rich or poor, Allah is worthier of both.1 So follow not [personal] inclination, lest you not be just. And if you distort [your testimony] or refuse [to give it], then indeed Allah is ever, with what you do, Acquainted."	• The verse informs us that everyone in their scope of responsibility or leadership should adopt justice as a trait. • Every human being is commanded to fulfil the demands of justice by being firm personally while making initiatives to ensure that others view that justice is served.

distribution, energy security and mitigating climate change.		• The world situation cannot improve by waiting for someone to come along and rectify the problem, the issues should be resolved proactively. • Therefore, energy management should be fair and just in an equitable manner.
Everyone should be responsible for their energy use. - Every individual in the government or any organisation should engage in participating and benefiting both (multiple and external) stakeholders in the efforts to reduce energy use as a societal obligation, thus protecting and preserving the environment.	**Al-Quran - Al-Baqarah (2:195):** "And spend in the way of Allah and do not throw (yourselves) with your (own) hands into destruction (by refraining). And do good; indeed, Allah loves the doers of good." **Al-Quran - Al-Qasas (22:76-77):** "Indeed, Qarun was from the people of Moses, but he tyrannised them. And We gave him of treasures whose keys would burden a band of strong men; thereupon his people said to him, 'Do not exult. Indeed, Allah does not like the exultant.'" [76] "But seek, through that which Allah has given you, the home of the Hereafter, and (yet), do not forget your share of the world. And do good as Allah has done good to you. And desire not corruption in the land. Indeed, Allah does not like corrupters." [77]	• One requirement of human actions is to complete the duty that has been assigned to them. • Another requirement is to conduct the duty reasonably, giving all of one's capabilities and resources towards the duty. • A man's fear of God is sufficient for the first level of conventional obedience. • *Ihsan* is a higher level that requires a great love for God and a deep commitment to Him. • Energy is used for the benefit of the community as a type of worship (Taqwa) and utilised to protect the environment from destruction (pollution) and to conserve energy (Ihsan). • The Quranic verses remind humans not to gloat with their possessions or be arrogant and proud of their wealth. • Instead, man should utilise the tremendous riches and great vast blessings bestowed by Allah to love, worship Him and be closer to Him by committing a range of good deeds which will bring rewards in this life and the hereafter. • Therefore, the human goal is not to propagate corruption and damage the creations of Allah. • In terms of energy use and conservation, humans are prohibited and condemned for causing harm to the Earth (overexploitation of energy resources, pollution and squandering energy).
Selflessness in conserving and preserving the Earth. - Researchers, practitioners and policymakers constantly seek opportunities to increase awareness of EE and conservation	**Al-Qur'an - Al-Hashr (59:9):** "And (also for) those who were settled in the Home (al-Madinah) and (adopted) the faith before them. They love those who emigrated to them and find not any want in their breasts of what they (the emigrants) were given but give (them) preference over themselves, even though they are in poverty. And whoever is protected from the stinginess of his soul – it is those who will be successful."	• The verse explains to Muslims about the Ansar (Muslims in Madinah). • They donated to Muhammad peace be upon him (SAW) their gardens and oases with a request that he distributes them among their emigrant (Muslim brothers). • The Ansar was very selfless as they would work, strive and make the emigrant partners work in the harvest. • Therefore, regarding energy consumption and energy conservation, every individual, community and organisation should encourage and improve by cooperating in constructing energy conservation policies, advancement in EE approaches and energy subsidies.

practices among occupants.		
Be Grateful and utilise natural resources reasonably. - Reducing energy consumption could lessen the generation of energy, thus minimising carbon dioxide emissions into the atmosphere. - Utilise natural daylight and ventilation to obtain optimum comfort and good indoor environment quality. - Explore new potentials to incorporate passive design elements into homes or building designs.	**Al-Quran - Hud (11:61-68)**: "And to Thamud (We sent) their brother Salleh. He said, 'O my people, worship Allah; you have no deity other than Him. He has produced you from the Earth and settled you in it, so ask forgiveness of Him and then repent to Him. Indeed, my Lord is near and responsive.'" [61] They said, "O Salleh, you were among us a man of promise before this. Do you forbid us to worship what our fathers worshipped? And indeed, we are, about that which you invite us, in disquieting doubt." [62] He said, "O my people, have you considered: If I should be upon clear evidence from my Lord and He has given me mercy from Himself, who would protect me from Allah if I disobeyed Him? So, you would not increase me except in loss". [63] "And O my people, this is the she-camel of Allah – (she is) to you a sign. So, let her feed upon Allah's earth and do not touch her with harm, or you will be taken by an impending punishment". [64] "But they hamstrung her, so he said, 'Enjoy yourselves in your homes for three days. That is a promise not to be denied (unfailing)'". [65] "So, when Our command came, We saved Salleh and those who believed with him, by mercy from Us, and (saved them) from the disgrace of that day. Indeed, it is your Lord who is the Powerful, the Exalted in Might."[66] "And the shriek seized those who had wronged, and they became within their homes (corpses) fallen prone." [67] "As if they had never prospered therein. Unquestionably, Thamud denied their Lord; then, away with Thamud." [68] **Al-Quran - Al-Mukminun (23:18-22)**: "And We have sent down rain from the sky in a measured amount and settled it in the Earth. And indeed, We are able to take it away." [18] "And We brought forth for you thereby gardens of palm trees and grapevines in which for you are abundant fruits and from which you eat." [19] "And (We brought forth) a tree issuing from Mount Sinai which produces oil and food (i.e.: olives) for those who eat." [20] "And indeed, for you in livestock is a lesson. We give you drink from that which is in their bellies, and	• The verses describe the story of Salleh and the people of Thamud. • Prophet Salleh is entrusted to awaken the people of Thamud from their lack of devotion. • Nevertheless, they rejected Salleh's word while Salleh defends his honesty by providing them a she-camel as a sign from Allah. • They murdered the camel and are threatened with annihilation. • Only Salleh and his followers were rescued from annihilation while the people of Thamud were utterly annihilated. • The story of Salleh and the Thamud people teaches about giving thanks for Allah's blessings and wealth by coming closer to Him and utilising the blessings to make development for the people and environmental benefits. • Allah explains in the surah (verse 18-22) that He (Allah) brought down rainwater from the sky in the appropriate amounts, not too heavy to produce a flood calamity and not too little to irrigate the gardens or plantations that require it. • The rainwater provides humankind with milk to drink and as modes of transportation. • From the verses and with knowledge, humankind should be encouraged to examine technological

	for you in them are numerous benefits, and from them, you eat." [21] "And upon them and on ships you are carried." [22]	advancement in EE and conservation, such as development through renewable energy resources.
Implementation of passive or green design elements. - Employing a passive design approach to the maximum extent to reduce building energy consumption, increase occupants' comfort, protect occupants from harmful forms of energy and minimise building energy demands.	**Al-Qur'an – Al-Baqarah (1:205)**: "And when he goes away, he strives throughout the land to cause corruption therein and destroy crops and animals. And Allah does not like corruption."	• Tafsir by Jalalyn describes that the verse explains those who do nothing but propagate and damage crops and livestock (society resources) are classified as 'corruption'. • Therefore, Allah completely condemns the behaviours. • Regarding energy use and conservation, humankind as caliphs is prohibited to exploit and waste energy but should instead promote the preservation of the environment, utilisation of energy, EE and energy conservation.

The ultimate aim of human existence is to fulfil two essential roles: to serve Allah as His caliphates and His servants. Although humans are inclined to savagery and destruction, Allah has delivered groups of prophets, as-Siddiq (honest people), as-Syuhada' (witness to truthfulness of Islam), Mukminin (strong believer), and Islamic scholars (Tafsir Ibn Kathir). The groups of people serve as guides for all human beings in managing the Earth following Allah's will. Allah has allowed humankind to perform duties as His caliphates through these specific people. As caliphates, one of the responsibilities He has assigned to mankind is to protect and preserve the environment, which are critical components in giving lives and maintaining existence. Hence, in the present day and age, Islamic scholars and authority bodies, the government, and environmentalists should continuously be aware and nurture knowledge of energy use and conservation to raise public awareness in practising proper energy management, efficiency, and reducing energy use.

Based on the analysis made above in Table 2, from the Qur'anic verses, we are outlined with many references, guidance and advice for humankind to live

on earth and manage its resources, which benefits all humankind along with other living things. From these Qur'anic verses regarding energy use and energy conservation, we have been taught to be responsible, selfless, just and grateful in our energy use. As a result of the lessons learned from Islamic teachings, everyone is encouraged to get involved in finding initiatives to use, sustain and protect natural resources from depletion. For example, every individual should utilise energy to its fullest in everyday routines, like preferring to sun-dry their laundry instead of using a dryer at home or in the office, workers can be encouraged to use laptops instead of desktops as laptops are more energy efficient; make sure to unplug the chargers when not in use. Besides, these Qur'anic verses have created awareness in humankind on how to be grateful for the benedictions that Allah has given and how we are responsible as khalifah to manage our consumption. For instance, as a home-owner or a designer or even an individual, we can try many ways in order to minimise building by implementing passive design elements in our buildings, like installing solar panels and favouring investing energy-efficient appliances, so that, energy is utilised wisely without any wastage.

People who value the Earth should utilise and pray to Allah to protect the environment and perform initiatives to maintain optimal preservation of the environment. Tafsir al-Misbah outlined that in response to Allah's admonition to humankind not to harm Earth, humans must preserve environmental sustainability and cleanliness. The initiatives could decrease environmental impacts given that a cleaner environment could benefit mankind in preventing unwanted implications, such as disease, sickness, pollution, global warming, and climate change. Summarily, Muslims are equipped with life-long guidance and teachings from the Quran, which constantly remind of energy use and conservation. The Quranic verses are the examples of warnings (awareness) and knowledge needed by mankind to enable practices on proper energy management, EE, and energy conservation, therefore mitigating the detrimental environmental impacts to benefit mankind, other living beings, and the environment.

CONCLUSION

The study emphasised the critical relevance of EE awareness and practices to reduce energy use, hence minimising detrimental environmental impacts. Past studies highlighted the importance of awareness, knowledge, and understanding of energy concepts that could aid in the implementation of EE practices. Low awareness contributes to the lack of knowledge and lowers EE investment costs, causing high monthly electrical utility bills, failure to achieve target reduction of energy consumption, and hinders energy conservation efforts.

Referring to the Quranic verses, positive attitudes towards awareness, knowledge, use of energy, and EE practices among consumers can be instilled

and nurtured. Consumers must possess awareness, in-depth knowledge, and direct exposure of EE as individuals with a significant role in fostering public awareness and knowledge by incorporating Islamic perspectives based on al-Quran for the benefits of humankind and the environment.

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THE ARCHITECTURAL STYLE WHICH ATTRACTS PEOPLE TO THE TRADITIONAL URBAN VILLAGE: KAMPONG BHARU AS A CASE STUDY

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Abstract

The traditional village is one of the urban design typologies where its survival depends on its success in attracting people. The number of people visiting an area can be considered as one of the factors used in assessing the overall success of a place. However, due to rapid urbanisation, the unique character of traditional villages in urban areas or cities can be seen as outdated or considered as not worth preserving. Thus, this paper aims to identify the buildings within a village that can create a character for the area, and which act as important physical elements that contribute towards the success of a traditional village in an urban setting. This case study was conducted in Kampong Bharu, Kuala Lumpur, and a mixed-method approach was used involving personal observations, in-depth interviews, and questionnaires with 330 respondents. The result revealed that buildings, as a physical element, play an essential role in attracting people to Kampong Bharu. Thus, this element should be considered for preservation in any regeneration programme targeted at existing traditional villages which are located in urban settings.

Keywords: Urban Village, Urban Design, Successful, Building, Kampong Bharu

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INTRODUCTION

Urban design involves multidisciplinary disciplines, namely: architecture, town planning, landscape architecture, and geographer. It involves planning the use of existing resources and the organisation of land use, transportation, and other networks (Ja'afar N.H., 2017). One of the definitions of urban design is 'life between building', where the village and the layout of the building within the area exist as a single typology (Ja'afar N.H., 2017; Ja'afar N.H. & Harun N.Z., 2018; Murtaza, F. F. N., 2020).

The concept of a village area differs depending on whether it pertains to an urban or town area. A village portrays its own unique characteristics, such as a sense of calmness, an uncomfortable feeling, nostalgic memories, a respected legacy, an association with greenery or nature, and the other elements its particular location provide unrelated to the economic growth cycle (Kamus Dewan Bahasa dan Pustaka; JPBD, 2001, 2016; Ja'afar N.H., 2017). The settlements which are known as 'traditional villages' are not only found in rural areas, but also exist in urban areas, according to Plan Malaysia (Federal Town and Country Planning Malaysia-JPBD, 2016). This type of village has been selected as a case study for urban design research.

On the other hand, the physical elements are important features for determining the potential activities, characteristics, and space design of a city (Ismail W.N.W. et al., 2017). Ismail W.N.W. et al. (2017), confirmed that the physical aspects of buildings and areas do contribute to the success of a municipality. However, according to Ja'afar N.H. (2017), current development typically tends to ignore the physical elements of traditional villages that are located in urban areas. For instance, several traditional villages in the urban area of Kuala Lumpur have been demolished and replaced with new developments which utterly ignore the existing character of the surrounding buildings. Due to this, the newer generations of young people are unable to understand the historical character and historical events associated with the places where they reside or visit (S. Alhabshi, 2012). This scenario happened in the areas of Kampung Abdullah Hukum and Kampung Kerinchi in Kuala Lumpur. Kampong Bharu is an iconic urban village in Kuala Lumpur, and may also suffer the same misfortune if serious remedial action is not taken soon (Figure 1).
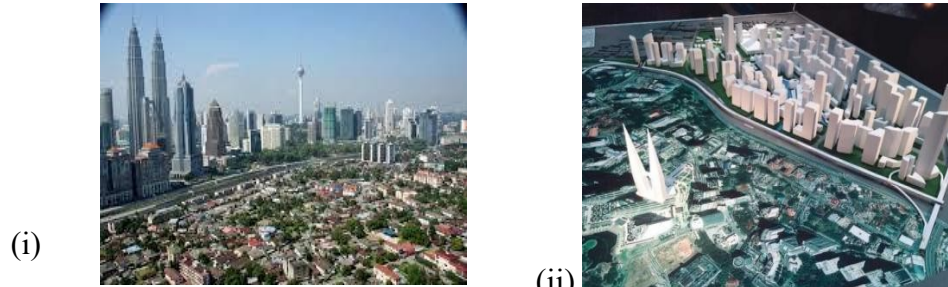
Figure 1: (i)View of Kampong Bharu in 2014 and (ii) future development of Kampong Bharu
Source: Ja'afar N.H. (2017)

Figure 2: (i) Development of Kg. Abdullah Hukum and (ii) future development of Kg. Abdullah Hukum
Source: Kosmo (2015) (iii) Metro (2016)
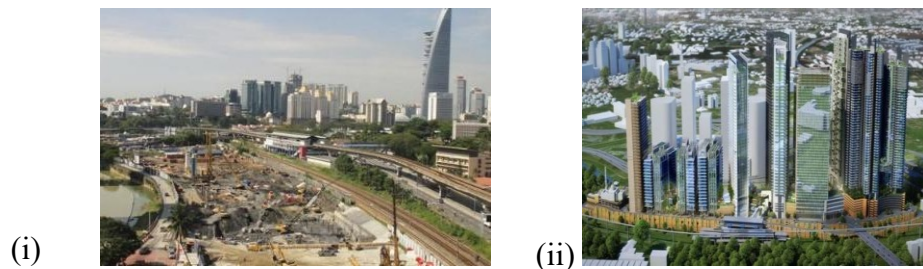
Figure 3: (i) Kg. Kerinchi in 1977 and (ii) future development of Kg. Kerinchi
Source: Metro (2016)

Thus, this paper aims to focus on the physical elements, which provide the overall design and character of buildings, which can in turn contribute towards the creation of an identity for a traditional village within a modern city. Kampong Bharu in Kuala Lumpur, the capital city of Malaysia, is considered as a unique case study due to the traditional character of the buildings and the uniqueness of the area, which can act as an attraction for local people and tourists alike (Shaw R. et al., 2009; Ja'afar N.H. et al., 2018).

METHODOLOGY

This study uses a mixed-method with both quantitative and qualitative surveys. This combination is able to complement the strengths and weaknesses of each method, and allows the results to be considered more effective and authentic (Ja'afar N.H., 2018). Quantitative data was obtained through surveys from 330 respondents with a 95% confidence level (Ja'afar N.H., 2018). By design, two types of questionnaires were used, namely, open-ended and multiple-choice questionnaires. The data was then analysed for simple statistics such as frequency and percentage, using the Statistical Package for the Social Sciences (SPSS) software.

Meanwhile, the qualitative data was obtained through interviews with users in a semi-structured design with observation. Twenty-one respondents were selected because, according to a previous study, this number of respondents is sufficient if the mixed-method is used (Ja'afar N.H., 2018). The observation technique was personally conducted by the researcher for two main reasons, namely: (i) to see the different activity patterns between weekdays (Monday-Thursday), Fridays, and weekends (Saturday – Sunday), and (ii) to see the current built form as entailed by the buildings, landscape, and circulation. The observation period took approximately two weeks. All the qualitative data was analysed qualitatively using the thematic analysis approach, which had been determined via the conceptual framework.

Users were selected as respondents in this study based on their identity ass local residents, and thus they were experienced in the location of research. The further addition of international visitors or tourists to the user pool offers the advantage of different physical image descriptions and a look at the opinions of outsiders (Alamoush S., et al., 2018). All the qualitative and quantitative data was analysed concurrently and triangulated with the existing literature before determining the results.

This study uses a case study as the research strategy, and Kampong Bharu in Kuala Lumpur, Malaysia was chosen. It was selected because it is historically and culturally important for its ability to portray the origin of Malay society within an urban settlement. Secondly, it is the only urban village that still exists in the middle of Kuala Lumpur City. The area is a Malay enclave that has been gazetted as a MAS or Malay Agricultural Settlement. Kampong Bharu became the largest Malay settlement through the gift of 223 acres of land by the Sultan of Selangor, Sultan Alauddin Sulaiman Syah Raja Muda Musa, in 1899. The land was awarded to the Malays from the Malay Archipelago, who held Islam as their official religion, conversed in Malay, and adopted the Malay culture. The land of Kampong Bharu consists of seven villages, where each village has its own particular ethnicity. Those villages are: Kampung Atas A (Mandailing ethnic), Kampung Atas B (Minangkabau ethnic), Kampung Paya (Jawa ethnic), Kampung

Masjid (Rawa ethnic), and Kampung Pindah, Kampung Hujung Pasir, and Kampung Periok with descendants of Melaka.

RESULT AND DISCUSSION
The buildings are one of the important unique elements that attract users to Kampong Bahru. Referring to Table 1, this point has been mentioned by both the qualitative and quantitative data, respectively. This was stated by a high percentage of 94% (n=310) via survey, all respondents (n=21) through the in-depth interview, and was also supported in observation. This shows that buildings contribute towards the uniqueness of Kampong Bahru, which in turn attracts people to visit the place.

Table 1: Buildings as the unique physical element that contributes to attracting people to Kampong Bharu according to qualitative and quantitative data

Physical Element	People			Observation
	Interview (n=21)		Survey (n=330)	
	Yes	No	Frequency (%)	
Building	21	0	310 (94%)	/

Source: Author

Table 2 shows further detail by asking, "why is the building unique?" as a follow-up question. Users responded that the unique appearance of the buildings attracts the attention of the users, and they consider it as one of the main attractions of Kampong Bharu. To explain in more detail, for the appearance characteristic, 69% of the respondents associated the architecture style, material and details as an important factor. Next, 31% felt that the colour of the buildings makes them unique, as seen in Table 2. The importance of these characteristics of appearance for traditional buildings was also mentioned during the in-depth interviews and was supported by observation.

Table 2: Factors that affect the uniqueness of a building's appearance

Why is a building unique?	Freq. (n=330)	Percentage (%)
● **Appearance**		
i.Architectural style, materials and details	228	69%
ii. Colour	72	31%

Source: Author

Furthermore, via in-depth interview, respondents elaborated on types of buildings and their appearance (Table 3). All respondents identified the Malay Traditional Houses, Kelab Sultan Suleiman, and Masjid Jamek Kampong Bharu as particularly noteworthy (Table 3).

Table 3: List of buildings that are noticed most by respondents

Buildings that are noticed most recognised (in-depth interview)	Appearance		
	Architectural Style	Details	Material
1. Malay Traditional Houses (n=21)	*	*	*
2. Kelab Sultan Sulaiman (n=21)	*	*	*
3. Masjid Jamek Kg Bharu (n=21)	*	*	*

Source: Author

Table 4: Buildings that are noticed most unique by respondents

Buildings that are unique in apperances (in-depth interview)	Freq. (n=21)	Percentage (%)
1. Malay Traditional Houses (n=21)	18	86%

Source: Author

The Malay Traditional Houses in Kampong Bharu were determined to be the most noticed (recognised) by all respondents (n=21) (Table 3) and the most unique buildings in this area (n=19) (Table 4). Below is the quotation from the interview.

"To me, the old houses in Kampong Bharu give a sense of attraction to someone who passes it every day. The heritage unique designs of these old homes with one of-a-kind carvings and cannot be found in other parts of Kuala Lumpur. The material of wood also make this historical building so amazing" –18th respondent.

The quotation above shows that the presence of the traditional Malay housing architectural style within the area contributes to Kampong Bharu's uniqueness. There is a strong association between the feeling of uniqueness and the details and materials of these buildings. These buildings were considered unique, and cannot be found in other areas of the city of Kuala Lumpur. The presence of these traditional buildings in Kampong Bharu sets this place apart from other areas, especially considering the scarcity of traditional-styled homes in cities nowadays. These features make this place more memorable for the people who pass through or do business in the area.
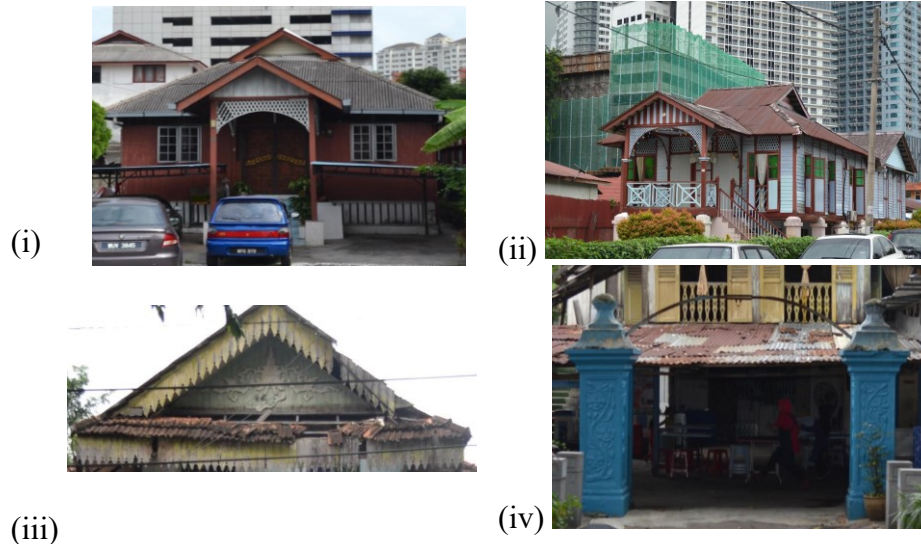
Figure 4: (i, ii) Some of the Malay traditional houses in Kampong Bharu with a variety of colours. (iii, iv) Details of roof and columns of Malay Traditional Houses

Abd Malek (2018) coined the phrase which refers to these dwellings, but the style originally came from Melaka, Johor, and Selangor. However, the appearance of this style is changing over time. According to historical data, the distinctive diversity of this style appeared because Kampong Bahru has seven villages, which each create their own unique visuals. This diversity of architectural style for Malay Traditional Houses is one of the features of the indigenous architecture that belongs to Malay (such as Melaka and Minangkabau, the original people of Malaya). (Abd Malek, 2018).

Observations revealed that even though there are differences in the architectural styles of the homes, we still find common elements of the unique Malay architectural style in all of them. Those basic elements of the style include using an on-stilt design and using timber as the main material with special carved designs that give the area its own identity (Figure 4).

Figure 5: Kelab Sultan Suleiman was mentioned by respondents as a unique colonial building in Kampong Bharu

Furthermore, Kelab Sultan Suleiman was also mentioned by all in-depth interview respondents (n=21) as a unique building in Kampong Bahru, with its own special architectural style, material, and details.

"Kelab Sultan Sulaiman building has a unique design compared to the ones surrounding it. This modernism style has its own simple details and material in concrete. It has its own charm and attracting qualities due to its one of a kind build."-12th respondent.

This interview shows that Kelab Sultan Sulaiman is not just a place of interest, but is also capable of attracting people to Kampong Bharu and making the place more memorable. The unique architectural style which includes modern characteristics, that can be seen from its use of concrete material and simple details, is also responsible for attracting people to Kampong Bharu.

Observation showed that Kelab Sultan Suleiman is a building that evokes a very nostalgic feeling in Kampong Bharu. This building has its own identity, which allows it to attract people with its unique architectural style, especially the design of its facade. According to history, this building is one of the colonial heritage buildings from the British era. This shows that the appearance of architectural styles through time could contribute towards the story of the historical timeline for Kampong Bahru. Thus, preserving these buildings will enrich the historical features of the place and attract more people to the area.

Figure 6: Masjid Jamek Kampong Bharu shows the uniqueness of Islamic architectural style and details

Masjid Jamek Kampong Bharu was also mentioned as a frequently visited building, and its appearance is considered unique. Furthermore, from the interviews, the users were able to identify the building based on these features.

"Masjid Jamek Kampung Bharu is one of those buildings that I always frequent for prayers here. To me, this building have their own architecture style and the details, such as Islamic features, are very attractive in this Malay area. – 14th respondent.

The quotation above shows that Kampong Bharu Mosque is able to give a high visual impact to people through the building's physical characteristics. As mentioned in the previous study, the importance of the mosque as a community centre, with the Islamic architectural style, has an influence on the place's identity (El Bouljoufi M. et al., 2021; Ismail, W.N.W et al., 2017). Lahamendu, V. et al. (2017) point out that the presence of religious buildings that are associated with the dominant elements of society will enhance the image of the area. This shows that a mosque is the perfect kind of building to attract people and has a great influence on the place's identity.

From observation, it was seen that Masjid Jamek was the most visited and noticed building in the area due to its Islamic architectural style. Islamic architecture is characterised by the variety of decorative elements that combine with the unique elements of Islamic architectural features based on the background of Malay society as a Muslim environment. The background of the

Muslim community and living environment can be seen through the decorations which are used (Nang Naemah & Nur Maslina, 2014). This new mosque was rebuilt on the old site and completed in 2015 with a combination of historic and modern features (observation). In addition to its function as a place of worship, this building also contributes to the community via its diversity society programme, which attracts people to visit this building as a place to gain knowledge or cook a "lambuk porridge" en masse. Even though it uses elements of the new Islamic architectural style, but the fact that it retains the spirit of the existing site, inherited traditional functions, and preserves local culture makes Kampong Bharu a place known for having its own identity as a Malay Islamic village community enclave (Yaman, M. et al., 2018; Raharjo, T., 2021). Thus, this intangible heritage of the original Malay Muslim society continues to attract more people to visit the Kampong Bahru mosque.

The descriptions above show how the Malay Traditional House, Kelab Sultan Suleiman building, and Masjid Jamek Kampong Bharu mosque are important factors in attracting people to Kampong Bharu due to their architectural style and their use of materials and details. The description above shows that most of the listed buildings are categorised as traditional buildings or as buildings which are associated with Kampong Bahru's historical significance. This shows that historical buildings are associated with the value of Kampong Bharu's character, and therefore make it much more memorable and attract more people. This is supported by Radzuan, I. S. M., & Ahmad, Y. (2016), who stated that a place has to have a clear image and be easy to understand for it to have a sense of uniqueness and find success with the public (Rahil, N. R. M., 2020).

CONCLUSION

In conclusion, because of Kampong Bharu's strategic location, it has become the prey of developers who desire to redevelop it into a series of high-rise buildings (PKB, 2021). In other words, Kampong Bharu has experienced a drastic morphological change in terms of the development of its socio-economic and physical form without much attention being paid to the quality of the urban neighbourhoods being provided (Abd Malek, 2018). Monolithic high-rise buildings reflect economic motives and are a result of the corporate image which has dominated development trends. The urban fabric is too often characterised as being fragmented, as a collage of buildings creates a profound sense of dissociation (Abd Malek, 2018).

Thus, there are a few building appearances (architectural style, details and material use) that have been determined as contributing towards the success of Kampong Bharu in attracting people. Therefore, these elements should be taken into consideration when planning new developments in the urban villages, in order to preserve their unique characteristics and at the same time support their ability to attract people to those places. These factors are:

I.   Conservation of the concept of Malay Traditional Houses with respect for the cultural society. These basic styles involve the use of on-stilt designs and using timber as the main material with special carved designs that give the area its own identity.

II. Enhance the mosque's architectural style and its function as a Malay Muslim community centre, along with its inherited local cultural society. This is one of the main aspects in safeguarding cultural heritage, according to (Bakar, A. A., Osman et al., 2014; Yaman, M. et al., 2018; Radzuan, I. S. M., & Ahmad, Y., 2020).

III. Conserving the architectural styles from different eras. This is because doing so will portray the importance of the historical timeline of the place, which will enrich the character and success of the area. Alraout, A. A. (2006) coined a phrase that shows that this represents some of the factors involved in being known as a "knowledge city".

To produce a thriving village, in a city that is able to attract outsiders, physical elements of the buildings should be prioritised for their ability to give the place character and create its own image (Murtaza, F. F. N., 2020; Rahil, N. R. M., 2020). A village which is alive, comfortable, pleasant, rich in culture, has interesting architectural styles, and offers exciting spaces, will attract more people (O.A. et al., 2020; Radzuan, I. S. M., & Ahmad, Y., 2016).

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ANALYSIS OF CURRENT CONDITION OF HERITAGE MASJID IN NEGERI SEMBILAN

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Abstract

In a Muslim community, the mosque or masjid is considered to be important because they have served as key locations for religious gatherings and centres for political and social activities in the community since the dawn of Islam. A heritage masjid in Malaysia is classified as having traditional architecture, which includes a distinctive style and material that represents the local people's customs and culture. Traditional architecture in Negeri Sembilan is in jeopardy as a result of rapid urbanization. Its abandonment might lead to the disappearance of its information, documentation, and features due to a change in design and materials. Whether as a consequence of natural calamities or human invasion, architectural heritage is constantly under risk. Therefore, preservation and conservation are essential stages in the life cycle of a historic property. Heritage masjid are important to protect, because it depicts the authenticity and workmanship of local villagers in an age before modern technology. The objective of this paper is to evaluate the current condition of heritage masjid in Negeri Sembilan. This research employed on-site observations and includes a comprehensive review of the literature approach on various documentation. This paper concludes with a discussion of how these findings will contribute to the improvement of the current situation and the preservation of the functional aspects of Negeri Sembilan heritage masjid.

Keywords: Heritage Masjid, Masjid Condition, Heritage Building Conservation

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INTRODUCTION

The masjid is very important to Muslims and can be considered as the heart of Islamic life. It functions as the sacred place where Muslim do prayers and act as a centre for education and information. In addition, Muslims use masjid for events during Islam's holiest month of Ramadhan. They are also known as places for social welfare and also for dispute settlement. In the modern era, intelligent architecture contributes a great deal to influencing the evolution of heritage building into a modern design building. Focusing on the evolution of masjid, we can find that nowadays, masjid are built with considerations of cheaper cost and modern designs to match the new era.

Norwina (2018) stated that the Islamic religion reached mainland Asia through the Silk Route and the Malay Archipelago via sea route used by merchants from the Muslim Middle East and China. Masjid architecture is significantly influenced by Islamic architecture as brought in by Arab merchants. The masjid's architecture then merged with the local culture, creating a distinct character especially in Negeri Sembilan that can still be seen today, such as the structure and the roof. The majority of communities in Negeri Sembilan are Muslim, as reflected in the number of masjid around the state.

In Islam, the masjid serves to provide a platform for various religious activity (Mizanur et al., 2010). A heritage masjid is one which has been preserved for current generations and will be passed down to future generations. The historical importance of the heritage masjid is its original and distinctive design, which may display the local culture's features (Kartina et al., 2017). The initiative to conserve heritage buildings began several years ago, and as such it has only been in the past decade that significant progress has been made. The formation of the National Heritage Department in 2006, as well as the National Heritage Act 2005, have contributed to this progress (Harun, 2011). The purpose of this study is to highlight the actual situation of the architectural disappearance and ignorance towards Heritage masjid in Negeri Sembilan. We must acknowledge that the masjid is a sacred place which should be maintained and regularly visited, as stated in Al-Quran:

"The mosques of Allah shall be visited and maintained by such as who believe in Allah and the Last Day, who establish regular prayers and pay the zakat and fear none but Allah. It is they who are on the true guidance"

(Surah Tauba 9:18).

Thus, the issue of abandoned masjid in society is a crucial one which calls for proper conservation. Nur et al., (2020) stated that the diverse sources of information, financial resources, society contribution as well as psychological support are all necessary in the preservation endeavour.

RESEARCHBACKGROUND

All over the Malay Peninsula, the masjid is a symbol of the Malay kingdom's greatness. Kartina et al., (2017) mention that the masjid's main characteristics include a large prayer hall, a minaret, a roof design, a *mihrab*, a *mimbar* (pulpit), and an ablution area. Fielden, (2003) stated any building over 100 years old is labelled as a heritage and historic building. According to the Negeri Sembilan State Government, Negeri Sembilan has a multiracial population of over one million inhabitants, with 61.5 percent of the Muslim community making up the majority. According to Jabatan Hal Ehwal Negeri Sembilan (JHEAINS), there are more than 300 masjid in Negeri Sembilan. 10% of these can be categorised as heritage masjid, which are more than 100 years old, as shown in the table 1.

Table 1: Heritage Masjid in Negeri Sembilan

Negeri Sembilan's District	Heritage Masjid in Negeri Sembilan over 100 years	
Rembau	Masjid Kariah Padang Lebar	1800
	Masjid Kariah Selemak	1844
	Masjid Kariah Astana Raja	1885
	Masjid Kariah Chengkau Ulu	1870
	Masjid Kariah Sawah Raja	1898
	Masjid Jamek Tanah Datar	1900
	Masjid Kariah Batu 17 Chembong	1900
	Masjid Kariah Tanah Air Hitam Chembong	1900
	Masjid Kariah Tanjung Berangan	1900
	Masjid Kariah Penajis	1900
	Masjid Kariah Bongek	1901
	Masjid Kariah Legong Ulu	1902
	Masjid Kariah Pekan Pedas	1910
Kuala Pilah	Masjid Kariah Kg. Jerjak	1905
	Masjid Kariah Kuala Talang (Tuan Tulis)	1907
	Masjid Kariah Kg. Parit	1909
	Masjid Kariah Kampung Gachong	1914
Seremban	Masjid Jamek Dato' Bandar Haji Ahmad Rasah	1800
	Masjid Jamek Dato' Klana Petra Sendeng,	1840
	Ampangan	1840
	Masjid Lama Lenggeng	1900
	Masjid Jamek Bandar Seremban	
Port Dickson	Masjid Kariah Lukut	1872
	Masjid Kariah Linggi	1884
	Masjid Kariah Kg. Chuah	1890
Jempol	Masjid Tuanku Puan Chik Kampung Serting Ilir	1905
Jelebu	Masjid Warisan Kariah Kuala Dulang	1850

Source: Negeri Sembilan Islamic Affairs Department (JHEINS)

A New Straits Times article by Intan, (2020) depicted several heritage masjid in Negeri Sembilan to show the uniqueness of architecture styles around that area. However, masjid have also disappeared or lost authenticity over times. Aziz et al., (2018 & 2019) declared that some of heritage masjid were being ignored and replaced with new architectural designs, without making any effort to maintain the heritage building.

Kartina et al., (2017) stated that a few studies and efforts have been undertaken to conserve heritage buildings. Conventional methods are still being used to conserved heritage buildings. In addition, the novel concept of Historic Building Information Modelling (HBIM) has been introduced by various researchers in order to protect this national property. Muhammad et al., (2020), declared that digitalizing using Building Information Modelling (BIM) data documentation can be utilise to preserve such cultural assets. However, the exploration and adoption of HBIM still new in Malaysia.

METHODOLOGY

The selection of Negeri Sembilan is based on the uniqueness of the design characteristic of the masjid that relates to their custom and culture. The study adopted in this research was a qualitative method by applying a case study approach to evaluate the current conditions of heritage masjid which affect their functions and societal responsibility in Negeri Sembilan. Seven districts have been explored and a thorough analysis of the on-site observations and a document review, was conducted in order to evaluate the current condition of heritage masjid in Negeri Sembilan. The document reviews included a content analysis of secondary data gathered from various sources, including peer-reviewed academic journal articles, conference proceedings, textbooks, governing organisations, and PhD theses. The data for on-site observation were analysed using content analysis.

RESULTS AND DISCUSSION

The current conditions of Negeri Sembilan Heritage Masjid

Based on the findings, there are more than 25 heritage masjid as listed by JHEAINS in Negeri Sembilan that have been around for more than 100 years. Some of the abandoned building components are still sturdy, and the materials can be restored and maintained. However, many of the heritage masjid seem to have been neglected for a long time, with little effort taken to address the situation.

The research shows that a few buildings have been abandoned, and some of the features and important components disappeared or were dilapidated as a result. Several buildings are being refurbished and maintained; however, the changes in their originality have resulted in comprehensive changes in the building's appearance. A few have been neglected and replaced by a larger masjid

near the old masjid's location. Based on the observation, Kuala Pilah district is the area that shows the highest concentration of the historically significant heritage masjid in decay. Other districts show a different condition based on the community interference to take action to maintain the significance character of the masjid. A few heritage masjid have been identified in Negeri Sembilan, and their current conditions are shown in table 2.

Table 2: The observation of the current condition of Heritage Masjid in Negeri Sembilan

Heritage Masjid/ Location	Aged	Characteristics	Conditions	Visual/ Images
Masjid Lama Kg. Pelangai, Kuala Pilah	111 years	The masjid has total of 20 pillars including 4 main pillars with the two-tier roof. The ceiling has five 'Buah Buton'. Decoration of 'tetupai' at the front column. The crossed ornamentation at the entrance for sun penetration. Timber structure, on stilts, concrete stairs. and using 'tanggam' techniques.	The building was abandoned and dilapidated. Some part of the wall, door, windows and flooring were gone missing.	

Masjid Lama Parit Istana, Mukim Terachi, Kuala Pilah	225 years	The masjid has total of 16 pillars with the two-tier roof. The four main pillars was carved with floral motive by four tribes (Biduanda, Sri Lemak, Tiga Nenek Acheh and Anak Acheh). The ceiling has five 'Buah Buton'. Timber structure, on stilts, concrete stairs. and using 'tanggam' techniques.	The new masjid was built on 1967 which is located next to the old masjid. The old masjid left abandoned and dilapidated. Some parts of the wall and flooring are missing.
Masjid Lama Kg. Kuala Serdang, Tanjung Ipoh, Kuala Pilah	113 years	The masjid has total of 20 pillars including four main pillars with two-tier roof. Timber structure, on stilts, concrete stairs and using 'tanggam' techniques. A small dome at the roof peak and the ceiling have one 'Buah Buton'.	The new masjid was built in front of the old masjid. The masjid has been conserved and well-kept by the inheritor (Puan Kathom binti Zainal Abidin).
Masjid Tua Kampung Tengah (Tanjung Beringin), Kuala Pilah	129 years	Four main pillars in the prayer hall with the two-tier roof. The exterior pillars that help to support the building was	Recognized by The Department of National Heritage. The building were

		carved with 'Jawi' and floral motive.	abandoned and dilapidated.	
Masjid Jamek Dato' Bandar Haji Ahmad Rasah, Seremban	221 years	Located under the major highway. The concrete structure, dome roof, building on the ground with few steps to the main hall. The green tiles (original features) on the walls. Perigi and Makam.	The original area is being conserved and refurbished with new features. Some of the original elements were maintained. The building has been extended a few times.	
Masjid Jamek Dato' Klana Petra Sendeng, Ampangan, Seremban	181 years	The concrete structure, the two-tier roof, building on the ground with few steps to the main hall. Four main concrete pillars and small dome at the roof peak.	The original area is being conserved and refurbished with new features. Some of the original elements were maintained and extended a few times.	

Masjid Tuanku Puan Chik Kampung Serting Ilir, Bahau, Jempol	116 years	Concrete and timber structure, four original main pillars, the dome with one-tier roof, building on the ground with few steps to the main prayer hall.	The original area was refurbished with additional new features. The four main pillars were maintained and the building extended and changed names a few times.	
Masjid Lama Kampung Terusan, Kuala Pilah	191 years	The masjid has four main pillars with two tier roof and dome on top. Timber structure, elevated concrete floors with stairs. The ceiling have one 'Buah Buton'. Perigi and Kolah.	The new masjid was built beside the heritage masjid. The heritage masjid was on going conservation.	

Several abandoned heritage masjid were discovered in Kuala Pilah, as shown in table 3. Five buildings were not listed because they were no longer in use as places of worship. Some of the masjid have been abandoned, while others have been converted into storage areas. This demonstrates the poor condition of social interactions between communities in that area, causing the abandonment of heritage masjid. An important finding to highlight in this research is that Masjid Parit Istana is the oldest heritage masjid in Negeri Sembilan (226 years old) but it has been neglected and become dilapidated over time.
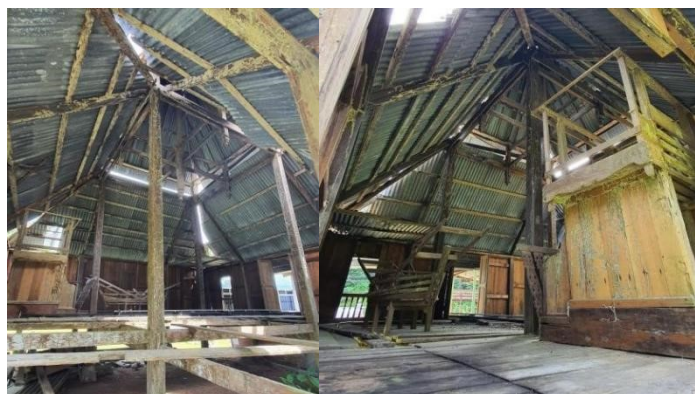
Figure 1: The special features of heritage masjid in Negeri Sembilan (four crafted main pillars and 'Buah Buton/Bergantung'). (Source: Author, 2021)

Table 3: The heritage masjid requires a proper conservation

Masjid location	Heritage masjid	Aged
Kuala Pilah	Masjid Lama Parit Istana	1796
	Masjid Lama Kg. Terusan	1830
	Masjid Tua Kampung Tengah (Tanjung Beringin)	1892
	Masjid Lama Kg. Kuala Serdang	1908
	Masjid Lama Kg. Pelangai	1910

Figure 2: The very dilapidated state of Kampung Pelangai heritage masjid.
(Source: Author, 2021)

Based on the overall observations, the current conditions of the heritage masjid in Negeri Sembilan can be placed into four categories, as shown in table 4.

Table 4: The current condition categorization of Negeri Sembilan heritage masjid

Condition 1	**Condition 2**	**Condition 3**	**Condition 4**
Abandoned masjid with no function (left decayed)	Conserved with different function	Renovation and the extension (Preserved original area)	Renovation and extension (No preservation and total change of design)

Figure 3: The oldest heritage masjid in Negeri Sembilan (Masjid Parit Istana) built in 1796. (Source: Author, 2021)

Projected heritage masjid for conservation

The heritage masjid in the Kuala Pilah area has the most critical need for conservation. A total of four heritage masjid have been abandoned and become dilapidated. The buildings will lose its authenticity over time and need to take proper action for conservation.

Table 5: The visual assesment of abandoned heritage masjid

Heritage Masjid	**Visual Assessment**	**Conservation efforts**
Masjid Lama Kampung Pelangai, Kuala Pilah	Very dilapidated, the architectural significance still can be seen. The structure remains strong, need major conservation. .	Full supports from community and authorities to show the effort to conserve the building.
Masjid Lama Parit Istana, Mukim Terachi, Kuala Pilah		
Masjid Tua Kampung Tengah (Tanjung Beringin), Kuala Pilah		

Masjid Kampung Lama Terusan, Kuala Pilah	Same design but replaced the whole building using new materials. No preservation of the original materials. No proper guidelines to preserve the original and the authenticity of the Masjid.	On going conservation. 90% completed.
Masjid Lama Kampung Kuala Serdang, Tanjung Ipoh, Kuala Pilah		Have been conserved by Negeri Sembilan Tourism Board and other authorities.

CONCLUSION

The heritage masjid in Negeri Sembilan has unique characteristics and still can be seen today. The world continues to change and evolve. Some things have been brought forward and upgraded, but some disappeared without a trace. The special design of the crafted main pillars, the traditional and regional influences in roof design, as well as the features of 'buah buton/bergantung' are reflected the original style and characteristics. Thus, it needs to be preserved and well-kept for future generations. Further contributions are required for conservation efforts to protect our national assets.

This research develops an essence of appreciation to our national heritage property and values. The desire to understand the disappearance of heritage masjid has brought forth the spirit to create awareness of the importance of cultural artifacts that are architecturally significant and historically important for future reference. Therefore, there is a need to explore more heritage masjid in various states in Malaysia. The conservation of cultural heritage is a value to contribute in sustainable planning development of the future. The urgency to conserve and preserve will protect and maintain the authenticity of the building which the life cycle will lasting for more than hundred years.

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PEOPLE'S AGES AND THE EFFECTIVENESS OF USING ACTIVITIES IN THE BUILT ENVIRONMENT OF COMMERCIAL STREETS

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Abstract

Streets are the most public of all city spaces and are utilised by all users. Therefore, activities are vital in persuading people to use the streets and in presenting the image of the city. The relation between people's ages and the used activities of the commercial streets has declined due to the poor physical environments in the local context. Streets have become progressively unpleasant, unsuitable in terms of functions, and have also become a disagreeable environment. This represents the problem statement of this research. The objective of this paper is to examine the relationship between activities on commercial streets and the different age groups of the users. This study focuses on the local context of Mawlawi Street, which is one of the major shopping streets in Sulaymaniyah city centre, Iraq. This paper used a quantitative methodology via a survey of users (n = 330). The data were analysed using frequency, mean value, percentage, and chi-square statistics. The results show that cultural activities were the most important for its users, while social activities were the least important, with businesses in the middle. The majority of the users were in the young-adults age category. The research gives a good overview of the types of activities which encourage high street usage, and which activities need to be improved or added.

Keywords: Age, Activities, Street, Commercial, & Environment

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INTRODUCTION
Understanding the activities that occur on the streets is a vibrant design factor that creates and proposes novel ideas for the sustainable development of commercial streets. This statement is supported by several researchers, who stressed the importance of street activities to exploit future designs of a pleasant street environments (Abdul Rahman & Md Sakip, 2015; Rahman et al., 2015; Rahman, Sakip, et al. 2018; Rahman, Shamsuddin, et al. 2018). According to Rahman et al., (2018), a mixture of activities and use can generate great streets, public spaces, and successful communities. Therefore, streets should be designed to suit the various activities of users including social, economic, commercial exchanges, and ceremonial activities (Al-Obeidy & Shamsuddin 2015; Musaab et al., 2018; Musaab Sami Al-Obeidy 2017).

RESEARCH BACKGROUND
People's activities on streets depend on their reasons for using streets as well as on the qualities and characteristics of the public environment. People use streets for their social, cultural, and leisure activities, and for travel, shopping, playing, and meeting other people (Ja'afar & Harun 2018; Musaab Sami Al-Obeidy 2017). Indeed, streets are the fundamental public space for diversified activities in every city and the lifeblood of social, environmental quality, commercial and economic exchange (Al-Obeidy & Shamsuddin 2015; Handoyo & Wijayanti 2021; Musaab Sami Al-Obeidy 2017). One of the most significant physical spatial elements of a city characterised by a vibrant environment is the variety of activities that take place on its streets (Chua & Ahmad 2021; Khalaf & Ja`afar 2020; Rahman et al. 2015). These diverse activities of different groups within a community that are carried out in the street are vital attributes to the functional characteristics of urban places (Al-Obeidy & Shamsuddin 2015).

Al-Obeidy et al., (2015) asserted that people use streets for social and commercial exchange and encounters, for communication, movement, and business, for politics and open public activities, and for ceremonial and symbolic functions. Renaningtyas (2018) and Jacobs (2013) described robust streets as multi-modal spaces that accommodate a wide range of users with different modes (cyclist, pedestrians, owned-cars, and public transports) to provide choice, create activities along the street and to make streets safe and friendly for users. Rahman et al., (2018) found that besides social activities, commercial activities and the presence of various distinctive products such as cafes, restaurants, public Wi-Fi networks, contribute to increase the interest of people to stay longer in streets.

According to Sammas (2008), streets are the main cultural-based space with traditions, unwritten rules, habits, customs, and the prevailing activities that take place therein. Cultural variables are critical for all activities in the streets as they control people's behaviour by explaining the non-uses of streets and other public spaces. Therefore, the physical environment does not determine the

behaviour; rather, it is the cultural-based variables that determine the people's behaviour during their diversified activities including sitting, walking, standing, lying down, cooking, eating, sleeping, shaving hair, laundry, fixing tires, sewing, playing, shopping, manufacturing things, chanting, bargaining, arguing, praying, festivities, theatre, music, and setting for funerals (Al-Obeidy, 2015; Amin 2008; Middleton 2003; Phenton 2013).

Frick (2007) argued that there is a relationship between the activities and behaviour in public places and that the physical character and behaviour of people are critical factors that define the social space. Ja'afar and Usman (2009) Shamsuddin et al., (2004) asserted that traditional and cultural streets provide several activities such as hawkers and stalls, traditional trades, and religious places. Such activities create a vibrant and liveable environment, promote users' sense of place and identity, and reflect the character of a good city (Al-Obeidy 2015; Ali et al. 2019, 2020) (Sipan et al. 2021). Sulaiman et al., (2017) found that many visible activities take place along the streets, giving users a welcoming and vibrant feeling to enjoy and stay longer in streets (Mehta & Bosson 2018; Ping-Li Chen 2014; Sulaiman et al. 2017; Zhu et al. 2013).

Street activities can be divided into three categories, namely necessary activities, optional activities, and social activities (Knapskog et al. 2019; Sutikno et al. 2013; Turel et al. (2007). Rapoport (1987) indicated that pedestrian activities are divided into dynamic and static activities. Both activities are important criteria of user-friendly streets and their behaviour have two main elements which are cultural aspects and perceptual (Rapoport, A., 1986). Activities and functions in the streets are greatly influenced by the quality and character of outdoor urban spaces (Gehl 2010; Saja Jamil Alamoush et al., 2018). In this paper, Activities are categorised into social, business, and cultural types (Chladek 2019; Pugalis 2009; Saleh 2001; Xia et al. 2020; Zakariya & Harun 2013) as shown in Table 1 below.

Table 1: Activities of commercial street

Type	Activities of Commercial Street
Social	- Reasons for using the street - as a meeting place - times have been visiting the street - visit with friends. - regularly visit. - Transaction (refers to good interaction between people and place)
Businesses	- types of businesses along street (stalls and hawkers, religious places, and traditional trades) - market place. - (Opening hours of shops can develop economic activity in street)

	- Commercial place (selling and buying activities, food stall area)	
Culture	- Culture-based Street activities refer to parades, street events, art performances, street musicians, traditional foods, - Culture-based goods such as crafts that form the life of a street-The street provides distinct experience	

Source: Researchers, 2020

METHODOLOGY

This paper used quantitative methodology. A sample survey questionnaire (n = 330) was distributed randomly to different daily and occasional users (street visitors of all ages, shop owners, and residents) using a time interval method. The size of the sample was generated according to the calculation by De Vaus (2005). It is based on a (5.5%) sampling error at a (95%) confidence level and the smallest sub-group should have at least 50-100 cases. All the data were analysed using the SPSS (2017) version (25.0) software. The highest mean values among the three categories of activities and between each one of them were recorded. All the structures of this study were calculated using a five-Likert scale anchored in a value of 1 strongly-disagree "minimum value" with 5 strongly-agree "the maximum value". This study used three categories: low when values are less than 2.33 [4/3+ lowest (1)], high when the values are higher than 3.67 [highest value (5) - 4/3], and moderate when the scores are between low and high, in order to interpret the 5-Likert scale (Johns, R., 2005; Ali O. H. et al., 2019&2020). The frequencies of all variables and the Chi-square (X2) test were used to assess the validity and significance of the variable's relationships in a contingency table. The relationship is only assumed to be statistically significant if the probability level is (0.05) or less. A significant relationship only shows the degree of association and not what the association is, whereas the results of the chi-square test (X2) show the degree of association between two variables.

Case Study

The data were collected from Sulaymaniyah city centre users. This city is the centre of Kurdish culture with historical values (M. S. Y. Al-Obeidy, 2015). This research concentrates on one of the most important vibrant streets in the city as an area of investigation known as Mawlawi Commercial Street that is located in the centre of Sulaymaniyah (Figure 1). Mawlawi Street was selected due to its physical, functional, socio-cultural, and historical characteristics which represent the character of Sulaymaniyah city centre. It is one of the most important and main streets in the city where bustling activities such as window shopping,

walking, eating, gathering, socialising, and carrying out ceremonial activities among others occur in the street (Figure 2).

Figure 1: The old city of Sulaymaniyah with a view of Mawlawi Street
Source: Fieldisurvey, 2020

Mawlawi Street is an important and active street that connects and intersects with a public park (Baha Keshti) and a building (Sulaymaniyah Palace) within the intersection of the Sara Square with a length of (650) m. It is located in one of the oldest neighbourhoods in the city of Sulaymaniyah (Melkandi Hill) in a region historically called Zamwa. Melkandi Hill is the modern-day site of the Daboka Bazaar (Khder et al., 2016). It was built by the Babanians with the other neighbourhoods that formed the city of Sulaymaniyah at the beginning of its creation, where the inhabitants of the village of Malakandi were engaged in raising animals and livestock as well as the building stone extraction industry, which is still known to them today (stone Malkindi). Malakandi is one of the largest shops in the old city of Sulaymaniyah. The height of the buildings is low, at an average of three floors (Yousif et al., 2019). The site is surrounded by main streets as it is located in the heart of the city, the streets including Peramerd, Goran, Bekas, and Shexan. It is also close to Qanat, Mawlawi, Sabunkaran, and Kawa Street, with most of them being heritage streets (Ismael et al., 2019).
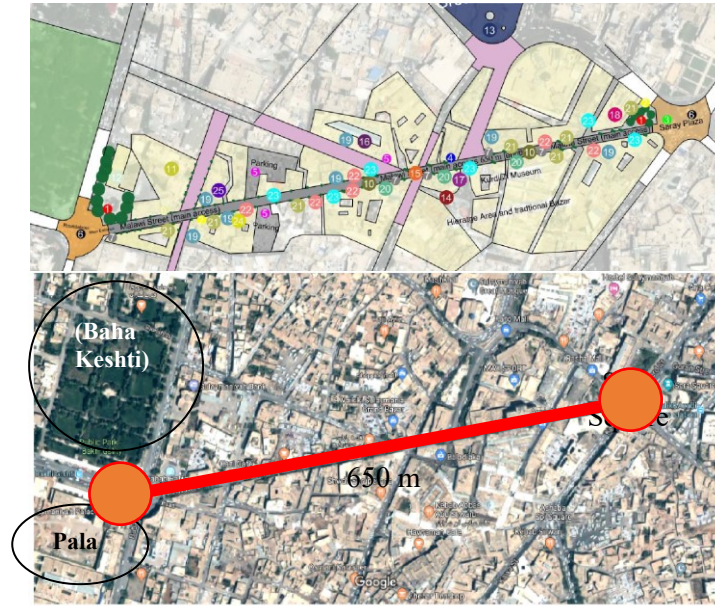
Figure 2: Mawlawi Commercial Street
Source: (Google earth), (Fieldisurvey, 2020)

RESULTS AND DISCUSSION

Based on the survey, Table 2 provides a detailed explanation of the respondents' profiles. The results indicate that most of the respondents were in the age groups of 18-25 (30.9%) and 26-45 (27%). This is because most of the users in this urban area are people within that age group.

Table 2: Respondent profiles

Type	Detailing	Frequencies	Percentage
Age	under 18	80	24.2
	18-25	102	30.9
	26-45	89	27.0
	46-59	41	12.4
	Above 60	18	5.5

Source: (Fieldisurvey, 2020)

In Table 3, the activities cited by the respondents as reasons for using Mawlawi street showed that the highest mean value went to cultural activities (3.05; Std.D. 1.14), followed by business activities (2.74; Std.D. 1.17) and lastly social activities (2.73; Std.D. 0.82). This demonstrates that the respondents do not have the same level of anxiety regarding the activities that make them use the street. It is also noted that the importance of the various activities that take place

in the streets does not differ much for street users. This also shows that the streets indicate a significant function in supporting cultural activities. Meanwhile, the differences concerning how they used the street were affected by the types of activity and the reasons for using the street

Table 3: Mean, Std.D, of items of activities

Factor	Item	Min.	Max.	Mean	Std. Deviation
Social	Shopping	1.00	5.00	2.69	1.55
	Visiting (passing through)	1.00	5.00	2.83	1.22
	Meeting friends	1.00	5.00	2.75	1.31
	Relaxing	1.00	5.00	2.47	1.24
	Studying	1.00	5.00	2.44	1.39
	Entertaining	1.00	5.00	2.70	1.22
	Live there	1.00	5.00	2.56	1.24
	The street provides distinct experience	1.00	5.00	2.72	1.24
	Good interaction between people and place	1.00	5.00	2.96	1.34
	Visually pleasing place	1.00	5.00	2.96	1.25
	I visit with most of my friends in this street	1.00	5.00	3.09	1.38
	Overall, I am very attracted to this street	1.00	5.00	3.01	1.32
	Total			**2.73**	**.82**
Businesses	Types of businesses along street (stalls and hawkers, religious places, and traditional trades)	1.00	5.00	2.60	1.53
	Commercial place (selling and buying activities, food stall area)	1.00	5.00	2.83	1.36
	Traditional market place.	1.00	5.00	2.69	1.58
	Opening hours of shops can develop economic activity in street	1.00	5.00	2.84	1.23
	Total			**2.74**	**1.17**
Cultural	Culture-based street activities refer to parades, street events, art performances, street musicians, and traditional foods	1.00	5.00	2.93	1.22
	Culture-based goods such as crafts that form the life of a street	1.00	5.00	3.08	1.28
	Total			**3.05**	**1.14**

Source: (Fieldisurvey, 2020)

The cultural motivations for using Mawlawi Street ranked first in terms of reasons for using the street by the respondents. The values of the arithmetic mean and the standard deviation of each item of the cultural activities were located between these values: (2.93 and 3.08), and the standard-deviation values were between (1.22 and 1.28). This reflects a high interest in culture activities compared to other reasons measured by the street users. Based on the results, business reasons for using Mawlawi Street in Sulaymaniyah ranked second. The values of the arithmetic mean and the standard deviation of each item of the business activities were located between these values: (2.60 and 2.84), and the standard-deviation values were between (1.23 and 1.58). This reflects a moderate interest in business activities by street users due to the limitations of such activities on this commercial street.

Also from the survey, the social reasons for using the street ranked last as a reason for using the street by the respondents. This reflects that there is no significant disparity between street users in terms of social motives for street use. The values of the arithmetic mean and the standard deviation of each item of the social activities were located between these values: the mean-values were between (2.44 and 3.09); and the standard-deviations values were between (1.22 and 1.39).

The understanding of the activities that occur on the commercial street is important to generate new ideas and also for proposing new development that is friendly to their users. This is in line with Shamsuddin et al (2010), who stressed that designers are highly recommended to look into the activities in urban spaces to exploit them for future design. Therefore, these factors must be taken into account when designing streets by competent authorities.

It is clear that there are differences in the answers of the sample members about the activities as reasons for using Mawlawi Street based on age group, where the level of statistical significance for this dimension was less than (0.05).

Table 4: Chi-square results on independence and the correlation between activities' factors and people's age variables

	Variable	Test	Result
Social	Age	Chi-square	X2 = 425.57; df = 132; P = 0.000
Business	Age	Chi-square	X2 = 317.89; df = 64; P = 0.000
Culture	Age	Chi-square	X2 = 140.67; df = 32; P = 0.000

Source: (Fieldisurvey, 2020)

For examining the independence of the factor of people's ages, the Chi-square test was used for each factor separately. It is evident from Table 4 that the factor of people's age's was not independent. The value of Chi-square for social activities and its relationship with people's age group were (X2 = 425.57, 463.60, 417.26) respectively, with (df = 132 and P = 0.000).

The value of Chi-square for business activities and its relationship with age group were ($X2 = 317.89, 244.21, 211.41$) respectively, with ($df = 64$ and $P = 0.000$). Additionally, the value of Chi-square for cultural activities and its relationship with age group were ($X2 = 140.67, 131.04, 97.18$) respectively, with ($df = 32$ and $P = 0.000$). Based on the survey, the age group (18-25 years old) answered between agree and strongly agree for the all activities (social, business, and culture) as reasons for using Mawlawi Street compared to other age groups.

CONCLUSION

In summary, in the urban commercial street of Mawlawi Street in Sulaymaniyah City, Iraq, cultural activities are the most important for street users, followed by business activities, while social activities were the last in terms of attention of street users. This reflects the strong cultural and historical value of the city of Sulaymaniyah. With regard to cultural motivations, "culture-based goods such as crafts that form the life of a street" ranked first, while the "culture-based street activities referring to parades, street events, art performances, street musicians, and traditional foods" was in last place in terms of street users' interest, which reflects the importance of cultural values for Mawlawi Street users.

In terms of business activities, "The opening hours of shops can develop economic activity on the street", and "Commercial place (selling and buying activities, food stall area)" were ranked first as motivation for using the street. "Types of businesses along the street (stalls and hawkers, religious places, and traditional trades)" was in the last rank in terms of motivation for using the street. This is normal because Mawlawi Street is located in the middle of the city, and this street is the main commercial centre of Sulaymaniyah. Additionally, with regard to social activities for using the street, "visiting friends on Mawlawi Street" was ranked first, and "relaxing and studying" was in last place as a reason for using the street. This is because Mawlawi Street is the main street and gathering centre for society within the city of Sulaymaniyah. The liveliness of the street must be boosted by adding more social activities since this study found a strong lack of them. This study also highlights the age groups which had a lower participation range in the street's activities such as the elderly and children. Activities requiring calm and slow-paced uses for the elderly and other activities that are family-friendly would increase the street's potential of becoming a social and cultural hub for everyone. it is expected that the findings from this study will help designers, urban planners, and policymakers understand the needs and attitudes of users towards creating a full active commercial street environment in northern Iraq's cities

ACKNOWLEDGEMENTS

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FELDA LANDS DEVELOPMENT BASED ON SUSTAINABILITY AND HIGHEST-BEST USE APPROACH: HOW TO GO ABOUT IT?

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Abstract

Rural catalysts, specifically Malaysia's Federation Land Development Authority (FELDA) settlement schemes promise a higher future return growth and become sustainable and resilient areas. FELDA, through the implementation of a Smart Plantation Management System (SPMS), has recently moved toward modern agricultural practices to increase productivity and optimise profits for the livelihoods of its settlers. This paper attempts to discover the FELDA lands development framework based on sustainability and the highest-best use (SHBU) concept as a missing link approach to SPMS. The idea is to oversee the potential of FELDA lands, not only for crops but also for other potential possible developments comprehensively. Analyses were based on literature review, contents analysis of relevant national development policies and FELDA's *Kertas Putih* and preliminary works based on a focus group discussion (FGD). In the end, this paper offers a comprehensive FELDA lands development framework, which is timely in coping with the current issues and future potential development crop lands and FELDA settlements, with the aim to bring profits and prosperity to its settlers and all nations.

Keywords: FELDA; Sustainability, highest and best use, Smart Plantation Management System (SPMS), Resilient

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INTRODUCTION

Rural area is safeguard lands for a sustainable living environment and generate wealth. In Malaysia, there are many fertile areas, in particular FELDA lands, which have the potential for a higher return in modern agricultural, industry and business sectors. With vast agricultural lands, FELDA can be a leader in the large-scale food industries either for local consumers or for exports. For this to take place, FELDA needs to play a key role in promoting and generating various rural economic activities to close the gap between urban and rural areas (FELDA, 2016), and to uplift FELDA itself towards sustainability and resilient settlement schemes.

Presently, there is a substantial number of FELDA households with a lower income (Government of Malaysia, 2019). This may be caused by multiplicative factors of unproductive crops activities, commodity's market volatility, lack of reform strategies, high debt and many other related issues, as mentioned by the Minister in the Prime Minister's Department (Economy) Datuk Seri Mustapa Mohamed in his speech on the FELDA recovery plan, as recorded in the Sun daily (2021). Due to this circumstance, there is a need to find interventions and solutions to enforce, especially the potential FELDA lands towards the highest and best use of land with a higher return to enhance the quality of life and liveability of its settlers and the nation. The ongoing national development policies such as *Dasar Perancangan Fizikal* (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 Ten-Years National Blue-Print of *Wawasan Kemakmuran Bersama* (WKB) 2030 (in 2019) offer strategies and tools to synergise rural change and social well-being aligned with the Sustainable Development Goals (United Nations, 2020), and the digital economy and technologies that become worldwide challenges and opportunities.

FELDA, by itself, has introduced a blueprint, the so-called report of *Kertas Putih*, which enforces a new direction of sustainable FELDA development in the future (Government of Malaysia, 2019). Through the *Kertas Putih*, two main catalyst projects were introduced, namely: (a) the Settlers Development Programme (*Program Pembangunan Peneroka - PPP*) with the aim to generate additional income to settlers and support the national food security initiative; and (b) Smart farming initiative via Smart Plantation Management System (SPMS). The implementation of both is still at a pilot stage and opens a venue for intervention.

Inspired by this, the current paper attempts to discover the FELDA lands development framework based on sustainability and the highest-best use concept as a missing link approach to the PPP and SPMS. The idea is to oversee

the potential of FELDA lands, not only for crops but also for other potential possible developments comprehensively.

FELDA, *PROGRAM PEMBANGUNAN PENEROKA* AND SMART PLANTATION MANAGEMENT SYSTEM
Strategic Issues of FELDA Lands Development
The Federal Land Development Authority (FELDA) was established in 1956 under the Land Development Ordinance (1956). It is a fact that the establishment was mainly as a result of a paradigm shift in the agricultural development policies that took into account the special needs of rural communities alongside the national development agenda (Mamat et al., 2016) through the cultivation of crops such as rubber and oil palm (Okposin et al., 1999). The main objectives of FELDA are to overcome the landless and unemployment problems as well as to increase rural income and to improve the living standard in rural areas. Lurah Bilut was the first FELDA settlement when it was first launched in the year 1958. It is a resettlement and rehabilitation scheme to eradicate poverty (Ariffin & Hussin, 2015) by transforming forests into productive agricultural farms to maximise yield (Hussin & Abdullah, 2012). The amendment of Land Development Act 1956 (Act 474) and Land Act (Clustered Settlement Area) 1960 (Act 530) has diversified the main functions of FELDA such as to assist, guide, advice, manage and coordinate activities of economic, social, settlement, agriculture, industry as well as commercial. As it grows, nowadays, there are approximately more than 400 FELDA settlers covering about 16% of the entire Malaysia area.

Today, the FELDA scheme has changed the livelihoods of the landless participants with the provision of housing, employment and income, and by becoming the owner of valuable land (Barau & Said, 2016) that created a widespread scatter of 'urban villages' (Mamat et al., 2016). After 50 years of operation, the agency has transformed itself from being an agricultural leader to a global corporate player (Mohamad et al., 2014). In line with the aspiration for its existence, FELDA maintains a proactive role, particularly in the planning, generation, and implementation of land development strategies through plantation projects and other socioeconomic programmes in rural areas (Din et al., 2020).

However, there are FELDA households with a lower income due to many factors. As reported in *Kertas Putih*, the strategic issues of FELDA that need further actions, such as, limited housing for second and third generations, and critical issues of settlers and new generations in sustaining their living and engaging in FELDA projects with unstable monthly income due to fluctuation of commodity prices and limited job opportunities, are the abandoned. Therefore, FELDA introduces *Program Pembangunan Peneroka* (PPP) that aims to generate

additional income for settlers and support the national food security initiative. Currently, the programme involves 317 FELDA settlements with approximately 112,638 settlers nationwide (Shahruddin, 2021). Another catalyst project is a smart plantation system (SPMS) initiative to maximise profits through monitoring plantations with the help of GIS and other related technologies. Both initiatives open new opportunities and provide the potential to intervene in FELDA development strategies.

Introduction to PPP and SPMS and Called for SHBU
PPP and SPMS are two catalyst initiatives in *Kertas Putih*, with the main goal of revitalising FELDA into a new chapter of transformation in terms of their fundamental issues and prospects. Both are very significant initiatives to ensure the sustainability of FELDA as a national rural catalyst development to improve the livelihoods and prosperity of settlers and their new generation (see Government of Malaysia, 2019).

Through PPP, it is estimated that each participant of this programme will get an additional monthly income in the range of RM500.00 to RM1000.00. This programme is divided into two concepts of participation, either individually (Plasma Category) or through cooperation (Cooperation Category). The fund allocated for PPP is RM1 billion. PPP is going to focus on cash crops (such as MD2 pineapple, fertigation chillies and young ginger, etc.), aquaculture, and livestock on the identified areas or spaces at settlers' housing lots or vacant lots at the FELDA settlement area. These projects are given based on several criteria such as the preference of the participants, expected high additional income to participant, minimal usage of land area and technical expertise of FELDA. The project will be awarded to a participant in terms of a grant worth a maximum of RM10,000.00 or more for Plasma Category, and RM20000.00 or more per participant for Cooperation Category. Currently, there are 3202 approved projects which are worth RM58.3 million (Shahruddin, 2021).

Meanwhile, SPMS is a crop smart management system developed by FELDA Research and Development Department (R&D) that is based on Geospatial Information System (eGIS) to manage and monitor the palm oil estate efficiently. Currently, there are 26 FELDA settlement schemes throughout Malaysia that have been monitored by the SPMS application which is still in Phase 1. SPMS uses drone technology and satellite images for high-resolution images to screen and measure the performance of palm oil trees for monitoring and cost-efficiency purposes. There are three main views of outputs that will be produced, which are, trees points, vacant points, and unhealthy points. These views assist in monitoring the numbers of existing trees by estimating the use of fertilizer to avoid wastage or shortages of it. SPMS images can also be used to identify the exact locations of vacant plots, thus assisting workers in preparing

for crop replating. The third function of SPMS is detecting unhealthy trees. By doing this, it would provide information to workers to monitor and treat the trees accordingly before the spread of the tree disease. The application of SPMS would efficiently save FELDA from unnecessary operational costs where the estimated saving is expected to be RM43 mil/year and an approximate RM23 mil/year would also be saved on fertilization cost (Shahruddin, 2021).

Therefore, based on the above discussion on this issue, there is a gap found that needs to be fulfilled to cater to shortfalls in both projects, especially on lands selection decision making, high-crops scenario planning and measurement and supportive intervention strategy formulation. The PPP, for example, is currently only implemented on a basis of settlers' preferences on their own spaces without land allocation or suitability land analysis for the entire settlement scheme. Furthermore, comprehensive planning of physical-support systems such as a business centre, crops collection hub, and so on, is required. Moreover, SPMS is undoubtedly an outstanding system that enhances the management of estates and crops. However, FELDA is still in a dire need of comprehensive support to ensure sustainability and the highest-best use for crop lands development. For this reason, the focus of this present study is not only on monitoring and managing the current crops, but also on finding solutions to the fundamental issues and prospects of land development and the well-being of FELDA communities that rely on the crops land development-based economy. With this, the study shall fulfil the gap through the introduction of the SHBU framework.

METHODOLOGY

The study explores the SHBU framework based on three main research approaches namely literature review, contents analysis of relevant national development policies and FELDA's *Kertas Putih*, and preliminary works based on a focus group discussion (FGD) and special sessions with FELDA representatives.

The literature review focuses on the concepts and approaches of sustainable and contemporary lands development and best practices of highest-best use that are relevant to FELDA transformation. Moreover, the content analysis involves three identified reports or documents, namely, *Dasar Perancangan Fizikal* (DPF) *Desa Negara* (2017), *Dasar Pembangunan Luar Bandar* (DPLB) (2018) and FELDA's *Kertas Putih* (2019). Both processes help in building a conceptual understanding of FELDA lands development based on the real issues and are incorporated with sustainability and highest-best use approach and setting domains or dimensions for FELDA lands development framework.

Finally, the FGD and special sessions were conducted to obtain first-hand information and fundamental issues regarding FELDA development and their feedback towards the proposed framework. The FGD was conducted on 29 June 2021 via an online Google Meet participated by eight representatives from FELDA. They comprised four first-generation and three second-generation FELDA settlers and a head of division official from FELDA headquarters. Then, there were two special sessions with the representatives from FELDA management office: (a) FELDA Lands Management Office and head of *Program Pembangunan Peneroka*, and (b) eGIS and R&D departments. The special sessions were conducted on 28 July 2021 and 24 August 2021 respectively, via online Google Meet. All related information was then transformed into a thematic analysis and interpreted accordingly to validate the formulation of the SHBU framework.

RESULTS
A Defined Concept of Sustainability and Highest-Best Use for FELDA Lands Development

This study attempts to integrate sustainability and highest-best use into a new development theme, the so-called sustainability and highest and best use (SHBU) to synergise FELDA for a change. The sustainability concept is crucial to realise the co-existence of the FELDA in the future to stimulate both social and economic development without compromising the environment. In its richest means, sustainability is the ability to continue certain development progress indefinitely as the Brundtland Commission defined it as the 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). Thus, despite a major disturbance or challenge, it is capable to maintain productivity with the adaptation to a new mechanism. Sustainability would then ensure that FELDA become a resilient organisation in promoting the prosperity and social-wellbeing of its settlers and the stability of rural development trends in the long run in the capacity of economic, social, technology and environmental systems to cope with change, in both foreseeable situations and unexpected disturbances (Knickel et al., 2018).

Meanwhile, the highest and best use (HBU) is a concept that originated from early economists such as Irving Fisher (1867-1947), who conceptualised the idea of maximum productivity. In a simple understanding, the HBU of lands development can be defined as the highest profits (returns) or satisfaction gaining from the productive lands for crops at a specific point in time. In a macro perspective, it is an income-based and measurable value, such as, increase in land value, diversified uses of lands with higher potential products, productivity and market price, high-value processing activities and other relevant elements with value attributes. Theoretically, HBU must be interpreted in the context of most

probable or most fitting use and is often consistent with definitions of the time. An area of land may be at its highest and best use when it provides the optimum return to its owner or user, which could be measured in monetary terms, or in intangible and social values, or a combination of such values. The HBU is the use of the most possible and optimal of an asset, which is physically possible, has been adequately considered, legally permitted, legally financially viable, has sufficient support, and is financially feasible and produces the highest value (Akmaludin & Utomo, 2013; Utomo et al., 2018; Fitriani, 2019).

SHBU based on Five-Dimension-Objectives Measure
Drawn from the above-defined concept, this research proposes the SHBU concept in rejuvenating and synergizing FELDA for change reflecting the prospects and fundamental issues in the settlements. By working on the literature and synthesising the available national policies and strategies, Figure 1 demonstrates a conceptual framework of the SHBU approach based on a five-**Dimension-Objectives Measure, namely: FELDA industries-based crops (FIbC) and SHBU plan management (SPM) from the HBU domain; and the remaining FELDA business centre (FBC), FELDA residential compound (FRC) and FELDA agro-preneur (FAgP) are from the sustainability domain.**
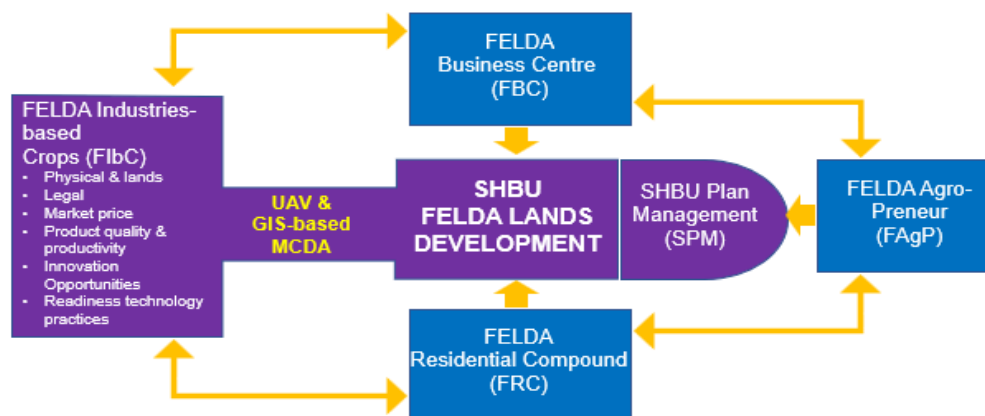
Figure 1: Five-Dimension-Objectives Measure-based SHBU Framework for FELDA lands development

The framework with a symbiosis of five dimension-objectives measure is said to be a strategic and comprehensive approach in realising the SHBU of FELDA lands development in the near future. To put it up front with the current demand, the Unmanned Aerial Vehicle UAV and GIS-based Multicriteria Decision Analysis (MCDA) approach is linked to the SHBU framework to conduct geospatial analyses for classifying lands potential levels and estimating

HBU returns based on what-if scenarios. Table 1 provides a detailed explanation of each dimension regarding their functions and main intentions or expected outputs.

Table 1: Five-dimension objectives measure and their descriptions

No.	Dimensions	Main Intention
HBU Domain		
1	FELDA Industries-based Crops (FIbC)	To propose future potential crops (also integrated agricultural development) securing a medium and long term higher-best profit – with an income-based and measurable based on the UAV and GIS-based MCDA approach and HBU elements such as product quality and productivity, innovations, technology practices and so on.
2	SHBU Plan Management (SPM)	To set up a task force unit representative from FELDA officers and other FELDA actors to make SHBU plans implementable or executable to deliver good results/profits.
Sustainability Domain		
3	FELDA Business Centre (FBC)	To strengthen FBC as a catalyst development of FELDA settlements that is linked to industrial-based crops and community needs. This also involves a geospatial analysis for identifying a new FBC based on the UAV and GIS-based MCDA approach and lands suitability criteria.
4	FELDA Residential Compound (FRC)	To promote sustainable residential and resilient-liveable community for FELDA second and future generations. It also involves a geospatial analysis based on the UAV and GIS-based MCDA approach and lands suitability criteria.
5	FELDA Agro-Preneur `(FAgP)	To equip FELDA settlement and younger generation with Agro-Preneur facilities and support systems towards multi-sources of income – linked to the main crops (upstream activities). It also involves geospatial analysis based on the UAV and GIS-based MCDA approach and lands suitability criteria.

In short, UAV and GIS allow for the assessment of the effectiveness of land suitability for development decision-making, i.e., agricultural and others with the advantage of acquiring data in a short period and giving a high-resolution image (Niluka et al., 2016; Franceschini et al., 2017; Norasma et al., 2019). It is a current demand in the agricultural sector where the Association for Unmanned Vehicle Systems International (AUVSI) posits that 80% of the UAV technology is going to apply in agriculture, thus indicating a crucial role in the development of the agricultural sector (Radoglou-Grammatikis et al., 2020). This is to say that the integration of the UAV and GIS-based MCDA generates an excellent analysis tool that allows for the creation of an extensive database and decision making

(see Malczewski, 2004; El Sayed, 2018) and would avail the building of the SHBU framework.

To materialise this, the SHBU framework puts the Plan Management (SPM) dimension as a second measurement factor to assign main actors (as a task force) for making plans implementable or executable and to monitor the delivery of good results and profits. It is important because as highlighted in DPF *Desa Negara* 2030, good governance plays a key role in bringing about or inhibiting change and transformation in the rural development ecosystem. The remaining three dimensions of sustainability are also crucial in making FELDA sustainable for future continuity and in playing a role in the prosperity of rural areas. All dimensions have gone through a review and validated based on an FGD and special sessions with the representatives of FELDA. This shall be further discussed in the following section.

PRELIMINARY FEEDBACK ON SHBU AND DISCUSSIONS

The proposed SHBU is said to be a comprehensive FELDA lands development framework to cope with the fundamental issues and future prospects. Based on an FGD and special sessions with the representatives of FELDA, it shows that the five-dimension objectives measure, namely, **industries-based crops (FIbC) and SHBU plan management (SPM) from the HBU domain; and the remaining FELDA business centre (FBC), FELDA residential compound (FRC) and FELDA agro-preneur (FAgP) from the sustainability domain, are well tallied** to the SPMS progress towards maximising crops returns through the digital database (eGIS) and technology practices, and PPP to improve settlers' income, prosperity and social well-being. This is illustrated in Figure 2 where it links the SHBU framework with both catalyst projects of FELDA. As previously stated, the proposed framework has been subjected to preliminary feedback or a validated process based on an FGD and two special sessions with FELDA representatives. All inputs were then summarised, clustered and produced in written reports. The key points or current situations of the synthesised findings supporting each of the proposed five SHBU dimensions are as follows.

- Every FELDA estate land must be planted only with rubber and palm oil commodities. Currently, only a few lands are considered not productive because of the unproductivity of settlers, and about 70% of the crops land is far from home and difficult to access. In addition, there are available spaces for interim crops, e.g., high-tech crops like kenaf, Guarana and vanilla during the replanting period.
- New physical development such as business centres, residential compounds need to be given extra attention because these human resources are the driving force for the progress of FELDA.

- The lack of second-generation occupancy in the FELDA scheme is due to limited residential opportunity. This affects the efforts to develop FELDA's estate because FELDA alone cannot be expected to manage without the involvement of the second generation. There is approximately 10% of the lands in the scheme reserved for economic projects. The land is under the jurisdiction of the State Government. A pilot housing project by FELDA, the so-called *Perumahan Generasi Baharu FELDA* (PGBF), has been undertaken and is at least 70% nearing completion.
- There is a need for FELDA Agro-Preneur to cater to the issues of side income generation for settlers, particularly the new generation. It is a part of PPP initiatives.
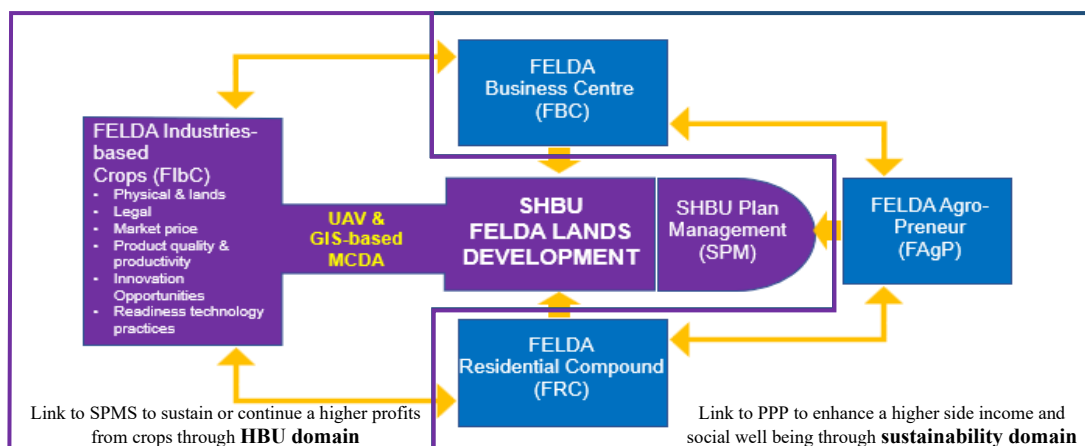
Figure 2: SHBU as a missing link approach to SPMS and PPP in realising FELDA transformation

From the above discussion, it is proven that that it is timely for this study to cope with the planning for future potential development crops lands and FELDA settlements in accordance with its direction proposed in the *Kertas Putih*. As included in the SHBU framework, the feedback also supports a need to set up a special task force or SHBU Plan Management Unit to do planning, execution, and monitoring stages to make it prosper in achieving the target aim (*Kertas Putih*). To achieve this, the SHBU shall include added values to the current initiatives. According to Walacik et al. (2020), the sustainability approach can create an added value and be dependable for future progress. Furthermore, based on the HBU approach, FELDA has the potential to diversify its agriculture industry by focusing on a variety of crops other than rubber and oil palm, thereby avoiding national reliance on a single crop (Sarena Che Omar, 2020). OECD (2012) in its 'Environmental Outlook to 2050' emphasises on the consequences

of inaction in resuming business which will have adverse and costly impacts on human well-being, security and economic growth, thus fundamental changes are needed. It is hoped that SHBU with the application of GIS-based MCDA approach (as a spatial decision problem tool) would lead to reconfigure these through R&D and innovation and adopting new practices (Figure 2).

Moreover, Rashid et al. (2021) and Sumane et al. (2018) emphasise that the transition towards more sustainable agriculture as well as modern agriculture will require a new knowledge base, particularly in digital technology, with new contents and knowledge experiential, while not dismissing the importance of farmers' informal knowledge. Knickel et al. (2018), based on their empirical research, confirmed that technological innovation is very important, and it cannot readily be separated from organisational at the farm, food-chain or market level. It is due to the fact that technological advancement is one of the decisive factors responsible for the increase in the productivity and output of crops (Mamat et al., 2016. It is also easier to adapt to and comprehend situations such as disruption, change, and crisis as part of the development process (Gabella & Strijker, 2019). It is, therefore, anticipated that the SHBU framework will be the appropriate missing link approach or future intervention strategy in synergising FELDA for change.

Hence, the elements of the SHBU will be transpired in the land suitability analysis based on GIS-based MCDA. Then, the strategies will be formulated to reflect national rural policies that resonate with the Sustainable Development Goals (United Nations, 2020). The outcome should enable FELDA to sustain the highest return in more comprehensive forms, not only in terms of the income of current settlers, but also the next generations of FELDA communities.

CONCLUSIONS

This paper has introduced SHBU framework for FELDA lands development - a missing link approach to the existing FELDA blueprint – particularly the PPP and SPMS. Specifically, SHBU is aimed at synergising FELDA transformation towards improving settlers' livelihoods by fully utilising FELDA lands and human resources for optimising profits at its best. The sustainability and SHU concepts are not new, but this study integrated them into five dimension-objectives measure which is tailor-made to the prospects and fundamental issues of the FELDA development. This is done to diversify the economic catalysts in the settlement schemes by crops-based industries and agro-preneurs as the economic themes, together with physical-infrastructure-services elements (e.g., a business centre and residential compound as support systems), and strategic governance unit to monitor at the execution and management level.

Worthy to note, this paper contributes to the process and cast ideas on the pathways of FELDA development in the challenging digital era. It is high time to cope with the current issues and future potential development crops lands, and FELDA settlements, to bring profits and prosperity to its settlers and the whole nation.

However, the outcome of this study is only at the conceptual idea stage; thus, for future research, an empirical study needs to be undertaken for a better insight on this issue. It shall be demonstrated in future publications.

ACKNOWLEDGEMENT

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INDOOR AND OUTDOOR AIR AND LIGHTING QUALITY ASSESSMENT IN HIGH-RISE LOW-COST HOUSING IN PENANG

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Abstract

Georgetown, the capital of Penang Island, records the second highest density in Malaysia. On the other hand, those with lower economic status mostly live in low-cost, high-density vertical housing with indoor and outdoor environmental quality. Such housing conditions have severe implications on the residents' comfort. Hence, this study adopted the mixed-method approach to assess indoor and outdoor air and lighting quality in high-rise low-cost housing. The qualitative approach was deployed to observe three low-cost high-rise housing in Penang while the second approach was quantitative data collected using a survey questionnaire distributed to households in the case study area. This study aims to identify the current environment indoor and outdoor lighting quality in low-cost high-rise housing. The three low-cost housing areas investigated in this study, namely, Taman Ampang Jaya (TAJ) (Seberang Jaya Utara (SPU) district), Halaman Kenanga (HK) (Daerah Timur Laut (DLT) district), and Idaman Seroja (IS) (Daerah Barat Daya (DBD) district), had more than 200 units. Resultantly, the three-housing had an average air and lighting quality, whereas the corridor indicated poor lighting, as well as foul and unhealthy air. Indoor and outdoor air quality and lighting in high-rise housing are related to the environment surrounding the site.

Keywords: High-rise housing, quality of housing, air quality, lighting quality

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INTRODUCTION

Low-cost housing attracts a high-density population, where people live in crowded spaces with limited facilities. Such housing conditions are associated with poor housing quality as the residents are faced with high-level air and noise pollution with heavy traffic congestion (Bakhtyar et al., 2013). Meanwhile, high-rise housing residents are becoming wary of sustainable development and smart cities.

Results from an (OCDE, 2011) study conducted on international housing showed that people living in good-quality homes with good indoor air quality enjoyed good mental health and prosperous lives. High-rise building design and construction features can contribute significantly to a sustainable environment in Malaysia (Zainon et al., 2016). Specifically, high-rise low-cost housing with high density is developed in Malaysia so that people can live in a building with shared facilities. According to (Husin et al., 2021), population density has a significant impact on the development of high-rise buildings in Malaysia. However, low-cost house dwellers residing in crowded units with fewer openings have a designed layout. A study revealed that low-cost housing with small overall floor areas of 650 sq ft and 700 sq ft, which come within a low budget, can lead to poor indoor environmental quality if the layout is poorly designed (Mohamed et al., 2014). Muhammad et al. (2015) reported that the housing quality is based on building design, wall and roofing material, building condition, building age, and lighting in the high and medium density areas. Architects need to design better low-cost houses to provide a better living environment for the occupants to achieve satisfaction and wellness in low-cost housing (Ismail et al., 2017). Additionally, architects must apply sustainable design principles to understand the laws and regulations related to the environment as referred by local authorities (Mohd Nawayai et al., 2020).

Indoor and Outdoor Air Environment

Indoor environment quality (IEQ) is critical in low-cost housing units, especially in narrow inter-building areas and high-density housing. However, other factors contribute to indoor discomfort and poor air quality, such as the release of energy from household activities and appliances (Sahabuddin & Bin, 2019). In Malaysia, high-rise low-cost housing layout floor plans have a combination of 12 units or 16 units for the one-floor plan. The indoor ventilation needs more IEQ when the floor plan is crowded. According to (Fantozzi & Rocca, 2020), occupants' health is related to indoor environmental quality. For instance, different apartments in Korea can evaluate the indoor environment to consider the noise and air condition to maintain a healthy home environment and lighting condition in old apartments (Cho & Lee, 2011).

The corridor and staircase make up the outdoor parts of a high-rise building. Outdoor is a social recreation area for individuals to interact with neighbours and visitors. Meanwhile, a high-rise housing corridor is a walkway that serves as a link to the lift lobby or the staircase. Outdoor space facilitates social interaction and affects residents in high-rise housing (Huang, 2006). Outdoor ventilation needs good air quality for residents to be healthy and comfortable at the corridor and staircase. The wind flow for high-rise buildings has different heights to ensure the efficient use of outdoor ventilation (Lee et al., 2013).

Indoor and Outdoor Lighting Environment
Lighting is important for both indoor and outdoor environments since it is the most frequently used element in a building. People tend to live in unhealthy environments when their homes lack natural lighting. The provision of daylight in the interior aspect of a house depends on the efficient design of the aperture, or in this case, the window. According to Kranti Kumar and Kranthi (2019), efficient daylight design must choose daylight methods aligning with passive techniques for building design.

The building design is essential to identify the housing quality and residents' quality of life in high-density housing. In order to measure residents' satisfaction towards the building quality, natural lighting is among the design quality and relevant indicators to be adopted in the Malaysian construction industry (Suratkon & Jusoh, 2015). Lighting is one of the building elements that the residents directly perceive and should be in good condition (Adeleye et al., 2014). Daylighting benefits the occupants of high-rise buildings to dry clothes and save indoor energy environment. Meanwhile, natural lighting is crucial to ensure comfort, healthy human body temperature, and a better interior environment. The outdoor area in a high-rise building needs good lighting, especially at the corridor and staircase, so that people can walk and perform outdoor activities comfortably.

RESEARCH BACKGROUND
Three high-rise low-cost housing areas, namely, Taman Ampang Jajar (TAJ), Halaman Kenanga (HK), and Idaman Seroja (IS), were selected to evaluate indoor and outdoor air environmental quality. The first case study, Taman Ampang Jajar (TAJ), is located in Seberang Perai Utara (SPU) district; while the second case study, Halaman Kenanga (HK), is situated in Daerah Timur Laut (DTL) district. The third case study is Idaman Seroja (IS), which is located in Daerah Barat Daya (DBD) district.

A 5-point Likert scale ranging from 1 = very poor, 2 = poor, 3 = simple, 4 = good, and 5 = very good was used in this study. Previous studies have shown

that this measuring scale assists in assessing the level of housing quality problem (David, 2010; Lestan et al., 2014). The assessment of housing quality depends on the housing condition (i.e., good or poor). The use of respondents' quality value level is easy to understand, thus allowing the house interior quality to be assessed. The objective of this study was to assess the quality of air and light indoor and outdoor at the selected high-rise low-cost housing areas.

METHODOLOGY

A mixed-method approach was employed in this study. Data were collected using a closed-ended survey questionnaire, whereas three low-cost high-rise housing in Penang were assessed in the case study. Stratified random sampling was used to select 115 households according to each case study area and low-cost high-rise housing chosen in the district at Penang.

A total of 345 households were involved in this study. Observation data were collected by capturing photos around the case study areas and inside the housing units with permission from the residents. Secondary data collection included population density, housing type, and housing location obtained from the Seberang Perai Municipal Council (MPSP) and the Department of Survey and Mapping Malaysia. The air and lighting quality values were measured based on on-site observation and experience. Observations of the images (photo taken) and data analysis revealed that level 7 corresponds to poor air and lighting quality levels.

RESULTS AND DISCUSSION

The present results focused on four specific variables to assess occupants' satisfaction with high-rise building housing: air quality, light quality, indoor and outdoor areas, and noise pollution. From the air and lighting assessment in the housing units (see Figure 1), HK had poor air and lighting quality (73.9%) while 57.4% and 69.9% of respondents in IS and TAJ respectively stated that their housing units had good air quality and lighting.

Photo 1 illustrates the indoor lighting condition in one of the housing units in HK at level 7. Despite receiving natural light through the windows, the interior was still dark and the residents had to turn on the lights even during the day. HK housing had 22 floors in one building; the housing units on floors one to seven received inadequate sunlight from daylight. Referring to the guideline from Uniform Building by Law (UUBL), ventilation and lighting need 15% opening for a room. The developer needs to follow the guidelines and implement new low-cost housing designs ((Amir et al., n.d.).
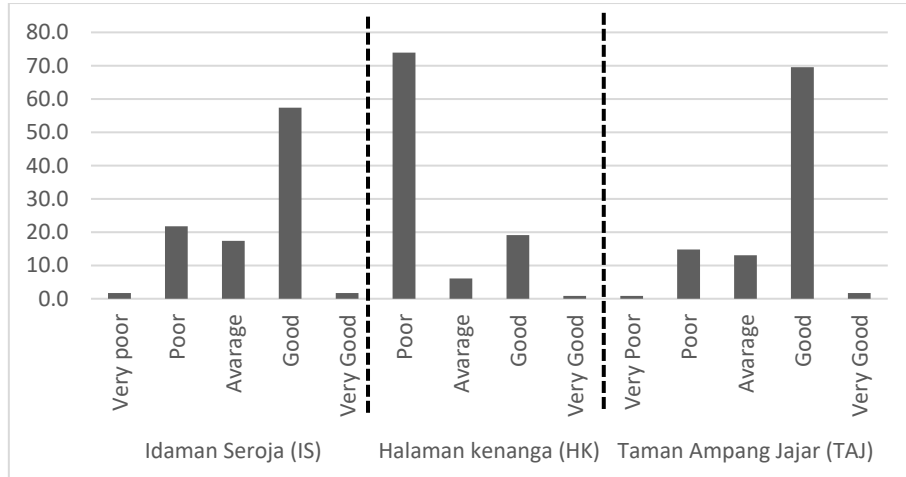
Figure 1: Air and light quality for indoor unit houses

Photo 1: Air and lighting quality of the indoor unit house in HK level 7
Source: Wan (2019)

Figure 2 shows that 52.2% of TAJ housing residents stated that the building had good air quality and lighting, followed by IS housing by 46.1% of the residents. However, 82.6% of respondents from HK stated that the air quality and lighting in the building was poor due to narrow corridors and high unit density. At times, foul odour reeked when it rained.
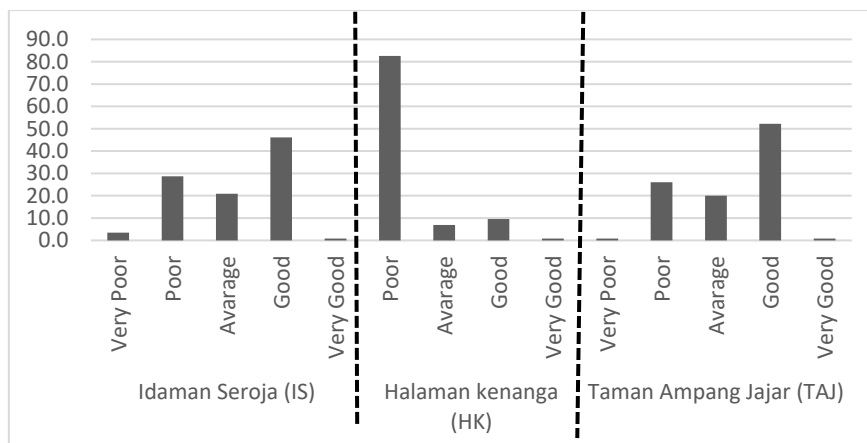
Figure 2: Criteria of air and lighting at the corridor

Photo 2: Air and lighting quality of HK housing corridor Level 7
Source: Wan (2019)

Photo 2 displays that HK housing level 7 required additional lighting during the day. The residents may improve the lighting in the corridor by installing lights in front of their houses. This is crucial for the residents' safety and comfort when walking down the corridor to the elevator or stairs. In this 22-block building, the size of the air voids was small and caused the units on the lower floors to suffer from poor air quality and lighting. In contrast, both IS and TAJ residential building designs had a wider opening in the lobby area. The IS housing had two separate blocks, in which one building block had only 16 units

with stairs that had an opening. This design ensured better air quality and lighting in the corridors of this building than that in the HK housing area. Meanwhile, the TAJ housing only had one L-shape block with an opening in the middle and the stairs were located at both ends of the open building.

Good air quality and lighting in the staircase area is essential for residents' and occupants' safety when using stairs. Figure 3 shows that 81.7% of respondents in IS housing stated that the air and lighting condition at the stairs was in good condition. Similarly, 87.8% of TAJ respondents were satisfied with the air condition and lighting of the staircase area in the building. Observations on IS and TAJ housing areas showed that the open stairs were located on both sides of the building without any stumbling block around the area; signifying good lighting and air at the staircase area.
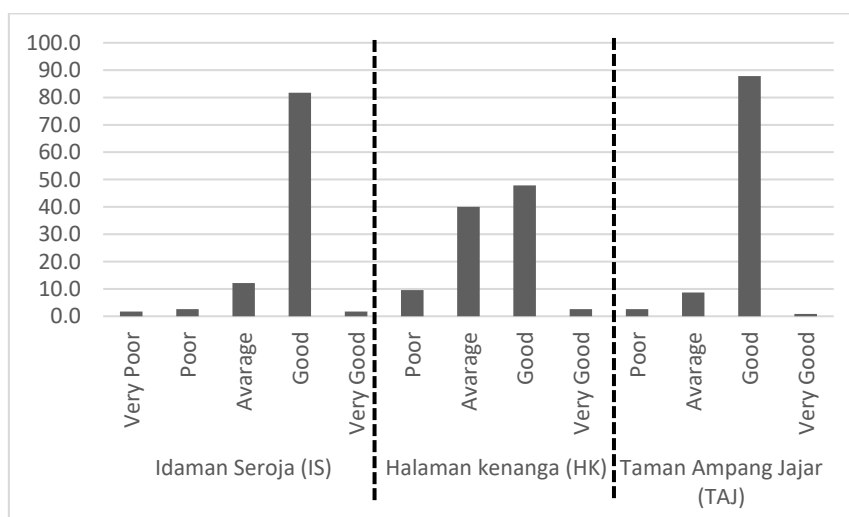
Figure 3: Criteria of air and lighting at the staircase area

Regarding the noise pollution assessment (see Figure 4), 45.2% of HK residents were awarded a simple score, 40.9% stated that the sound quality in the housing environment was of good quality, and 13.0% claimed that the noise quality was in poor condition. The HK residential building had two blocks and each consisted of 22 floors with a total of 357 units per block. The total number of housing units in this building was 714 units – indicating a high number of occupants. The noise was heard occasionally in the morning when the residents were getting ready to go to work and upon returning home in the afternoon. Additionally, children played in the playground that was located close to the site. Apart from the occupants, the source of noise pollution was from the main road that was close to the building (see Photo 3). Nevertheless, 57% of IS housing

respondents were satisfied with the minimal noise pollution in the morning and evening while 60.9% of TAJ housing respondents had no complaint about the noisy condition. This is because the TAJ housing is surrounded by landed housing, rice fields, and factories that did not contribute significantly to the generated noise.
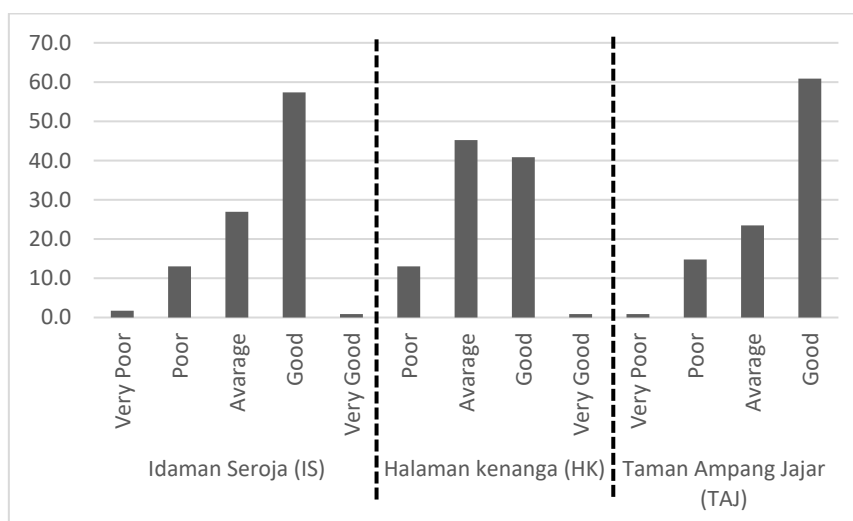
Figure 4: Criteria of noise pollution in the housing areas

Photo 3: Low-cost Halaman Kenanga (HK) in front main road and playground inside site housing
Source: Wan (2019)

CONCLUSION AND RECOMMENDATION

In conclusion, air quality and indoor lighting in high-rise low-cost residential buildings demand efficient ventilation. The shape and orientation of the building that is in line with the direction of the sun and wide openings with the appropriate

distance between buildings are crucial to improving air quality and lighting. Window size is also important in increasing natural airflow and lighting into the building. Good air and lighting offer comfort and safety to the residents when walking along the corridor. An architect needs to consider the outdoor environment quality in building design for the occupants to live comfortably in high-rise buildings. Good air and lighting are pertinent for occupants' safety, especially at the staircase for fire escape. This study assessed the air and lighting quality in indoor and outdoor of low-cost high-rise housing areas located in Penang. Future studies may determine indoor and outdoor daylight quality of low-cost high-rise housing in Malaysia. This study highlights the need to improve the environment and design to ensure more comfortable indoor and outdoor lighting quality. This could be achieved by ensuring that a unit house has a gap opening, a maximum of 16 floors, and the presence of a side opening staircase. Future research might consider different study methods or designs and target groups, such as high income and residents in the city.

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RURAL YOUTH LOCAL CHAMPIONS SUPPORT FOR RURAL DEVELOPMENT POLICY AND PROGRAM

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Abstract

Rural youth development must be exposed to the genuine intents and goals of the country's rural development direction in guiding the rural youth. As a result, this study seeks to find Local Champions (LC) support for rural development policies through the Rural Business Champions (RBC) lens. This study uses parallel mixed methods. The findings show that the LC technique and the Rural Development Master Plan should be promoted to the youth who agreed the most. However, all the mean scores are high, and RBC supported all programs to enhance LC among the rural youth. Interviews revealed a need for programs that develop passion and drive among rural youth and an emphasis on implementing entrepreneurial knowledge. Thus, this study found that the local youth participating in local champion policies and programs need to be exposed to knowledge, passion, and mentor by being included in local champions practices.

Keywords: Entrepreneurship, local champion, rural youth, rural planning

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INTRODUCTION

Rural development is one aspect of national planning that aims to achieve sustainable development by improving the quality of life of local communities (Md Sharif & Tuan Lonik, 2017). Rural development has become a concern worldwide because of the enormous gap between urban and rural developments (Kamarudin et al., 2012; Manggat, 2018; Rashid et al., 2021). Demographic trends do not give hope for rural areas in an advanced economy (Tuomas et al., 2016). However, it should carry the causes of rural development due to high poverty rates, low productivity, lack of economic and social infrastructure, and the market (Zeinab et al., 2016). Most studies have found that development rates for small enterprises in rural areas are lower because it exposed them to a more excellent range of challenges than urban areas due to the constrained environment (Fabeil et al., 2017). This is even more worrying as unemployment is more pronounced in rural areas than in urban areas (Galvão et al., 2020).

In Malaysia, the rural population is predicted to gradually decline over the next few years, reaching around 7 million in 2030 (Rashid et al., 2021). The Government of Malaysia made various measures and approaches to increase rural development since the country's independence in 1957 through to the 1990s (Fatimah & Mad Nasir, 1997; Alex, 1980; Manggat, 2018). Therefore, Malaysia's government intends to promote rural regions into economic hubs, enhance rural livelihoods and living conditions, and close the gap in life quality between urban and rural residents (Rashid et al., 2021). One of the rural development programs is Local Champion (LC). The movement of the rural population is due to an increase in out-migration, particularly of youth (Ismail et al., 2021; Rashid et al., 2021). Thus, the LC program is vital in producing more rural youth that venture into entrepreneurship, businesses, and others to increase their income and development.

Youth are the pillar of the country in the future and have a positive impact on the development of rural communities (Zeinab et al., 2016; Omar et al., 2017). The Malaysian government has introduced entrepreneurship programs, especially in rural areas, as a job opportunity for the youth (Zeinab et al., 2016). However, to provide LC, they need to have a noble intention and aim for the country's rural development direction to guide other youth in rural areas. Thus, this study aims to identify Local Champions (LC) support for the government's policy on rural development based on Rural Business Champions (RBC). RBC is the winner of a Business Plan competition organised by the Kementerian Pembangunan Luar Bandar (KPLB) and a successful LC. Therefore, this study required their views to see the support and importance of rural development policies and program in producing more LC youth.

RURAL DEVELOPMENT AND YOUTH LOCAL CHAMPIONS

Rural assets and resources (agricultural, entrepreneurial, business, and tourist) should be further developed to avoid rural populations from encountering impediments or difficulties in meeting their demands due to global urbanization challenges (Rashid et al., 2021). As suggested in the literature, among the gaps between urban and rural development are the development of agro-based entrepreneurs (Siti Aisyah et al., 2015), and the development of a Smart ICT point to reduce the digital gaps (Zurinah et al., 2016). Urban areas are frequently equated with appropriate facilities or core infrastructure, in contrast to rural communities, which continue to be constrained by restricted and insufficient infrastructure (Manggat, 2018).

The effort by the Malaysian government to improve the socio-economic status of rural areas is to intensify their involvement in programs such as homestays, handicraft making, and indigenous processed foods (Fabeil et al., 2017). However, empirical studies on entrepreneurship programs and their development in rural areas are still lacking (Galvão et al., 2020). Rashid et al. (2021) stated that the development criteria of a modern rural village should include strengthening local businesses, education, health and welfare, technology engagement, and food security; all of which are required components of the modern rural approach. Contemporary studies on youth's disposition, options, and intentions for rural life present contradictory results (Tuomas et al., 2016).

Most youth believe they can affect small changes at the community level in the Malaysian context, while just a minority believe the contrary (Samsuddin et al., 2018). In most developing countries, including Malaysia, youth living in rural areas are involved with local natural resource-based jobs (Zeinab et al., 2016; Tuomas et al., 2016; Md Sharif & Tuan Lonik, 2017). The strategy adopted by the Government of Malaysia to eradicate poverty is modernization to increase efficiency, productivity, production, and returns to farmers and fishers (Alex, 1980; Rozhan, 2017). The rural development policy was introduced again with the National Development Policy (DPN) in 1991 (Zurinah et al., 2016) to achieve a national standard, social justice, values, ethics and morality, political stability, quality of life, government administration, and economic excellence. The 11th Malaysia Plan (RMK-11), which the Malaysian government began, has devoted a sizable budget to improve and upgrade existing basic facilities in rural regions to ensure the rural people's well-being (Unit Perancang Ekonomi, 2015).

Based on the policy's core in rural youth development, the government has set a public policy statement for the Core 5: the empowerment of high, knowledgeable, skilful, patriotic, creative, innovative, and enjoy sustainable income through entrepreneurship (Ministry of Rural Development, 2019). One strategy developed in this policy is to strengthen the youth in business and

entrepreneurship. Hence, the government aspires to develop rural youth by creating business opportunities and engaging in entrepreneurial activities.

FRAMEWORK RURAL YOUTH SUPPORT FOR RURAL DEVELOPMENT.

This research focuses on aspects of rural development such as support for government policies and programs, and the issues and challenges faced to focus on local youth involved with the local champion program. The framework for this investigation is summarised in Figure 1.
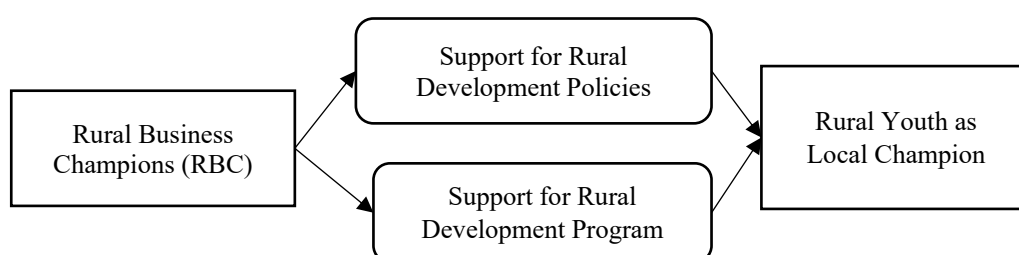
Figure 1: Conceptual framework

Five indicators were identified to be evaluated to obtain RBC's support for rural development policy. First, the local champion development approach is needed for rural youth development to local champion development programs. According to Muhamamd Zulhafizi and Zurinah (2021), several measures that the government is actively implementing are to increase and expand the role and capacity of entrepreneurship training institutions, strengthen the cooperative sector and provide assistance to the Small and Medium Industry (SME) sector in terms of finance, needs, guidance. etc., to increase its contribution to the economy to the level of 40% by 2015. Second, Local champions (LC) need to understand the philosophy and policy of rural development.

Furthermore, Jalaluddin (2015) explained that Malaysia does not lack local wisdom for sustainable development such as Vision 2020, transformation of the New Economic Model (NEM), 1Malaysia Concept, Bandar Selamat program, Sustainable Village, Prosperous Community, 1Malaysia Community, and global planning and development philosophy by Jabatan Perancangan Bandar dan Desa (JPBD) (2011). Thus, LC development needs to understand the philosophy and policies of rural development, understand the Rural Development Master Plan, adopt the new Model of rural economic transformation, enhance the dissemination of information on rural development policies, programs, and activities.

The study also identified the support of RBC winners towards programs related to economic sector improvement that have been implemented and

proposed to create more LCs among rural youths. There are six rural LC development programs and activities identified are The Rural Business Challenge (RBC) (Zubir, 2020); The Model of Sustainable Rural Development (Ibrahim, 2015); The "Gerakan Desa Wawasan" (GDW), and "Gerakan Daya Wawasan" (KPLB); The global iconic people who contributed to the community should be exposed to youth (Boldureanu et al., 2020); 1M4U (Institute Social Malaysia), Volunteer programs by NGOs such as "Yayasan Salam" and "Yayasan Sukarelawan Siswa" (Muhammad Ismail, 2015; Sinar Harian, 2017). RBC winners evaluated all items as a form of initiative that helps stakeholders focus on LC development among rural youth.

RESEARCH METHODOLOGY

This research uses parallel mixed methods. The study sample comprised Rural Business Challenge (RBC) winners from 2013 to 2016. Data was collected through a survey of the RBC winners provided by the KPLB. The entire list of winners provided had 137 people. However, this study could only collect 30 RBC winners as a sample study because there were several constraints in obtaining a sample for this study; among which are the factors of time, distance, and commitment of the sample to their careers. Based on a population size of 137, assuming an estimated RBC winners of 50% with a 90% confidence interval, we calculated a required sample size of 30 respondent with 13.36% margin of error.

We conducted a field study to get data from the sample respondents from 21 April 2018 to 14 July 2018. The questionnaire items for this study were divided into three sections: demographics, policy support for rural development, and program support for rural development. The items of this study have been validated by five experts in the field of rural development policy. Cronbach's alpha values were used to demonstrate the questionnaire's reliability for this item:

Table 1: Cronbach Alpha value

Questionnaire Instrument	Item	Cronbach Alpha Value (α)
Support for rural development policy	5	0.783
Support for rural development programs	6	0.819

Based on the Cronbach alpha score (Bond & Fox, 2015), the Cronbach's alpha coefficient of 0.7 is good and acceptable, while 0.8 and above is very good and practical with a high level of consistency. Thus, the Cronbach's alpha value in this study based on Table 1 shows a high value and understood by the respondents. The results presented in this paper were analysed using a descriptive statistical analysis aided by the computer software Statistical Package for the Social Sciences (SPSS) version 23. Meanwhile, interviews were conducted with three respondents out of the 30 people.

RESULTS

The results are based on the objective of this study which is to identify the support of Local Champions (LC) towards government policy on rural development. Hence, this study sets out a discussion that shows that rural development needs to develop more LC among rural youth. The second objective is to see the respondents' support for programs implemented in the rural development policy as the need to produce more LC in Malaysia.

Respondents' Support for Rural Development Policy Requirements

Respondents' support towards the rural development policy is based on five identified items, as shown in Table 2 below. The result shows that most respondents agreed (82.8%) that the LC development approach is needed for rural youth development programs. Meanwhile, only 17.2% of the respondents disagreed. This decision also offers the same results for the indicator that the Rural Development Master plan is to be explained to the group of local champions. However, the results show a high level of agreement on the rural development policy in the LC program.

Most of the respondents strongly agreed with the philosophy of rural development in Malaysia where the youth should understand the development programs of local champions, with the support of 75.9%. At the same time, the rest agreed (20.7%), and only 1% was neutral. Furthermore, the youth need to practice the new rural economic transformation model, showing the difference supported by RBC. The percentage of 34.5% strongly agreed to deliver the highest support, 27.6% agreed, and 27.6% were neutral, while those who disagreed and strongly disagreed were 6.9% and 3.4%, respectively. Lastly, information on agency policies, programs, and activities for youth development is necessary to accelerate the local champion's fast process. This item shows that the percentage of strongly agreed is higher than 75.6%. In contrast, the rest of the respondents agreed with 20.7% and only 3.4% disagreed. The number of mean scores shows all high items are over 4.0 and above.

Table 2: Support for rural development policy

	Support for Rural Development Policy	Percentage (%)					Mean	St.D
		SD	D	N	A	SA		
1	The local champion development approach is needed for rural youth development to LC development programs.	-	-	-	17.2	82.8	4.83	0.384
2	The youth should understand the	-	-	3.4	20.7	75.9	4.72	0.528

		SD	D	N	A	SA	Mean	St.D
	philosophy of rural development in Malaysia for the development programs of LC.							
3	The Rural Development master plan should be explained to the group of LC.	-	-	-	17.2	82.8	4.83	0.384
4	The youth need to practice the new Model of rural economic transformation.	3.4	6.9	27.6	27.6	34.5	4.59	0.733
5	Information on agency policies, programs and activities for youth development is necessary to accelerate the LC fast process.	-	3.4	-	20.7	75.9	4.69	0.660

*Note: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA), St.D (Standard Deviation).
*Score mean: 1.00-2.33(Low); 2.34-3.66 (Medium); 3.67-5.00 (High)

The high score means of 4.83 offers support from RBC about needs and planning from rural development policy which are highly recommended to develop LC among rural youth. Result of interviews also show knowledge on the development of rural entrepreneurs:

"..Sometimes these youths do not believe by just giving explanations and theories, but they believe more when we bring them ourselves to the processing plant area." (Informant 2)

However, Informant 3 also commented on the term of entrepreneur of knowledge to:

"..I once sent some participants and also follow -up staff from the program (entrepreneur program that has been organized) to get more knowledge and training." (Informant 3)

Therefore, it can be concluded that knowledge needs to be in line with practical knowledge that focuses on entrepreneurship, government policy, and rural development.

Support for Local Champions Development Programs
Table 3 shows the support from RBC towards rural development programs in developing LC among rural youth. This result shows six items to discuss. First, the Rural Business Challenge (RBC) program can produce successful local LC had respondents who strongly agreed with a higher percentage of 65.5%, followed by agreed with 20.7%, while neutral and disagreed with 6.9%. Second, the Model of Sustainable Rural Development through cooperation is beneficial in building socio-economic rural youth. The results show that the respondents strongly agreed with 34.5%, agreed with 27.6%, and neutral with 27.6%. Other than that, the results show support by disagreeing and strongly disagreeing with 6.9% and 3.4%, respectively.

Third, the "Gerakan Desa Wawasan" (GDW) and "Gerakan Daya Wawasan" are still necessary as the basis for rural youth development, showing the higher result of strongly agreed with 48.3%, followed by neutral and agreed with 24.1% and 21.7%, respectively. At the same time, some of them disagreed and strongly disagreed with 3.4%. Fourth, global iconic people who contributed to the community, such as Princess Diana and Muhammad Yunus, should be exposed to the youth. The higher percentage strongly agreed (48.3%), followed by those who agreed with 27.6%, while the rest showed that 17.2% were neutral and 6.9% strongly agreed. In addition to having an influential mentor or icon, RBC as a mentor also has constraints to play a role to rural youth:

"maybe because the entrepreneurs themselves (experts/mentors), as I am busy running the business, at the same time want to help them as well. Ideally, if I see,.. entrepreneurs who want to be involved in programs with the youth need to be stable before training others. If entrepreneurs are not stable, how to train people. We are like that..." (Informant 1)

Table 3: Support for rural development programs

	Support for rural development programs	Frequency and Percentage (%)					Mean	St.D
		SD	D	N	A	SA		
1	The Rural Business Challenge (RBC) program can produce a successful LC.	-	2 6.9	2 6.9	6 20.7	19 65.5	4.45	0.910
2	The Model of Sustainable Rural Development through cooperative is very effective in building socio-economic rural youth.	1 3.4	2 6.9	8 27.6	8 27.6	10 34.5	3.83	1.104

3	The "Gerakan Desa Wawasan" (GDW) and "Gerakan Daya Wawasan" are still necessary as the basis for rural youth development.	1 3.4	1 3.4	7 24.1	6 20.7	14 48.3	4.07	1.100
4	The global iconic people who contributed to the community, such as Princess Diana and Muhammad Yunus, should be exposed to youth.	2 6.9	-	5 17.2	8 27.6	14 48.3	4.10	1.145
5	1M4U Program can create a LC among the rural youth.	1 3.4	2 6.9	10 34.5	8 27.6	8 27.6	3.69	1.072
6	Volunteer programs by NGOs such as "Yayasan Salam" and "Yayasan Sukarelawan Siswa" should be exposed for the development of the rural youth champion.	1 3.4	-	4 13.8	10 34.5	14 48.3	4.24	0.951

*Note: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA), St.D (Standard Deviation).
*Score mean: 1.00-2.33(Low); 2.34-3.66 (Medium); 3.67-5.00 (High)

Fifth, the support toward the 1M4U Program that can create a local champion among the rural youth got a different result with a higher percentage of neutral at 34.5%, followed by strongly agreed and agreed with 27.6%. Meanwhile, the rest disagreed and strongly disagreed with 6.9% and 3.4%, respectively. The last item is support for volunteer programs by NGOs, such as "Yayasan Salam" and "Yayasan Sukarelawan Siswa", should be exposed for the rural youth champion's development, showed the majority strongly agreed with 48.3%, followed by 34.5% who agreed.

In contrast, the rest were neutral and strongly disagreed with 13.8% and 3.4%, respectively. The high mean score of 4.45%, offers support from RBC as RBC is the best successful program to develop LC among rural youth. On the other hand, the lowest mean with 3.82% refers to the Model of Sustainable Rural Development effectively building socio-economic among the rural youth. However, all the mean scores show a high score, and all the programs got support from RBC to develop more LC among the rural youth.

Nevertheless, most of the informants stated that there are challenges in educating rural youth because their passion and interest in entrepreneurship is lacking, as they explained:

"..The process to recruit these youth is difficult...especially when we want to find and gather them to share (entrepreneurship program) with us.." (Informant 1)

"..I also have experience with entrepreneurs .. there are many genuine problems, some are problematic, and some are successful. And we are involved with the youth, especially in agriculture. Because agriculture is familiar with rural activities. we need to focus on their interest." (Informant 2)

"..what I see among these youths, something that we share easily..like when we share something that is not from him having passion, they are not motivated to do something. So little difficult actually.." (Informant 3)

As can be seen, the critical challenge is to discover a more acceptable way to attract the youth in engaging in entrepreneurship.

DISCUSSION

The best and most successful program to be implemented is the Rural Business Challenge (RBC). It also supported the assumption in a study by Galvo et al. (2020), which established that entrepreneurship might create jobs and economic development in urban and rural locations. Entrepreneurship is one of the main economic growth drivers in which it creates wealth, innovation, and use of technology and poverty reduction. It is also one of the economic strategies to maintain the country's competitiveness in enhancing globalization trends (Zeinab et al., 2016).

Based on the interviews, we found that several approaches carried out by the RBC winners towards local youths explained some issues and challenges that need to be coordinated with programs from the Government for rural development among local youths. The results are also supported by previous studies that found some need to introduce the LC program. For example, Noor et al. (2017) explained, the factors contributing to entrepreneurial activity are internal factors, such as personality traits, skills, and motivation. Next challenge, which is to create more experts or mentors, is one of the issues that need to be arranged well because the role of mentors inspires the youth to participate in entrepreneurial activities and local champion programs.

The third issue or challenge, which is the local youth mentality, is also supported by Jaafar et al. (2015), where small rural tourism business owners are low educated. Therefore, the results of their study found that some rural communities are less skilled in using ICT technology for conveniences, such as

making business capital transfers and others. Further to that, the fourth issue or challenge is that knowledge is vital for rural development modules or programs, primarily to generate a generation of LC. The findings of these concerns and challenges in terms of knowledge have significantly bolstered previous research that identified various aspects which necessitate the construction of a knowledge-based program (Jaafar et al., 2015; Noor et al., 2017).

The study results show that RBC plays an essential role as a leader and role model to rural youths to become LCs like them. Other than that, RBC also increases employment opportunities and the resilience of rural youths to improve their economic and living standards in rural areas. Furthermore, RBC's contribution to encouraging rural youths to choose entrepreneurs as their jobs is capable of achieving the government's target of producing more rural entrepreneurs by 2030.

CONCLUSION
It was concluded that support for rural development policies and programs received encouraging approval from the RBC winners to produce more local champions (LCs) among rural youths. However, aspects of knowledge about these policies and programs need to be in line with the internal development of youth, such as motivation, and building a deep interest and desire for entrepreneurship and business. Rural development programs that produce an LC generation are very useful in helping rural communities to develop their areas while upgrading their lives and economic resources. However, disclosure of the program needs to be expanded and improved in terms of management.

The study results and the use of parallel mixed methods show the ability to answer the objectives of this study. Therefore, the researcher sees the need for mixed methods studies to evaluate the approach to plan rural development policies and programs. However, this study also has limitations that focus on the involvement of those who organise activities to produce a generation of LC among local youth only. Thus, it is proposed for future studies to examine more broadly the evaluation of the youth themselves. It is crucial to gain legitimacy more clearly on the needs to be focused on rural youth to engage in rural development activities. Besides that, it is essential to show the alignment between rural development policy and the targeted program that is RBC with the reality that must be taken to develop LC among local youth. Therefore, it is essential to plan strategies that the targeted parties and those who formulate policies and programs for rural development can achieve.

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IDENTIFYING THE OPTIMAL PLACEMENT OF SPATIAL WIND ENERGY FARMS IN SELANGOR, MALAYSIA

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Abstract

Electrical energy is indispensable for the economic growth and well-being of humanity. However, there is a growing concern with the conventional method of generating electricity which is by burning coal and other fossil fuels. In the coming decades, the world will experience a transition to cleaner energy, away from the use of fossil fuels. One of the clean and renewable energies that is getting more popular and advancing in technology is wind energy. Wind energy requires a proper location to operate in order to be profitable and have the desired impact on society. In search of a suitable location for wind energy, a Geographical Information System based Multi-Criteria Decision Making (GIS-MCDM) approach was utilized in this paper to explore the suitable areas for wind energy development in Selangor. Eight parameters were chosen to address this concern, including terrain elevation, terrain slope, road network, airport locations, forests, settlements, water bodies and average wind speed. All of these criteria were weighted using the pairwise comparison approach in MCDM, and the decision-making process was facilitated by the criteria utilizing the ArcGIS-weighted overlay tool. The study has identified seven potential sites, but only four sites that are practically located the wind energy site, which are Banting, Jeram, Ijok and Kerling. GIS-MCDM can assist the decision-maker in designing the optimal placement of wind farms in real scenarios.

Keywords: Wind Energy, Site Selection, Suitability Index Map, GIS, MCDM

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INTRODUCTION

Electricity is essential for the economic growth and well-being of human populations. Nowadays, the majority of electrical power is generated with the burning of fossil fuels such as oil, coal, and nuclear reaction. Increased environmental concern and issues surrounding the security of supply have led to a global drive to develop renewable energy systems (Harper et al., 2017). Many energy sources are renewable and safer than fossil fuels. One of such resources is the energy obtained from wind (Szurek et al., 2014)

Building a new infrastructure such as a wind turbine to serve as an active long-term investment requires careful planning in terms of the site selection. Site selection of wind farms producing electricity requires careful and combined analysis of numerous criteria such as technical requirements, as well as environmental, social, and spatial constraints (Szurek et al., 2014). Wind turbines would probably operate profitably at a speed of 4.5m/s - 5.0 m/s. (Csikós & Szilassi, 2015). A suitable site should also consider the slope, aspect surface of the area, location of nature protection areas and their buffer zones, built-up areas and their buffer zones, location and distance from power lines, location and distance from rivers and surface waters, location and buffer zones from forests, location and distance from telecommunication lines and location, technical standards and distance from roads and railways (Szurek et al., 2014).

A multi-criteria decision making (MCDM) model for calculating wind speed and slipstream topography is used in this study, as an integrated calculation model in GIS implementation. Therefore, a Digital Elevation Model (DEM), wind data from the nearest weather station, geology data for determining appropriate soil, the distance to power lines and land use data sets are used to identify a suitable location for power generating wind turbine (Arcidiacono, 2012). The study's main aim is to identify suitable locations to place power-generating wind turbines in Selangor using the GIS-MCDM approach with influential parameters. The specific objectives are i) to determine the criteria of profitable wind turbine location in Selangor ii) to estimate the weight of the criteria and sub-criteria for a profitable wind turbine in Selangor, and iii) to create a suitability index map of wind energy locations in Selangor.

WIND ENERGY AND SITE SUITABILITY

In the context of geographical suitability, identifying a good location is vital for the success of wind farms (Eichhorn et al., 2019; Becker and Thran, 2018). There are three key factors influencing the location of wind farms which are wind energy output, grid availability and construction conditions. On the other hand, there are limiting factors such as the technical requirements, economic, social and environmental considerations, which present a sitting difficulty of the wind farms (Musa et al., 2012). In Malaysia based on MCDM method, there are four criteria

considered including wind energy density, wind speed, terrain condition and noise restriction (Hwang et al., 2011).

Meanwhile, a study in Thailand found that to select a suitable site for the wind farm, the criteria of urban areas, community zones, important places, scenic areas, airport areas, highways, wind energy potential, surface roughness, elevation, river/canal are suggested to be considered (Bennui et al., 2007). In finding a suitable location for the wind farm in Nebraska, there are seven probable criteria that are taken into consideration such as the potential of wind energy potential, land use, population density, distance to major roads, slope, distance to transmission lines, and exclusionary areas (i.e., areas where cities and towns, wetlands, airports and roads are located) (Miller & Li, 2014).

According to Szurek et al.(2014) and (Saleous and Issa, 2016) , the criteria that should be put into considerations when determining the suitable location to establish power-generating wind turbines are the location of nature protection areas and their buffer zones Hence, this study has considered a widened selections of factors influencing the suitable wind energy area that have been discussed by previous studies (Eichhorn et al., 2019; Hwang et al., 2011; Musa et al., 2012; Bennui et al., 2007). Eichhorn et al. (2019) addressed that wind power provides an important role in shaping sustainable energy system, such as reducing carbon emissions and ensuring the health of residents and the environment.

GIS-MCDM AND REMOTE IMAGERY APPROACH FOR WIND ENERGY LOCATION

GIS-MCDM incorporated explicit statements of preferences of decision-makers and such preferences are represented by various quantities, weighting scheme, constraints, goal, utilities, and other parameters used. This is to analyse and support decision through formal analysis of alternative options, their attribute, evaluation criteria, goals or objectives, and constraints (Bennui et al., 2007).

Some functional operations are implemented in the GIS-MCDM approach, such as Analytical Hierarchy Process (AHP) and weighting. AHP method is a flexible and simple Multi-criteria Analysis (MCA) and it has been largely explored in the literature related to location identification as conducted in several studies in Malaysia (Saad et al., 2021; Mohd Zaini., 2021; Rasam et al., 2017; Abdul Rasam et al., 2016; Mamat et al., 2014; Othman et al., 2021). AHP is recognized for its ability to consider tangible and intangible criteria in giving solutions to a multi-criteria problem. There are two distinct characters of AHP; the ability to assign a hierarchy structure and conducting pairwise comparisons between different criteria (Musa et al., 2012; Kaluthanthri & Osmadi, 2020).

Weighting scores for each criterion is derived from AHP, by directly comparing the importance of one criterion to another criterion. Rules for defining

the score are; "1" when the criteria in columns are less significant than those in a row, "2" when the criteria in columns have the same significance as those in a row, and "3" when the criteria in columns are more significant than those in a row. When criteria in columns are the same as those in a row, the score is equal to "0" (Bennui et al., 2007).

MODIS is the Moderate Resolution Imaging Satellite built by Santa Barbara Remote Sensing. It maps the earth at 500-meter spatial resolution for six different Land Cover types. The maps were derived from the classification of spectro-temporal features. Identifying proper locations for onshore wind turbines requires consideration to a lot of spatial characteristics; hence, GIS is widely used to carry out such studies (Abdel-Basset et al., 2021; Tercan et al., 2020; Díaz-Cuevas, 2018; Harper et al., 2017).

METHODOLOGY

There are four steps involved in the methodology of the study. The first step is the preliminary study in identifying the criteria and sub-criteria in locating the suitable location for a wind farm. Next is the geospatial data collections such as the DEM, wind speed data, land use map, and road networks. The third step is the data processing, which was carried out to map all the datasets and classify them according to the suitable criteria for wind energy generation. The weightage (pairwise comparison method) is decided based on previous study as mentioned on literature review. Finally, all the created maps were overlaid using the weighted overlay tool in ArcGIS to create the suitability index map of wind energy. Figure 1 shows the research methodology workflow.
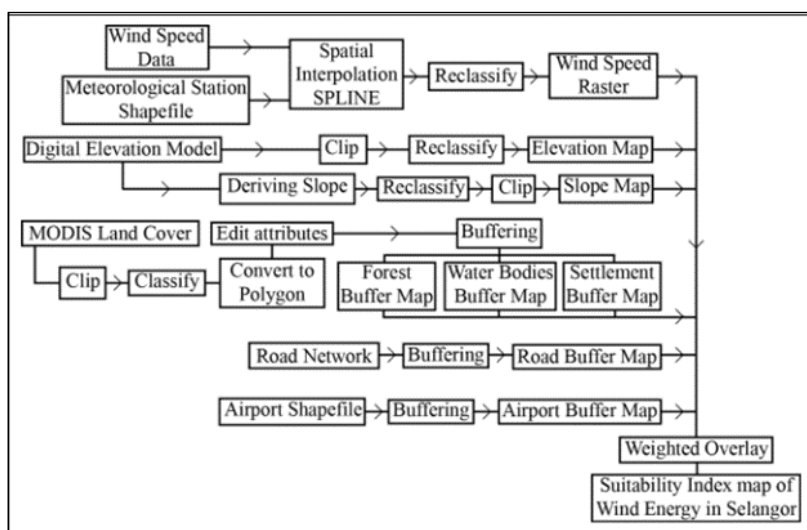
Figure 1: Research methodology

THE STUDY AREA AND CRITERIA FOR THE WIND FARM LOCATION

The study was carried out in Selangor, as shown in Figure 2. It is one of the largest states in peninsular Malaysia, with high GDP and population. Selangor is chosen since it is the most developed state in Malaysia located on the west coast of the Peninsular Malaysia and it is estimated to be 8000 square kilometres in width with a hilly and flat terrain.

Figure 2: Study area located in Selangor, Malaysia
(Google Map, 2019)

In the process of identifying suitable locations for wind farms in Selangor, several spatial characteristics are considered. The spatial characteristics and their ranking are obtained from several previous studies carried out in another country, as illustrated in Table 1 and Table 2. The criteria considered are wind speed, forest, airport location, water bodies, settlements, terrain slope, terrain elevation, and roads. Thus, the selected location will be based on the sub criteria, which are obtained from a previous study conducted by UTHM, and based on the criteria, the suitable location within the Selangor state and its districts will be selected in order to build the wind turbine.

Table 1: The sub-criteria for the wind farm location

Spatial Characteristic	Suitability Index					
	0	**1**	**2**	**3**	**4**	**5**
Wind Speed (m/s)	<1.0	1.0 – 1.5	1.5-2.0	2.0 – 2.5	2.5 – 3.0	>3.0
Forest (m)	<1000	-	-	-	-	> 1000
Airports (m)	<1000	-	-	-	-	> 1000
River/Water Bodies (m)	<200	201–350	351–500	501–650	651–800	>800
Settlements (Km)	>0.5	5.0 – 4.0	4.0 – 3.0	3.0 – 2.0	2.0 – 1.0	1.0 – 0.5

Terrain Slope (°)	>40	>10	7.5 – 10	5–7.5	2.5–5	0–2.5
Terrain Elevation (m)	<200	160 – 200	120 – 160	80 -120	40-80	0-40
Roads (m)	<50	>1000	751– 1000	501–750	251–500	51–250

Table 2: The GIS operations

Input	GIS Operations	Output
Elevation Raster	Clip and Reclassify	Elevation Map
Elevation Raster	Clip, Deriving Slope and Reclassify	Slope Map
Meteorological Station Points Shapefile	Spatial Interpolation	Wind Contour Map
Land Cover Raster	Clip, Classify, Edit Attributes and Buffering	Forest Buffer Map Settlement Buffer Map Water Bodies Buffer Map
Road Network Shapefile	Buffering	Road Network Buffer Map
Airport Shapefile	Buffering	Airport Buffer Map
Elevation Map Slope Map Wind Contour Map Forest Buffer Map Settlement Buffer Map Water Bodies Buffer Map Road network Map Airport Buffer Map	Weighted Overlay	Suitability Index Map of Wind Energy in Selangor

DATA COLLECTION AND PROCESSING

The dataset was collected from various open sources by referring to the previous study. The land use data were obtained from MODIS land cover data, which can be accessed through the USGS Earth Explorer server. DEM was acquired from Shuttle Radar Topography Mission, made available and accessible in opentopography.org for producing elevation and slope map. Road network data were obtained from openstreetmap.com, and wind speed data were collected from selected meteorological stations in Malaysia. Table 3 shows the GIS operation involved in the study. Each dataset undergoes several GIS operations to produce suitability maps. All the suitability maps were used in weighted overlay to produce a wind energy suitability index map in Selangor.

RESULT AND ANALYSIS

This part discusses the results that are from the data processing and analysis. It consists of GIS calculation and processes such as wind contour map, elevation map, slope map, forest, settlement and water bodies buffer map, road buffer map, and airport buffer map of Selangor. All of these maps are analysed by their area, class types, and distribution of their legends across Selangor. The final map, which is the product of the weighted overlay process from all the maps produced, is called the suitability index map of wind energy in Selangor. The results were also overlaid with Google Earth for accuracy assessment.

SPATIAL CHARACTERISTIC AND RANKING

Spatial characteristic of several studies is combined. The more frequent a spatial characteristic appeared in previous study, the higher the score ranking of the spatial characteristic. The weight is determined by calculating the percentage over the total score of the ranking. The ranking is based on the analysis in Table 3.

Table 3: Analysis of spatial characteristic used in previous studies

Study Area	Wind Speed	Terrain Elevation	Terrain Slope	Distance from Forest	Water Bodies	Distance from Settlement	Road Network	Distance from Airport
Louisiana USA	-	-	-	-				
Tehran Iran	-	-	-	-		-	-	
Thailand	-	-	-		-	-	-	-
Malaysia	-	-	-					
United Kingdom	-					-	-	-
Serbia	-		-			-		
Ecuador	-		-	-	-	-	-	-
Zanjan, Iran	-	-	-	-	-	-		-
UAE	-		-			-	-	-
Nebraska USA	-		-	-	-	-	-	-
Prusice Poland			-	-	-	-	-	
Hungary	-			-	-	-	-	
Score	11	5	10	7	6	10	8	6

Table 4 shows the ranking of the spatial characteristic, which is determined by analysing several previous studies for determining the suitable wind farms.

Table 4: Ranking and weight

Spatial Characteristic	Score	Weight (%)
Wind Speed	11	17
Terrain Elevation	5	8
Terrain Slope	10	16
Distance to Forest	7	10
Distance to Water Bodies	6	10
Distance to Settlement	10	16
Distance to Road Network	8	13
Distance to Airport	6	10
Total	63	100

SUITABILITY MAPS OF THE CRITERIA

The suitability level of each criterion of wind energy is shown in a suitability map. All maps were combined for the analysis to produce a suitability map of energy wind. The following figures show the results of the suitability maps of the criteria.
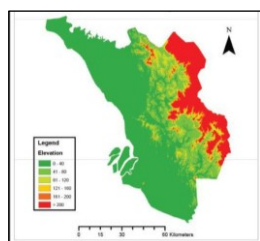
Figure 3: Elevation map   **Figure 4**: Slope map   **Figure 5**: Wind contour map
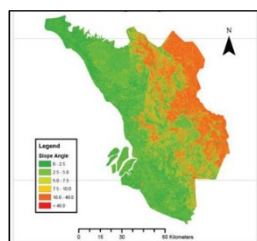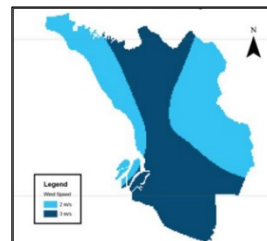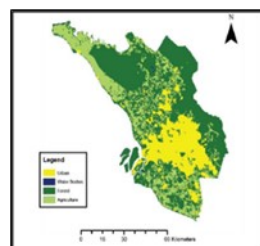
Figure 6: MODIS land map   **Figure 7**: Forest buffer map   **Figure 8**: Settlement map
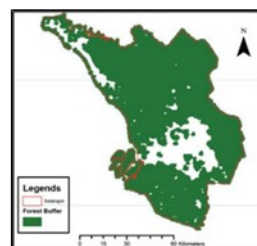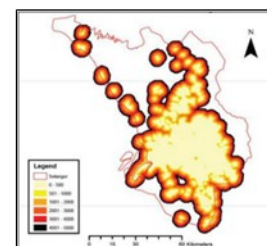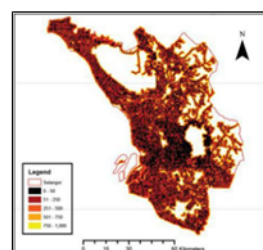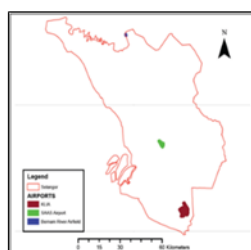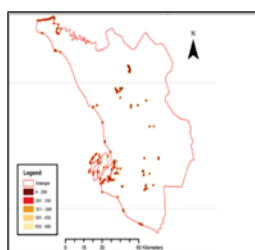
Figure 9: Water bodies map   **Figure 10**: Airport map   **Figure 11**: Road network map

The elevation map (Figure 3) shows that a lot of suitable lands are situated at the west side (green) of the Selangor state that is facing the Straits of Melaka while the unsuitable land area lies (red) at the east side of Selangor state, which is the mountainous region of Titiwangsa Mountain. The class and percentage of the suitability map is shown in Table 5.

Table 5: Suitability Map Classification

Class	0-40	40-80	80-120	120-160	200	>200
(%)	58.643	16.625	6.102	2.357	1.696	14.576

For the slope map, as shown in Figure 4, only 0.23% of Selangor land is not feasible due to its steepness. Most of this land is situated at the eastern side of Selangor, where the Titiwangsa mountain range lies. On the western and flatter side of Selangor, lies a relatively flat landscape, predominantly a class 1-3 land with a maximum steepness of 7.5°. The highest class's percentage would be class 1 with steepness ranging from 0°-2.5° angle, which is the most suitable type of land in terms of its steepness. The analysis of the slope is depicted in Table 6.

Table 6: Slope Map Classification

Class	0-2.5	2.5-5.0	5.0-7.5	7.5-10.0	10.0-40.0	>40
(%)	33.390	26.506	9.963	6.160	23.751	0.230

The wind contour map is illustrated in Figure 5, indicating 2 classes of wind 2m/s and 3m/s. The 2m/s wind class is spread along the mountain's region on the east of Selangor and the coastal area on the west of Selangor. For MODIS Land Cover, Selangor is made up of 54.02% Forest, 25.22% Farmland, 20.29% of Urban Area, and 0.47% of Water Bodies (Figure 6). Wind farm can only be established in an area without water bodies, forests and urban areas. Hence, farmland covering a quarter of Selangor's land is the only suitable location for a wind turbine farm. Farmlands are mostly located in the northwest and southern part of Selangor and are also sparsely scattered in the middle of Selangor and north of the major urban area. As shown in Figure 7 and the analysis in Table 7,

forest area and its buffer cover 85.16% of the total land area in Selangor. This leaves Selangor with a measly 14.84% of the land to establish wind energy farms.

Table 7: Forest buffer map class

Class	Ranking	Buffer Area(m^2)	Percentage of Cover
0	Restricted	7035100728	85.16
1	5	-	14.84

The urban area in Selangor is focused on the centre of Selangor, which also happens to be the capital city of Malaysia, Kuala Lumpur. This is shown in Figure 8 and the settlement buffer map in Table 8.

Table 8: Settlement buffer map class

Class	Ranking	Buffer (m)	Percentage Area Cover (%)
0	Restricted	500	26.98
1	5	1000	5.72
2	4	2000	9.50
3	3	3000	7.94
4	2	4000	7.12
5	1	5000	6.74
No Data	Restricted	>5000	36.01
Total Percentage Area Cover			63.99

The water bodies in MODIS Land Cover data only cover water bodies that are bigger or wider than 500m due to MODIS spatial resolution Figure 9. By referring to the Table 9, water bodies and their buffers cover only 3.29% of the total land area in Selangor, and only 0.51% falls under the restricted area in terms of nearness to water bodies. This means that 99.49% of land in Selangor is available for wind energy farms in this context. About 96.71% of the area not affected by the buffer falls under the rank 5 in terms of distance to water bodies, making it the most suitable land in this context.

Table 9: Water bodies buffer map

Class	Ranking	Buffer (m)	Percentage Area Cover (%)
0	Restricted	200	0.51
1	1	350	0.57
2	2	500	0.63
3	3	650	0.67
4	4	800	0.92
5	5	>800	96.71
Total Percentage Area Cover			3.29

As shown in Figure 10 and Table 10, Selangor is sprawled with roads, and its buffer cover 79.63% of the total land area in Selangor. about 22.81% of the area is restricted due to being too close to the road network, leaving 77.9% of the land in Selangor available for wind energy farms in this context.

Table 10: Road network buffer map class

Class	Ranking	Buffer (m)	Area Cover (%)
0	Restricted	50	22.81
1	1	250	34.82
2	2	500	11.69
3	3	750	6.09
4	4	1000	4.21
5	5	>1000	20.38

Airport and its buffer only account for 1% of the total land area in Selangor. the buffered area is restricted for wind energy farms due to take-offs and landings of the airplane. the result is displayed in Figure 11 and Table 11.

Table 11: Airport buffer map area cover

Airport Buffer	Percentage Area Cover (%)
KLIA	0.70
SAAS Airport	0.24
Bernam River Airfield	0.06
Total Area Cover	1.00

SUITABILITY INDEX MAP OF WIND ENERGY

After producing the suitability map of each criterion according to its sub-criteria, all the suitability maps were overlaid according to their assigned weightage to produce a suitability index map of wind energy in Selangor, as shown in Figure 12. From the map, it can be observed that there are seven potential sites for wind energy around Selangor. Four out of seven potential sites are located in Banting, Selangor, and the rest is located at Ijok, Kerling, and Jeram.

All the potential sites are located on agricultural land. Based on the analysis depicted in Table 12, site number 4 has the largest area while site number 6 has the smallest area. There is only one site with a suitability ranking of 5, which is site number 2, and the rest of the potential sites have a suitability ranking of number 4. These sites have suitable terrain conditions, and away from roads and is in suitable proximity to the major settlement to which it can then supply the power generated.
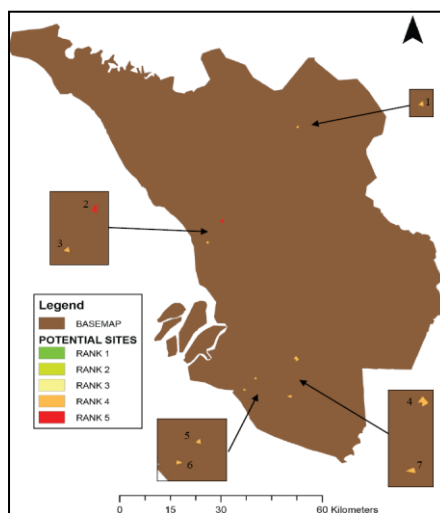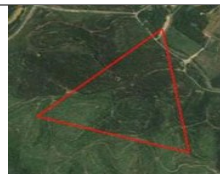
Figure 12: Spatial suitability index map

Table 12: Suitability Index Map Analysis

Number	Suitability Ranking	Area	Land Use Type
1	4	366896.67	Agriculture
2	5	731697.04	Agriculture
3	4	366897.15	Agriculture
4	4	1211132.65	Agriculture
5	4	366896.67	Agriculture
6	4	343173.81	Agriculture
7	4	723364.00	Agriculture

Table 13 describes the analysis carried out on the Google Earth platform. The site is analysed based on its terrain roughness and terrain elevation, its surrounding cultural features, and the distance of the nearest settlement that are located in Selangor.

Table 13: Suitability sites-analysis for each potential site using google earth platform

No.	Description	Sites
1	The site is located in Kerling, Selangor. It is approximately 2 km from a major settlement which is Bandar Baru Lembah Beringin. It is a sloppy area and situated at a relatively high elevation.	

2	This site is located at Ijok, Selangor and the distance is 3.5 km from the settlement of Kampung Ijok. The terrain of the site is flat and has a low elevation. It has major road passes through the side.	
3	The site is located in Jeram, Selangor. It is situated approximately 2.5 km away from the nearest major settlement, which is the town of Jeram. The terrain is flat and is at a low elevation. It is also surrounded by agriculture processing plants.	
4	The site is located at Kampung Seri Cheeding Banting Selangor. The site is nearby a school and settlements. The site is flat and has a low elevation.	
5	The site is located at Kampung Sungai Buaya Banting, Selangor. It is located around 1km from a major settlement which is Kampung Sawah and Kampung Tanah Raja. The site is flat and has a low elevation. It is also 1.6 km from the nearest river.	
6	The site is located at Kampung Sungai Arak, Banting Selangor. It is situated around 1km-1.5km from several major six settlements, namely Taman Banting Baru, Kampung Sungai Arak, and Kampung Kathong. The site has a low elevation and flat terrain	
7	The site is located at Kampung Sungai Kelambu, Banting Selangor. It is situated around 1.5km from the nearest settlement. It has a flat ground and a low elevation.	
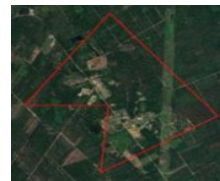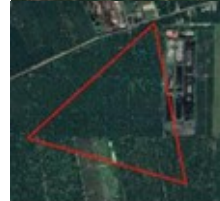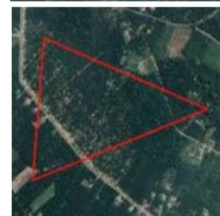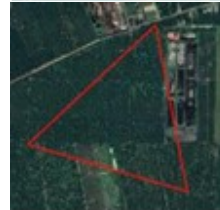
CONCLUSION

In conclusion, the GIS-MCDM model works in trying to allocate potential wind energy locations in Selangor using the selected spatial characteristics. The ranking and weight of the spatial characteristic also work well in allocating the potential sites. Four of the potentially suitable sites are located at Banting, Jeram,

Ijok, and Kerling. that are located on agricultural lands. Problematic sites are site number 4 and 6 due to close to the public school, and a major road, which is an exclusionary zone for wind turbine location. The most promising site is site number 2 because of the vastness and suitability of the area. The terrain is flat, has a low elevation and the site has a suitability ranking of 5. It is also only 1.5 km away from a major settlement. This will enable site number 2 to accommodate plenty of wind turbines as it will ease engineering works. The author suggests having a collaboration with the local experts to select the actual criteria and sub-criteria of a good wind farm location. The factors of electric grid networks, telecommunication lines, wind direction and density should be included for future spatial analysis to obtain more significant results.

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THE EFFECT OF SOCIO-DEMOGRAPHIC ATTRIBUTES ON WALKING BEHAVIOUR OF RESIDENTS IN SHAH ALAM CITY, MALAYSIA

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Abstract

Walking is the most common form of physical activity people engages in. However, people walk for different purposes, which most times are influenced by environmental, and socio-economic factors operational within a particular setting. Literature on walking behaviour is dominated by physical environment factors with little mention of socio-demographic factors. Therefore, this study examined the influence of socio-demographic attributes on two categories of walking behaviour: the utilitarian and recreational walking. Through an online survey, 320 copies of the questionnaire were purposefully administered to adults of 18 years old and above in Shah Alam City, Malaysia. A multiple linear regression analysis technique was adopted in identifying the predictors (socio-demographic attributes) that significantly influenced the utilitarian and recreational walking behaviour of respondents. Findings revealed that monthly income ($\beta=-.350$, $p<0.05$), educational qualification ($\beta=.187$, $p<0.05$), and age ($\beta=-.126$, $p<0.05$) have a negative association with utilitarian walking. In contrast, educational qualification ($\beta=.295$, $p<0.05$) and age ($\beta= .240$, $p<0.05$) have a positive association with recreational walking. The findings also revealed that male respondents engaged more in recreational walking while the unmarried walking behaviour varied. Thus, in formulating policies and actions that promote walking, the identified differences in walking behaviour of various groups must be taken into consideration.

Keywords: Utilitarian walking, recreational walking, socio-demographic attributes, multiple linear regression

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INTRODUCTION

Regular engagement in physical activity has been associated with a wide range of health, environmental and social benefits (Poitras et al., 2016; World Health Organization, 2018). There has been a decline in levels of physical activity globally, especially among teenagers (Aubert et al., 2018; Guthold et al., 2019), and one of the feasible ways to integrate physical activity into people's daily life is by encouraging walking (Rainham et al., 2012). Hunter et al. (2021), noted that walking is the most common and accessible form of physical activity behaviour. For example, in the United States of America, walking is the most predominant recreational physical activity and the most often reported physical activity among people who meet the public health physical activity standards (Paul et al., 2015). Walking is categorized into two: utilitarian walking (walking as means of transport) and recreational walking. The latter involves a conscious decision, with an intended purpose and level of commitment (Coughenour et al., 2019). Frank et al. (2003) noted that walking occurs incidentally while accomplishing another purpose, for example walking to the market, shopping, work, inter alia. Walking is one of the ways to reduce auto dependency and greenhouse gas emission associated with the transport sector (Rifaat et al., 2019), protection of the environment and overall human health (Thunberg, 2020). Walking is the most form of physical activity that individuals engage in (Rosenberg et al., 2009) and it has some mental and physical health benefits, such as reduced obesity, diabetes and cardiovascular diseases (Warburton et al., 2010). Neighbourhoods that promote walking are inadvertently increasing means of physical activity within a given population (Giles-Corti et al., 2013; Harun et al., 2020).

Literature is replete with studies that have examined the influence of the physical environment on walking (McCormack et al., 2004; Owen et al., 2004; Malek & Nashar, 2018; Hosseinzadeh, 2021). Other studies have equally examined the influence of socio-demographic attributes on walking behaviour (Cao et al., 2009; Azmi et al., 2012; Pinna & Murrau, 2018; Hunter et al., 2021). There is no consensus among researchers on the influence of each socio-demographic attribute on walking behaviour as results obtained are frequently contradictory. The reason for this is due to different social, cultural and environmental conditions where these studies were conducted.

This paper, therefore, examines the effect of socio-demographic attributes on the walking behaviour of residents in Shah Alam City, Malaysia. Most of the existing literature were studies conducted in European or American settings. This paper intends to add to a growing body of knowledge on socio-demographic correlates of walking behaviour, by examining utilitarian and recreational walking in urban setting of a developing country.

LITERATURE REVIEW

Individuals whether old or young engage in walking. It is the most common type of physical activity (Hunter et al., 2021), and also a basic mode of transportation in sustainable urban transport (Sharifi et al., 2020). In the United States of America, walking is the most reported recreational activity among adults who meet public health physical activity requirements (Paul et al., 2015). The effect of socio-demographic attributes on walking behaviour of individuals have become a subject of research over the years. Azmi et al. (2012) compared walking behaviour of individuals residing in urban and rural neighbourhoods and found that the mean walking speed of men and women within the age range of 13-60 years old was higher than those above 60 years. In another study, Rosselli et al. (2020) found that age increase brings about reduction in walking and other physical activities, because sedentary lifestyle becomes dominant among the elderly ones. Male participate more in walking and other physical activities than females (Barr et al., 2020; Asiamah, 2016). Educational qualifications influence the prevalence of recreational walking. Those with higher educational qualifications engaged more in recreational waking than those with lower qualifications (Kruger et al., 2008; Buehler et al., 2020). The low and medium-income groups tend to use non-motorize transportation such as walking and cycling (Manoj &Verma, 2015), while advancement in income increases the opportunity of motorized vehicle ownership (Jain & Tiwari, 2019). In the study of COVID-19 effect on walking behaviour of people in the United States of America, Hunter et al. (2021) reported that residents of low-income group neighbourhoods engaged more in walking than those in the high-income neighbourhoods.

METHOD

Self-report measurements are the most appropriate method for examining context-specific behaviours in population studies (Giles-Corti et al., 2006). Thus, respondents were asked in the questionnaire to state the time spent per/day for walking (recreational work and utilitarian work). Through an online survey, 350 copies of the questionnaire were purposefully mailed to respondents in Shah Alam City, and only 91% (320) responded to the questionnaire. After that, the data was coded into SPSS 20 software for further analysis. The multiple linear regression analytical technique was employed in testing the relationship that exists between walking behaviour (number of time spent on utilitarian and recreational walking per/day) and socio-demographic attributes of respondents. Multiple linear regression analysis is a statistical technique that seeks to associate the value of a set of independent variables (predictors) to a further variable whose value is supposedly dependent on them. According to Gallimore et al. (1996), the idea is to produce a model or equation, that explains the relationship and thus

enable prediction of the outcome (dependent variable) in cases where it is unknown.

In general, the multiple regression model is written as:

$$Y = C + \beta 1 V_1 + \beta 2 V_2 + \beta 3 V_3 + ... + \beta n X_n$$

where,

Y, is the dependent variable
C, is the constant
$\beta 1, \beta 2, \beta 3, ..., \beta n$, is the regression coefficient
$V_1, V_2, V_3,......, X_n$, are the independent variables

Y = time spent on walking per/day
V_1 = age in years
V_2 = monthly income in Ringgit
V_3 = number of years spent in school
V4 = gender as dummy whereby 1 = male, otherwise 0
V5 = car ownership (number of cars from 0, 1, 2, 3 ....)
V6 = marital status as dummy whereby 1 = single otherwise married or divorced

Walking can either be for recreational purposes or as a means of transport. Thus, two regression models are generated.

Utilitarian walking (means of transport) model:

$$YMT = C + \beta 1 V 1 + \beta 2 V 2 + \beta 3 V 3 + ... + \beta n X n \quad (1)$$

Recreation walking model:

$$YMR = C + \beta 1 V 1 + \beta 2 V 2 + \beta 3 V 3 + ... + \beta n X n \quad (2)$$

RESULT AND DISCUSSION
Majority of respondents (60.1%) are between 18-24 age range, while 34.7% are between 25-44 age bracket and 5.2% between 45-64. 68percent of respondents are female while 32% are male. In terms of marital status, 76% are unmarried, while 23% are married and 1% divorced/separated. Monthly income of 71% respondents falls within the range of < RM2,500-RM4,850, 22.4% (RM4,851-RM10,970) and 6.2% (RM10,971-> RM15,04). 69% of respondents obtained

university and other degrees, 25% pre-varsity, 2% high school and 4% primary education.

In multiple linear regression analysis, two major assumptions that must be met are: (i) normal distribution of data and (ii) collinearity (i.e., the independent variables must not be highly correlated with each other). The kurtosis value obtained in SPSS for each of the variables in the regression model ranged between -2 to +2, which is an acceptable standard to prove that univariate normal distribution exists (George & Mallery, 2011). For the collinearity, the SPSS diagnostic statistics revealed that all the independent variables fall within the acceptable range. Based on the rule of thumb, tolerance must not be less than 0.10 or the variance inflation factor (VIF) greater than 10.

Utilitarian Walk Model

The major thrust of conducting the multiple regression analysis was to examine the influence of walking behaviour towards socio-demographic attribute in the study area. With an R^2 (coefficient of determination) value of .487 and F= 10.709, p<0.05 (Table1), socio-demographic attributes account for major variation in utilitarian walking behaviour (dependent variable). Therefore, there is a significant relationship between socio-demographic attributes and utilitarian walking. Out of six predictors (socio-demographic attributes) in the model, only four (income, education, gender and marital status) significantly influenced utilitarian walking at 0.05 (5%). In multiple linear regression analysis, the contribution of each predictor (independent variable) shows its relevance in the model vis-à-vis other predictors. This is determined by the value of the standardized beta coefficient of each predictor in the model. Results (Table1) show that monthly income (β= -.350, p<0.05) contributed most to explaining variation in time spent per/day for utilitarian walking by respondents. A closer look at the value obtained shows it is negative, which suggests that there is an inverse relationship between monthly income and utilitarian walking. What this implies, is that a unit decrease in monthly income could bring about an increase in time spent per/day for utilitarian walking. In other words, the lower income group, tends to embrace walking as a mode of transportation than the higher income group respondents. Improvement in income increases the chances of car ownership (Bansal et al., 2018), however, will reduce utilitarian walking. Mirzae et al. (2020) reported that monthly income and age have a negative association with utilitarian walking and that the younger ones tended to walk more frequently for utilitarian walking than the elderly. Mirzae et al. (2020) also noted that the negative relationship between age and utilitarian walking may be due to possible safety concerns of the elderly and limitations in mobility. This result is also consistent with the studies conducted by Cao et al. (2009) which reported that respondents between age 64 years old and above

walked less on average compared to the younger ones (those within the age range 18-45). Similarly, results from this study reveal that educational qualification, with the second highest beta coefficient, is inversely related to utilitarian walking ($\beta = -.187$, $p<0.05$). This means respondents with lower educational qualification (high school and primary school) tend to adopt walking as a modal choice than those with higher educational qualification. Marital status also significantly influenced walking ($\beta = .135$, $p<0.05$). Marital status was coded as dummy variable, whereby 1 stands for unmarried otherwise 0 (married or separated). Based on this, the unmarried respondents are likely to adopt walking as a means of transport than the married or divorced. This result contradicts a study by Pettee et al. (2006) that married men engaged more in physical activity than their single counterparts. This may be due to the fact that the study examined gender and marital status together, while in the present study, only marital status was examined. Age as revealed by the results is negatively related to utilitarian walking ($\beta = -.126$, $p<0.05$). Meaning that a unit decrease in age would bring about an increase in time spent on utilitarian walking when other variables in the model are held constant. These results infer that increase in age could bring about reduction in time spent per/day on utilitarian walking. In other words, younger respondents (age 16-40) are more likely to adopt walking as a modal choice than the elderly. This is consistent with the findings of Roselli et al. (2020), who reported that participation in physical activities decline with age.

Table 1: ANOVA results for utilitarian walking model

	df	SS	MS	F	p-Value
Regression	6	136.583	22.764	10.709	.000[b]
Residual	313	665.339	2.126		
Total	310	801.922			

	R	.698[a]		
	R Square	.487		
	Adjusted R square	.154		
	Standard Error	1.45797		
	Observations	320		

	Standardized Coefficients (Beta)	Standard Error	t	p -Value
Intercept		2.153	-1.015	.311
Income	-.350	.179	-6.254	.000**

Age	-.126	.186	1.054	.042**
Car ownership	.072	.042	1.010	.313
Gender	.077	.186	1.054	.292
Marital status	.135	1.526	2.003	.036**
Education	-.187	.264	2.812	.005**

Note: Statistics is significant at 0.05**

Recreational walking model

As stated earlier, walking behaviour in this study is conceived as walking as means of transportation (utilitarian) and walking as a form of recreation. This section examines the regression model to see whether the predictors (socio-demographic attributes) varied in their influence on the walking behaviour of respondents. The results present in Table 2 shows that there is a significant relationship between socio-demographic attributes and time spent per/day for recreational walking (F=8.279, p<0.05, R2=.216). In other words, the predictors (socio-demographic attribute) explain for significant variation in the respondents' recreational walking behaviour. The results reveal that out of six predictors (socio-demographic attributes) in the model, three of them (income, education, gender) are significant at 0.05. Their contribution in predicting variation for recreational walking behaviour in the model is quite significant. Based on the beta coefficient values, education (β=.295, p<0.05) contributed most among the socio-demographic attributes in explaining variation in recreational walking. This represents a positive relationship between educational qualification and time spent per/day on recreational walking. Particularly, those respondents with higher educational qualification are more likely to engage in recreational walking compared to those with lower educational qualifications. This result is consistent with past studies (Kruger et al., 2008; Buehler et al., 2020). For example, Buehler et al. (2020) in their study, found that the rate of walking and cycling is highest among those with higher educational qualification in the United States of America. Cheah (2011) posited that those with a higher educational qualification have more tendency to engage in physical activity (recreational walking, etc.) because they have more knowledge on the health benefits that are accruable from regular participation in physical activity. Also, Asiamah (2016) reported a positive relationship between educational qualification and participation in physical activities among the working class in Ghana. However, in another study conducted in South Africa, Muzindutsi (2016) reported that the level of study (educational qualification) is negatively related to participation in leisure time/recreational activities among undergraduate students. The author noted that first year students participated more in recreational/leisure time activities than the old students. The result in Table 2 shows that, there is a positive relationship

between income and time spent per/day on recreational walking ($\beta = .240$, p<0.05). It should be noted that a unit increase in income would bring about a change in time spent per/day on recreational walking. Thus, it could be said that the higher income group in the study area tends to spend more time on recreational walking than the lower income group. Monteiro et al. (2003) and Varo et al. (2003), reported that individuals with higher income have a greater propensity of participating in recreational activities like walking, cycling and jogging. Gender as shown by results contributed significantly ($\beta= .233$, p<0.05), in predicting the time spent per/day on recreational working in the model, 1 stands for male otherwise 0. Given this, it could be said, that male respondents in the study area tended to spend more time on recreational walking than their female counterparts. This is consistent with earlier studies that reported the probability of males engaging in physical activities such as walking is higher than their female counterparts (Barr et al., 2020; Rosseli et al., 2020).

Table 2: ANOVA results for recreational walking model

	df	SS	MS	F	p-Value
Regression	6	11832.346	1972.058	8.279	.000[b]
Residual	313	74556.901	238.201		
Total	310	86389.247			

	R	.465[a]
	R Square	.216
	Adjusted R square	.120
	Standard Error	15.43376
	Observations	320

	Standardized Coefficients (Beta)	Standard Error	t	p -Value
Intercept				
Income	.240	.648	4.100	.000**
Age	-.096	1.969	-1.293	.197
Car ownership	.016	.528	.181	.857
Gender	.233	1.864	4.163	.001**
Marital status	.005	2.805	.077	.939
Education	.295	.429	3.641	.000**

Note: Statistics is significant at 0.05**

CONCLUSION

Walking regardless, whatever purpose it may serve, has both health and environmental benefits. For individuals, walking as a form of recreation promotes healthy living. It also helps in reducing the carbon emission associated with high use of motorized transport in cities. Studies on factors influencing walking behaviour are dominated by physical attributes or urban design qualities. This study diverges the influence of socio-demographic attributes into two categories of walking in the existing literature – that are utilitarian and recreational walking. Mirzaei et al. (2018) noted that people walk with varying degrees of motivation from intrinsic to extrinsic motivation. Therefore, the findings of this study provide an insight into the interplay of socio-demographic attributes on walking behaviour in a developing country urban setting. Results from the multiple regression analysis revealed that four explanatory variables (income, educational qualification, age and marital status) influenced utilitarian walking while three explanatory variables (income, gender and educational qualification) influenced recreational walking. However, the degree of influence of this explanatory on the respondents' walking behaviour in the study is somewhat different. For the first regression model (utilitarian walking model), income, educational qualification and age have negative association with utilitarian walking. This suggests that younger respondents, those with low income and educational qualification spend more time per/day on utilitarian walking. The second regression model, income, educational qualification and gender have a positive significant effect on time spent per/day by respondents on recreational walking. Meaning that respondents with high educational qualifications and those with high income tended to spend more time per/day on recreational walking. Also, male respondents spend more time per/day on recreational walking compared to their female counterparts. Engaging in utilitarian or recreational walking by individuals, as revealed from this study, is partly influenced by different socio-demographic factors. Some of the results may corroborate or contradict similar studies conducted in other parts of the world, where their socio-economic setting may vary from Malaysian context. This study has shown that socio-demographic attributes are essential in understanding motivation for walking behaviour, which may require policy action.

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FACTORS DETERMINING THE PURCHASE DECISION OF GREEN RESIDENTIAL PROPERTIES IN MALAYSIA

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Abstract

This study aims to determine and rank the factors influencing purchase decisions of green residential properties in Malaysia. The quantitative research approach was adopted in this study where the approach includes conducting surveys and analysing the quantitative data within green residential properties owners or residents with green certification mainly located in Penang and Selangor. Relative importance index is applied to data from a sample of 171 respondents through a purposive sampling. The main factors in influencing the green homebuyers' decisions were found to be location factors followed by financial and neighbourhood and housing attributes. This study was the first to include green residential properties owners with green certification from Malaysian Green Building Index which focus only for green residential properties owners in Penang and Selangor as the sample of the study towards factors for influencing the purchase decision of green residential properties. Further development of empirical models could be developed and tested not only in other countries as well as to other types of green buildings. This study could provide best indicators for purchase decisions that could be embedded in the future green residential development. Stakeholders and policy makers could also provide incentive, recognition and take actions to increase awareness related to green development to internalise the medium-and long-term goals of green technology.

Keywords: Purchase decision, green residential, homebuyer, sustainability

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INTRODUCTION

Real estate construction industry has shown a great potential to reduce the carbon footprint (Ott & Hahn, 2018) due to a large number of employed workforce and its resources. The real estate sector is responsible for 80% of global greenhouse gas emissions and consumes 75% of the world's natural resources (Royal Institution of Chartered Surveyors, n.d.) In line with this purpose for environmental sustainability, housing buyers in Hong Kong are expecting that "green" living is increasing and regarded as one of the important considerations while buying a property (Jayantha & Man, 2013). Furthermore, the effort to spread climate change awareness has pushed the green buildings market for investment in both supply and demand sides (Xiao et al., 2017). As a result of the increasing trend in green real estate projects, arithmetic data shows a reduction of 200,000 tonnes of carbon dioxide emission in the Malaysian construction industry (Green Building Index, n.d.). Empirical research conducted by Duan et al. (2020) revealed that green real estate development can increase $0.899km^2$ of urban green space. Moreover, it is documented that the increase of urban green space in Shaanxi city benefits the urban residents and creates an additional buffer zone for the city. Given these influential criteria, investors and investors-owned will eventually shift from conventional to greener buildings. In fact, a study from Fauzi et al. (2021a) indicated that property management corporations may focus on green elements especially in human satisfaction management. Similar results could also be found when green design features make indoor air quality better for society's well-being (Deng & Wu, 2013). The 2020 property market report revealed that there is a significant growth in green buildings ownership and property sales in Malaysia. In addition, there are about 400 green building projects that have achieved green building certification. As a key means of achieving more green building ownership, the promotion of green building properties should take a holistic approach that focuses on factors and preferences among the investor-owned and purchasers. Notwithstanding, the mismatch in pricing strategy with the consumers' expectations and property buyers' preferences causes an increase in the number of overhang properties in Malaysia. Hence, it is important to understand the factors and attributes that significantly influence the house buyers' intention and preferences (MOF, 2017). Past literature has examined the purchase decisions determinants for retails and conventional buildings (Fauzi et al., 2021b) yet less has emphasised the green residential properties, specifically in Malaysia. Therefore, this research aims to determine and rank the factors influencing purchase decisions of green residential properties in Malaysia.

LITERATURE REVIEW
Definition of Purchase Decision
In research from Rachmawati et al. (2019), a consumer will have a choice sequence in the event of making a purchase decision. The decision before making a purchase generally includes three phases, specifically problem recognition, seeking information, and evaluation for the final decision. In relation to the purchase decision for green residential properties, research has found that purchasers and real estate investors have the tendency to purchase green residential properties that benefit the environment (Kim et al., 2020). This shows that investor-owned and property owners are concerned about the effect of sustainable development on the environment. Before a decision is made, a consumer, especially the property investor will rely on past purchase experience. Chau et al. (2010) revealed that experiences might change an individual's decisions. He added that more than half of the residents were aware and willing to embrace the green concept in their residential developments. This is evidenced by their willingness to purchase and pay additional expenses to own an apartment in green development. Their willingness shows that they treasured their green living experiences and the benefits of green residential development.

Green Residential Certification
A green building focuses on the efficiency of resources particularly in energy, water and materials during the building lifecycle. The green rating system known as Green Building Index (GBI) was developed in 2009 by Pertubuhan Arkitek Malaysia (PAM) and the Association of Consulting Engineers Malaysia (ACEM) to lead the Malaysian property industry towards becoming more environmentally friendly. Green certification would be issued by the GBI once the sustainability elements have been fulfilled. Apart from the certification, there are also other GBI ratings such as Platinum, Gold and Silver. For residential green buildings, the sustainability elements include energy efficiency, indoor environmental quality, sustainable site planning and management, materials and resources, water efficiency, and innovation (GBI, 2020). As of 18th March 2021, 13 residential townships in Malaysia (PropertyGuru, 2021) have received the green certification from GBI, reflecting the increasing number of green residential properties. These sustainable green elements are then reflected in the development of the questionnaire particularly in the factors determining the purchase decisions supported by previous literature in green residential properties.

Factors Determining Purchasing Decision
The factors determining the purchase of green residential properties could be divided into location, financial, neighbourhood, and housing attributes. Location is one of the purchase decision factors for having any kind of property. According to new research, strategic location and good environmental quality are the most

significant factors that influence occupants to occupy the green certified residential building in Johor Bahru (Azis et al., 2021). Regardless of income levels, buyers still consider that the most important factor in the house purchase decision is the location of the property. Although the awareness of green housing issues and energy efficiency in housing is growing in the residential property market, it is only a major consideration for young and older buyers in the high-income brackets and is only of some importance for all other buyer sectors of the residential property market. Research by Rachmawati et al. (2019) articulated that the location of a residential property is significant to the purchase decision by consumers. Examples are proximity to workspace and basic facilities such as school, commercial centres et cetera.

The next factor determining a purchase decision by a consumer is the financial factor. A research by Tan and Goh (2018) stressed that consumers' purchase decisions are influenced by several factors, most importantly is the financial risk. This can be explained by three attributes. Firstly, house prices. A competitive house price will motivate buyers to make buying decisions (Rachmawati et al., 2019). Recorded in 2015, the demand for green residential was still very low due to an increase in the cost of about 30% compared to the conventional house concept (Elias & Lin, 2015). Secondly, the capability to secure a house loan. The average Malaysian wage is about RM 5,900, the housing buyer was not ready to own a green residential house which is priced up to RM 950,000. Thirdly is the reputation of developers. Research by Elias and Lin (2015) reported that housing developers realised the green residential project and the construction industry faces trouble in extending the green building technologies in Malaysia. Consequently, it will contribute to the delay in implementing green technologies into residential building construction. This will be the consequence of the minimal experience among the developers with green technologies' impact. The developers assisting with green building certification obtain good recognition in the property market (Jayantha & Man, 2013). Thus, the goodwill of the developers will be one of the reasons for buyers to own the "new" residential concept in Malaysia.

The third factor is the neighbourhood and housing features. There are five attributes for this factor. First is the design of the house. Investment in green residential provides healthy indoor and air quality. This motivates purchasers or real estate investors to invest in a healthy house with green technology, especially people who suffer from diseases such as Asthma (Elias & Lin, 2015). Secondly is the land area. In response to the site of the housing, a sustainable site must be incorporated with appropriate land area and size (Adnan et. al, 2013). This is to ensure that the ongoing operation and maintenance of the site could minimise the impact on the environment. The third is privacy. A calm and serene neighbourhood influences a house buyer's purchase decision. Jayantha and Man (2013) reported that noise and indoor issues are two standards that should be

taken into consideration in green building management practice. Zrobek et al. (2015) reported that Poland residential consumers preferred a quiet neighbourhood behind the most important factor other than location. The next factor will be most likely related to the dynamic factors of the green building which can be considered as the building orientation. Based on Maslow's Hierachy of Needs, the happiness and productivity improvement due to building orientation design and dynamics of the green building brought a means of social engagement (Zhao et al., 2015). The elements for energy efficiency is one of the criteria for green residential building benefits that are ready to motivate consumers to indulge in green initiatives. Good energy performances affect house selling prices positively through installation of green energy features such as usage of renewable energy, implementation of proper construction material waste management with storage, collection and re-use of recycles and rainwater harvesting. This shows that energy efficiency recommendations seem to have an impact on sale price; thus, home buyers seem to require a larger "discount" for more complex types of measures (Högberg, 2013). The environmentally friendly green features create a positive relationship with the residence attraction to buy where more home buyers in Hong Kong are willing to pay a sale price premium ranging from 3.4 to 6.4 percent (Jayantha & Man, 2013). Fifth is the number of bedrooms. The consideration to have a good indoor environmental quality in the building is significantly related to the number of bedrooms provided. Bond (2015) ranks number of bedrooms as the third characteristics most preferred by Californian realtors' that may contribute to the "green" housing. Hence, a good criterion of a room is to have maximum natural light and fresh air that also could embrace the benefits of green elements (Adnan et. al, 2013).

METHODOLOGY

The present study used quantitative research methods. An online questionnaire survey was designed to collect the data via email, Facebook private groups, and Whatsapp application. It was used to collect the relevant data from green home residents in Penang and Selangor, Malaysia, particularly certified green residential schemes. The research instrument has performed a comprehension validity and amended according to the academician acceptance of the designated questions. A cronbach alpha (*a*) was used for a reliability test of the items in the questionnaire. A reliability test was established using a pilot test of 20 respondents not included in the sample. The need of a reliability test is to reduce deviation or error for item measurement accuracy. With a 0.90 reliability coefficient value, the items were highly reliable (Bolarinwa, 2015).

A total of 171 valid respondents have been obtained using the purposive sampling technique. The respondents selected are limited to the green residents' owners only. The variation of the selected sample location is good to generalise the result since all the locations recorded the highest number of green homes in

Malaysia. In this survey, respondents were asked to rate how agreeable they were with the items on a five-point Likert scale, ranging from 1 for "strongly disagree" to 5 for "strongly agree". A Likert scale is the most popular form to measure the level of agreement because it is simple and easy to prepare and interpret by the researcher (Talib, 2013). To determine the optimum number of sample sizes, the researcher used the rule of thumb 5:1 ratio as suggested by Hair et al. (2010), of which five responses should be obtained for each variable. The total numbers of items were 23; hence, the required sample size was supposed to be at least 60 (12 x 5). Therefore, a sample of 171 respondents was deemed sufficient to analyse the data. Respondents received a Google form link that contained the questionnaire.

The data collected from the online questionnaire was analysed descriptively and the relative importance index (RII) was used to assess and rank the attributes towards the motivation to invest in green residential properties. According to Akadiri (2011) in (Rooshdia et al., 2018), five important levels are transformed from importance values as in Table 1 below;

Table 1: Importance Level for RII

RII Values	Importance Level	
$0.8 \leq RI \leq 1$	High	H
$0.6 \leq RI \leq 0.8$	High Medium	H-M
$0.4 \leq RI \leq 0.6$	Medium	M
$0.2 \leq RI \leq 0.4$	Medium-low	M-L
$0 \leq RI \leq 0.2$	Low	L

Source: Akadiri (2011)

The highest ranking refers to the highest RI value. Waidyasekara and Silva (2016) also mentioned a low RII indicates that the factor is less applicable and less relevant, whereas a high index indicates higher applicability, agreement, and relevance. The RII analysis also was adopted by (Fauzi et al., 2021a) in their research of The Importance of 'Sustainability Implementation for Business Corporations' that is almost similar to this research.

RESULTS AND DISCUSSION

Descriptive analysis was used to identify the general demographic characteristics of respondents. The majority of the respondents were male, where the average age was between 36 to 50 years old (46.2%). Most of the respondents were from

the private sector (39.8%) with a household income between RM5,000 to RM11,000 (59.1%) with 101 respondents.

Table 2 depicts the overall ranking and importance of each factor affecting the purchase decisions for green residential investment. Based on the RII score, all attributes were found to be at a high level when RII scores were found to be more than 0.8. The researcher found that the location factor ranked first (RII=0.9310) followed by financial (RII=0.9289), and neighbourhood and housing (RII = 0.9277). These revealed that the main factors for green residential investment are due to their strategic location, in line with Aziz et al (2021) when they also found that location and good environment quality are the most significant factors that influence occupants to occupy the green certified residential building in Johor Bahru.

Table 2: Factors for purchase decision green residential investment

Factor	RII	Rank	Importance Level
Location	0.9310	1	High
Financial	0.9289	2	High
Neighbourhood & housing	0.9277	3	High

Table 3: Top important factors for purchase decision green residential

Attributes	RII	Rank	Factors
Strategic location of the green residential properties	0.9427	1	Location
Developers' reputation	0.9357	2	Financial
The land area	0.9357	3	Neighbourhood and housing
Proximity to basic facilities such as school and commercial centre	0.9310	4	Location
The design of the house	0.9287	5	Neighbourhood and housing
A quiet place in the neighbourhood	0.9287	6	Neighbourhood and housing
Consider taxation imposed by government	0.9275	7	Financial
Building orientation	0.9275	8	Neighbourhood and housing
House price	0.9263	9	Financial

Attributes	RII	Rank	Factors
My capability to obtain loan financing	0.9263	10	Financial
Proximity to my workplace	0.9193	11	Location
The number of bedrooms	0.9181	12	Neighbourhood and housing

The overall RII score with all three factors was found to be in the top 10 attributes (see Table 3), implying the importance of these factors to be adopted in future residential development. A strategic location exhibits the highest score, implying homebuyers consider good accessibility and proximity to communal amenities and facilities such as schools and business centres. Apart from that, the land area of a green-certified house is important for homebuyers' to be considered in their decision making particularly when it involves landed properties. In general, land area is a factor that greatly influences the home purchase decision and it is also dependent on the purpose of the purchase being made (Lamsali et al., 2020). The elements of sustainable site planning could be achieved through selecting appropriate sites with access to open space and landscaping. A quiet neighbourhood and scenic value were regarded as the most important determinants in the group of non-economic factors (Zrobek et al., 2015). This is in line with a study by Nizarudin et al. (2011) who determined that natural resources and natural landscaping are highly important to consider and should remain untouched to preserve a sustainable environment.

It is interesting to note that in terms of the financial aspect, the house price of green residential properties is not an issue. This is because most of the respondents are M40 and T20 when the majority of them have a household income between RM5,000 to RM11,000. However, most homebuyers are more focused on the developer's reputation when they want to purchase a green-certified house. This is agreed by Nursal et al. (2019) that found this decision grew more apparent due to so many negative issues caused by developers. In addition, it is essential to choose a qualified developer especially in developing green homes as it is more complex compared to conventional homes. This is definitely important to avoid project failure and future problems.

CONCLUSION
Three main factors for the purchase decision of green residential properties investment have been identified namely, location, financial, and neighbourhood factors. The data is collected by means of a questionnaire survey method to the greenhouse owners or residents in Malaysia particularly the residential scheme which received green certification. Relative importance index is applied to data from a sample of 171 respondents through a purposive sampling. Location,

financial, and neighbourhood housing display the highest RII implying green residents considered these factors when they purchase their green residential properties. The results indicate the importance of these factors to be adopted in future residential development. Hence, these three (3) factors contributing to the motivations of households to own green residential properties could encourage more sustainable and environmentally friendly development in the future. This study weighs and demonstrates the essence of green residential development factors that potentially allowed the stakeholders and policy makers to move towards green initiatives in green housing schemes.

For the property development industry, specifically for the green residential building development, this study could provide the best indicator for buyers' motivation which could be embedded in their development. This study anticipates the factors that could motivate others to go green by purchasing thus providing an important view for governments' blueprint to equip with the green element in building a sustainable city in the future. While facilitating property developers' meaningful insights in formulating their marketing strategies that could lead to a greater demand for sustainable development of residential properties, signifying the need to establish a model for green residential properties. Future research in terms of development of empirical models could be tested in other states or countries as well as on other types of green buildings. This study could serve to address the gaps by examining all of the stipulated factors that influence the purchasing power of green residential within potential buyers in Malaysia.

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INVESTIGATING THE AWARENESS AMONG POTENTIAL HOMEBUYERS TOWARDS ELEMENTS OF GREEN RESIDENTIAL BUILDING

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Abstract

The number of green residential buildings in Malaysia is on the rise trend. However, there is an imbalance in the amount of green residential buildings available in main cities. Why do things like this happen? Is there a lower demand for green residential buildings in Malaysia's other main cities? Are potential homebuyers aware of the elements of green residential buildings? Therefore, this research was conducted to identify the demand for green residential building and to investigate potential homebuyers' awareness towards the elements of green residential building. The city of Ipoh, Perak, was chosen as the study's focal point, and Ipoh residents with good professions were chosen as respondents. This is because Ipoh has less green residential buildings than some other cities in Malaysia. A quantitative approach was adopted. A total of 384 responses were accepted for analysis. The collected data were analyzed using frequency analysis and the relative importance index (RII). According to the data, the majority of potential homebuyers in Ipoh, Perak, are aware on the elements of green residential building and are willing to purchase it in the future. This indicates that this residential concept is in high demand in the Ipoh market. Ipoh residents are also well aware of the elements of a green residential building. Hence, developers and the state authority would be able to increase the number of green residential developments in Ipoh.

Keywords: Awareness, green, residential building elements

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INTRODUCTION

In response to this scenario, Perak's Chief Minister announced in 2019 that contractors and developers should emphasize green technology in the development (Bernama, 2019). This is to ensure that Perak's development moves towards green development. However, according to Adzmi and Abdullah (2018), demand for the green building concept is still low compared to the conventional building because the Malaysian are still lacking an awareness of environmental concern. Agreed by Lim et al. (2018), that found one the obstacle to the development of the green buildings in Malaysia is the lack of public awareness. Therefore, this research was conducted to identify the demand for green residential buildings and to investigate the awareness of potential home buyers towards the elements of green residential buildings. The findings of this research can help developers and state authorities in determining whether there is a demand for the concept of green residential in Ipoh, as well as their awareness of the concept and elements of green residential to predict future green residential development plans.

LITERATURE REVIEW

The issue of global warming, which has been debated around the world, has contributed to the growth of green buildings, including the construction of green residential buildings in Malaysia. Green residential buildings are a subcategory of green building concepts that focus on green amenities and features incorporated in the operation of residential buildings. This study will discuss more about the demand for green residential buildings, as well as the elements that come with this type of property.

Demand for Green Residential Building

There are many definitions for green building, but none of them are completely satisfactory (Sayce et al., 2007). The green building also known as sustainable building (Fauzi, Johari, Chuweni et al., 2021) and high performance building (Shaikh et al., 2019). The main key for green building is to minimize environmental impact and costs while maximizing occupant comfort and satisfaction (Fauzi, Johari, Zainuddin et al., 2021).One of the green residential criteria, according to Elias and Khai (2015), is the house that can achieve long-term sustainability through energy efficiency, green technology applications, rainwater collection, and recycled materials, and that it is operated with sustainable resources in order to achieve the goals of sustainable development.

The number of green residential properties in Malaysia has been steadily increasing (GBI, 2013). According to Kasim et al. (2015), the housing sector's need and demand were excessive, particularly in urban areas. This is due to the increasing demand for sustainability in building design and construction (Uche et al., 2013). Not only that, Uche et al. (2013)believe the demand for green

building nowadays increasing due to green building materials are getting more affordable and the design also becoming more widely accepted, which fulfil the demand of the tenants and potential homebuyers. According to Shafiei et al. (2017) there are various factors which led to the occurrence of a rapid green development in this country which is included due to increasing awareness of environmental issues, increasing demand for architectural environmental quality, development of various green building technologies, successive implementation of green building assessment criteria and other relevant policies and regulations.

Elements of Green Residential Building
Many develop country had implemented the green building concept. There are 56 list of rating tools that are administered by the World Green Building Council. The difference adoption of building guidelines and rating systems are influenced by the climate, economy, and culture of the location. For Malaysia, Green GBI has been introduced and adopted as a green building rating tool since 2009. For residential green building, GBI rating systems focus on energy efficiency (EE), indoor environmental quality (EQ), sustainable site planning and management (SM), materials and resources (MR), water efficiency (WE), and innovation (IN) (GBI, 2013).

Energy Efficiency (EE)
According to the GBI (2013), EE can be achieved through several initiatives that includes of passive design, and active design. Passive design is one of the methods for lowering energy use while simultaneously increasing energy savings. In line with GBI (2013) the objective of passive design for EE is to minimize energy consumption in buildings so that CO_2 emissions are reduced. According to(Ann and Abualrejal (2015), building orientation, window location, shading, size and form, planning and design, and construction elements are all included in passive design. According to Kibert (2016), the location and the design of the building are the two primary components of passive design whereby for the location element, the building's construction must be carried out appropriately in order to minimize the building's energy profile and for the design element The building's orientation, aspect ratio, day lighting, ventilation, and other architectural factors should be included. The appropriate orientation allows the structure to benefit from natural resources such as enough daylight. According to Ann and Abualrejal (2015), a window orientation may help in the creation of natural daylight, natural ventilation, and heat reduction, therefore reducing the usage of energy such as light bulbs and air conditioners.

While, active system, are the approaches will help to improve energy efficiency in the building. This is consistent with GBI (2013) that aims to minimise reliance on energy used while at the same time to maintain a comfortable indoor environment. The mechanical and electrical methods are the

two major methodologies used in active systems. Heat, ventilation, and air conditioning are examples of mechanical systems, whereas light and electrical motors are examples of electrical systems (Kibert, 2016). One of the active systems utilised in property development companies is the sensor system in lighting (Ann & Abualrejal, 2015) whereby, this device detects any movement and is often mounted on the ceiling. The purpose of a sensor system or an automated lighting system is to reduce energy waste and achieve energy efficiency by preventing waste in the use of power or lighting systems. Aside from that, using LED light bulbs in lighting systems may also help conserve energy. Apart from using less energy, it may also minimize heat generation, lowering the need for air conditioning in the structure.

The EE also promotes the use of renewable energy systems to reduce energy costs and promote the usage of green energy (GBI, 2013). According to Kibert (2016), the term "renewable energy technology" refers to the energy that can be generated on-site. Photovoltaic, wind energy, and biomass are three ways that may be utilized to create sustainable energy. A photovoltaic panel is also known as a solar panel that is able to convert solar energy into electrical energy (Ann & Abualrejal, 2015). The installation of a solar photovoltaic panel (PV) can provide a number of benefits to the building user, including lower electricity bills, limitless power storage and generation, and no harmful influence on the environment (Ann & Abualrejal, 2015). EE also emphasises external lighting and control, which encourages the use of energy-efficient lighting and sensors to maximise energy savings in external or common areas, as well as internet connectivity, which encourages working from home via an internet connection, thereby reducing unnecessary commuting (GBI, 2013). Thus, in order to ensure that the green building elements continue to operate as intended, a well-sustainable maintenance plan must be created.

Indoor Environmental Quality (EQ)
The aim of indoor environmental quality is to achieve high efficiency in air quality, acoustics, visual, and lighting. These may require the use of low volatile organic compound materials, effective air filtration, proper air temperature regulation, and motion and humidity control. According to Abdulaali et al. (2020), the design of a building could have an influence on indoor environmental quality. He went on to say that by leveraging natural resources such as organic compounds, air filtration quality, accessible temperature control, and air humidity, indoor air quality (IAQ) may be improved. IAQ, lighting, visual, and sound are the four main components of indoor environmental quality (Abdulaali et al., 2020).

Sustainable Site Planning and Management (SM)
The aim of sustainable site planning and management is to select ideal places with scheduled access of public transportation facilities, community facilities, open spaces, and landscaping. According to Faulhaber (2011), a sustainable site plan is one that has a low environmental effect while yet accomplishing the client's objectives. Added, the site selection, site or building layout, and impervious surfaces are all important aspects of sustainable site planning in order to avoid and conserve environmentally sensitive places. Therefore, appropriate site selection is critical. Moreover, reusing and recycling an old building structure for a new building design on a brownfield site, it will assist to revitalise the property and its surroundings, making it a better place to live (Zin, 2012). Faulhaber (2011) mentioned, in order to encourage people to utilise public transportation, the development of green buildings must include the public mobility aspect. Effective design and effective public transportation system construction can help to minimize the number of individual transportation on the road that indirectly able to reduce congestion and air pollution (Zin, 2012).

Material & Resources (MR)
Material and resources are more towards promoting the reuse and recycling of environmentally friendly products. According to Sharma (2012), pre-construction, construction, and post-construction stages are the three main stages in which materials and resources can be improved in a green building development. In order to protect occupants from interior pollutants such as indoor air pollution, developers or contractors must choose appropriate sustainable materials (Zin, 2012). Contractors can reuse any excellent building components and waste materials throughout the construction stage to save waste while also reducing negative environmental effect.

Water Efficiency (WE)
Water efficiency is mostly concerned with long-term water usage, such as planned rainwater harvesting, in order to reduce water use. Any usage of materials that improve the efficiency of water is also taken into account in this criterion. The efficacy and efficiency of a green building's water consumption differ from the conventional building with no water-savings features (Cheng et al., 2016). According to Cheng et al. (2016), as compared to conventional buildings, green buildings used water more effectively. The use of green roofs helps to minimize storm water runoff and combined sewer overflows, but it comes with a cost (Nelson, 2007). Aside from that, rainwater can be collected and used for plant irrigation and washing, allowing the building to save a significant amount of water (U.S Green Building Council, 2021).

Innovation (IN)

Innovation is used as a complementary feature to add more value to the building and produce a more sustainable design. According to the GBI rating tools, innovation can be used in the construction process, such as self-cleaning facades and real-time energy and water usage displays, as well as installation or equipment of daily use, such as solar hot water systems and five stars energy efficiency appliances (building occupant). Growing innovation in the real estate industry shows an improvement in social life since innovation management has proved linked to significant social advantages (Ma et al., 2017).

METHODOLOGY

The quantitative method was adopted for this research, whereby the questionnaire instruments used to collect the data. The questionnaire instrument is divided into two parts includes of Part A for demographic questions, while Part B questioning on awareness towards the elements of the green residential buildings. The questionnaire was distributed to 500 respondents through several online mechanisms of WhatsApp, email and telegram. Residents of Ipoh who are working, own a house but want a more comfortable house, as well as potential first-time homebuyers, are the target respondent for this research. The non-probability sampling design named voluntary sampling technique was used. A total of 458 people responded to the survey. However, when the outliers' replies were removed, only 384 responses were left for analysis. After counting around 829,700 residents in Ipoh, Perak, this still fulfils the minimal requirement of the Raosoft sampling calculator that required a minimum sample of 384 samples.

The frequency analysis used in the data analysis to identify the demand for green residential building, and to investigate potential homebuyers' awareness of the elements of green residential building. Ipoh, Perak. Frequency analysis is a very fundamental tool to describe the data. While the relative important index (RII) analysis was employed in order to identify the level of awareness for each element available that encounter for green residential building. RII is a good tool for ranking indicators that are scored on a Likert scale (Mohd Adnan et al., 2017; Rooshdia et al., 2018). This research adopted five-point Likert scales for the questionnaire instruments that start from strongly disagree, disagree, neutral, agree and strongly agree. According to Rooshdia et al.(2018), five important levels are transformed from importance values. They commence with high (H) $(0.8 \leq RI \leq 1)$, high medium (H–M) $(0.6 \leq RI \leq 0.8)$, medium (M) $(0.4 \leq RI \leq 0.6)$, medium-low (M-L) $(0.2 \leq RI \leq 0.4)$ and low (L) $(0 \leq RI \leq 0.2)$. A low RII indicates that the item is less aware, whereas a high index indicates that the item is more aware and agreeable.

RESULTS

The frequency analysis in Table 1 shows, male respondents accounted for 60.9 percent of all respondents to this questionnaire survey, while female respondents accounted for 39.1 percent. This is because the male population in Ipoh is higher than the female population. The respondent's age has been divided into three categories: 20–30 years old, 31–40 years old, and 41 years old and up. It reveals that respondents between the ages of 20 and 30 had the largest frequency, with 180 respondents accounting for 46.9% of the total. Then there are responders between the ages of 31 and 40, who make up 31.0 percent of the total. The least likely demographic to reply to this poll is those aged 40 and up, with 85 respondents (22.1%). It reveals that respondents in this age group are more likely to buy for investment or to live. The job category has been divided into four categories: government sector, private sector, and self-employment. The government sector has the largest frequency of respondents, with 172 respondents (44.8%). Then there are respondents from the private sector, who account for 137 (35.7%) of the total, and self-employed people, who account for 75 (19.5%) of the total. The researcher has sorted out unemployed respondents because one of the study's major goals is to discover a potential buyer.

From Table 1, 51.8 percent of respondents have not yet purchased a house, whereas 48.2 percent of respondents have purchased a house. The table's findings also indicated that respondents are well-versed in the elements and benefits of green residential. This is demonstrated by the results, which reveal that 67% of them are really aware, 8% are aware, but not really aware, and 25% are not aware. The results also indicated that there is a demand for green residential because 75% of respondents stated they wanted to buy green residential, while 25 % stated they don't. It demonstrates that the respondents to this poll are interested in purchasing a green residential building, either to live in or to invest in the future.

Table 1: Demographic, awareness and future purchase decision

	Item	F	%
Gender	Male	234	60.9
	Female	150	39.1
	Total	**384**	**100.0**
Age	20-30 years old	180	46.9
	31-40 years old	119	31.0
	>41 years old	85	22.1
	Total	**384**	**100**
Occupation	Government Sector	172	44.8
	Private Sector	137	38.7
	Self-employed	75	19.5
	Total	**384**	**100.0**
Previous house buyer	Yes	185	48.2

	No	199	51.8
	Total	**384**	**100.0**
Awareness on elements of green residential building	Not Aware	96	25.0
	Away But Not Really Aware	31	8.0
	Really Aware	257	67.0
	Total	**384**	**100**
Want to purchase green residential building	Yes	288	75.0
	No	96	25.0
	Total	**384**	**100.0**

Source: Authors' Research, 2021

The results in Table 2 demonstrate that the majority of the RII's results indicate more than 0.8, with ten elements above 0.9 and another eight over 0.8. This implies that respondents are quite aware about green residential building elements, particularly those relating to wall orientation and window placement (1st rank; 0.9156), automatic lighting systems (2nd rank; 0.9151), and renewable energy (3rd rank; 0.9141). They are, nevertheless, well-versed in sustainable material elements (13th rank; 0.7188). This is because the RII findings are less than 0.8 but more than 0.6. When looking at the groups' element, energy efficiency comes on top (0.9149), followed by water efficiency in the second (0.9078). While innovation is ranked third (0.9026), indoor environmental quality is ranked fourth (0.8859), sustainable site design and management is ranked fifth (0.9149), and materials and resources is ranked sixth (0.8563).

The findings are in line with earlier studies, which found that building orientation and windows allow inhabitants to benefit from natural lighting and fresh air (Tjenggoro & Khusnul Prasetyo, 2018). The use of an automated lighting system is a typical sustainable building practice. Further, the most popular element of green building is renewable energy, such as solar system installation (Omer, 2014). Furthermore, earlier research has discovered water-saving fittings that are frequently utilized in sustainable residential building (Razali et al., 2015). Rainwater harvesting systems commonly adopted in green buildings that can reduce about 40 to 60% of global water use (Alsadi et al., 2019; Misra et al., 2016; Yusop & Syafiuddin, 2018), while 68% reduce water consumption specifically. Irrigation is another popular application. Moreover, previous research also emphasised the Innovation aspect, which is more connected to the adoption of new technology and innovation tools (Ohueri et al., 2018; Pandey, 2016; Razali & Hamid, 2018) with the goal of providing better long-term value. Therefore, it's not surprising that the majority of respondents in Ipoh are aware with these three primary aspects. Although the other aspects are not in the top three, the respondents are aware of them because the results are more than 0.8, indicating a high degree of awareness.

Table 2: RII results of awareness on green residential building elements

	Item		RII	Level	Rank	RIIG	RankG
Energy Efficiency	EE1	Wall orientation and windows placement	0.9156	H	1		
	EE2	Automated lighting system	0.9151	H	2	0.9149	1
	EE3	Renewable energy	0.9141	H	3		
Indoor Environment Quality	EQ1	Good ventilation system	0.9083	H	9		
	EQ2	Good quality of lighting	0.9104	H	6	0.8859	4
	EQ3	Wall colour	0.8661	H	15		
	EQ4	Sound quality	0.8589	H	17		
Material & Resources	MR1	Site selection and Planning	0.8719	H	14		
	MR2	Nearest to public transportation service	0.8599	H	16	0.8563	5
	MR3	Strategic location	0.8370	H	18		
Water Efficiency	WE1	Water saving appliances	0.9115	H	4		
	WE2	Irrigation system	0.9115	H	4	0.9078	2
	WE3	Rainwater harvesting	0.9005	H	10		
Innovation	IN1	Innovated system	0.9089	H	7		
	IN2	Construction process	0.8901	H	13	0.9026	3
	IN3	Equipment and appliances	0.9089	H	7		

Source: Authors' Research (2021)

CONCLUSION

The research concludes that the majority of respondents in Ipoh, Perak are aware of the green residential building concept and they are positives towards owning the house. This implies that there is demand for this type of residential property in the Ipoh city market. Research also revealed residents in Ipoh are highly aware of the elements of the green residential building. Therefore, developers and state authority are able to increase the number of green residential development in Ipoh city. Aside from that, a wider range of designs should be available to provide more options to the potential homebuyers. Moreover, further research should be conducted to discover any demanded design and type of residential green building desired by the potential homebuyers.

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THE PREFERENCES AND REQUIREMENTS OF GREEN GARDEN RETIREMENT CARE OF THE ELDERLY: CASE STUDY AT RSK TAIPING, PERAK, MALAYSIA

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Abstract

The elderly people in retirement homes generally pain from health's problems, depression, and anxiety. Previous study revealed that the elderly requires high consumption of healthcare facilities. However, in Malaysia, the gap of the built environment for green garden, especially in the existing strategy at planning, design, and implementation of the elderly institutional care is currently lacking and inadequate. Consequently, the elderly usually requires much green or naturals to spend considerable time gardening and therapeutic activities. The green garden can entail and develop their stimulation, increase socialization, and decrease feel of isolation. Therefore, this study investigates the requirements of green garden retirement care for the elderly in supporting their active ageing and preferences design of green garden to improve the quality of life at retirement homes. This study embedded mixed-method designs, including structured interviews with the sixteen (16) residents and four (4) staff at RSK Taiping, Perak. together with observation of senior outdoor survey (SOS) tools. Findings revealed that the requirement of green garden retirement care facilities and location influenced garden usage in the elderly at retirement homes. The design considerations of landscape design on green gardens have been identified to be prominent in preferences for the elderly at retirement homes. The evidence in this study is particularly compelling for the holistic planning, design of the green garden at retirement homes and provides better reflection in future policy for institutional care facilities development.

Keywords: Green garden, retirement care, preferences, requirements

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INTRODUCTION

Green garden is a new term practiced worldwide with its primary aim is highlighting the gardening activities with sustainable landscape management practices. According to Prasad (2017) and Wen et al. (2018) green garden is comprised to as therapeutic, green space and natural landscape. The concept has been adopted on various types of the garden, from an individual's own private garden to the community garden (Curl et al., 2016; Finlay et al., 2015). Recently, increasing evidence shows that 'exposure to the green garden is beneficial to mental and physical health' (Darmawati, 2019; Shi et al., 2019). Thus, providing a natural environment in institutional care and health facilities for the elderlies played a significant role in determining a healthy environment (Zainol & Pettit, 2016). The green garden concept should be applied to various levels of society, especially in the elderly community. Previous research by National Institute on Aging (2019) shown that elderly or older adults are more prone to various mental and health conditions. In Malaysia, the numbers of elderly are increasing dramatically. From 2015 until 2030, the Malaysian ranking of ageing are increasing fast. According to the Department of Statistics Malaysia (2017-2020), Malaysia is expected to become an ageing nation in 2030 with a population aged 60 years that will overreach 15.3% of the total population. Hence, to ensure the elderly are well protected from mental and physical diseases, a green garden was referred to therapeutic and green space concept as one of the best activities for the elderly in Malaysia. Moreover, green garden activities can be enjoyed even among the elderly with limited mobility. Therefore, the green garden concept should be introduced, especially in the institutional care of the elderly in Malaysia. This paper sets out to study investigates the requirements of green garden retirement care for the elderly in supporting their active ageing and preferences design of green garden to improve the quality of life at retirement homes. In addition, this study also involved selected variables gained from the literature review to test on physical, and social needs of the elderly in Malaysia institutional care facilities. The findings from this study are expected to portray the elderly needs, specifically in the Malaysian context, on constructing and emphasizing the green garden for the elderly institutions.

Green Garden: The Dimension and Benefit to the Elderly

Generally, the green garden concept refers to gardening area, therapeutic, natural landscape and green area inhabited by plants, minimizing disturbance to the environment, and a simple garden (Prasad, 2017). Nowadays, the concept of a green garden has been adopted in the green pocket area for an eco-friendly environment. It is either horizontal on the earth surface, vertically set up, or ceiling or roof green garden. These dimensions lead to improved quality of community through self-health aspects, economic, and socially balanced. Given

the strong tendency of people to connect with nature, it seems appropriate to distinguish 'green garden' as a particular form of dimension that is of great importance to the elderly, and nature may affect the relative importance levels of the preferences (Scannell & Gifford, 2013, 2017). The green gardens that are planted together can help in improving the long-term quality of health. Through planting and gardening activities at green garden, it can help in improved mental health. This is addressed from a study conducted by Finlay et al. (2015); Scott et al. (2015) and Wakefield et al. (2007) that participants found the opportunity to interact with nature relaxing and calming. Moreover, Dahlkvist et al. (2016) revealed that green garden may enable psychological distance, engage effortless attention, encourage more frequent visitation, and leads to the formation of positive self- characters. Detweiler et al. (2012) stated that elderly people with dementia tend to have a reduction in aggression and medication and thus lowering the costs. Furthermore, green garden helps the elders to be more engaged and do light activities to promote their self-health and self-movement. According to Fumagalli et al. (2017), green gardens that have these characteristics may promote positive health development: (i) a lush garden setting, (ii) safe and comfortable, (iii) outdoor walking and activities, (iv) easy to see and reach, and (v) connect to the world. A well-designed garden for the elderly plays an essential role in providing a sense of belonging and encourages the elderly to be more physically active. Dahlan et al. (2016) stated in their study that having more greenery, and natural elements in outdoor spaces such as green gardens for the elderly people will promote various experiences. Such as being away and fascinated when residents' go outdoors and that this, in turn, will encourage more frequent visitation and better health. Both combinations of facilities, natural garden setting and aesthetic quality play an essential function in making these good social places for seniors' citizens. Furthermore, green garden also helps strengthen the bonds of unity and quality of communication between the community of elderly people.

The Preferences of Green Garden in Retirement Homes
The garden is part of a green background that ensures a sense of calmness and peace (Ali et al., 2019). Several studies have investigated green-space preferences of different age segments. The elderly needs a specific green space or garden at retirement homes or care centres to improve their quality of life (Ali et al., 2019). The previous study by Azmi et al. (2021) revealed that the elderly needs environment features with activity and gardening space. The green garden makes the elderly stay active and positive. For example, access to gardens has a connection with giving benefits to healthier older people; yet little was known about the conditions of experiences in green and gardens that may endorse health (Scott et al., 2015). Garden is seen as an imperative nature support tool to the

health facilities, and it fabricates sustainability for the elderly communities at retirement houses (Ali et al., 2019). Elderly people's physical condition and cognition have gone through the aging process, so they may find some green spaces to be more attractive than young people would (Wen et al., 2018). Previous studies defined preference as a cognitive process where some people appreciate a landscape more than another, considering it to be more aesthetic, lively, or desirable' (Wen et al., 2018). The elderly has different preferences for social and physical aspects of green spaces (Arnberger et al., 2017). Thus, in this study, the preferences of a green garden in a retirement home are divided two-aspect which are physical and social.

Physical and Social
By engaging and interacting with green spaces or gardens on daily basis help the elderly to garner their mental and physical health benefits. Therefore, green gardens require physical preferences to meet the needs of the elderly in retirement homes. For the example, elderly prefer seating opportunities along access routes to green spaces providing resting points for them (Arnberger et al., 2017). The Elderly also need physical activities and movement to improve and maintain their health. Physical activities such as gardening, walking, or leisure depend on age and the individual's capacity (Artmann et al., 2017). Therefore, when they do activities in the green garden with the facilities provided, it will enhance their life aspects. The elderly also prefers more plants, flowers, and some interaction with animals. Animals and plants are more important for the older compared to younger residents living close to the green elderly (Arnberger et al., 2017). In social aspects, a few studies have observed that social factors play a significant role in the green garden preferences of the elderly (Arnberger et al., 2017). Green garden was denoted that specific social aspects seem to be more vital for the elderly than for younger individuals. Elderly people, especially, feel less lonely and experience more social support when living in green areas (Artmann et al., 2017). Green gardens in retirement homes for elderly people benefit their social interactions with different groups of individuals. It can create elderly social and pleasure bonding with each other (Ali et al., 2019). For example, they found that social support provided by friends to be positively related to leisure-time physical activities of older adults. The enjoyment and access to sightseeing in the provided green allow the elderly to gain their memorabilia, experience and it enhances the sensitivity to the staff and communities. Consequently that, they felt that their life is closed to them.

DESIGN AND METHODS
This study embedded mixed method designs to achieve the research aims. This method is provided to complete the data collection, support each methodology's

strength, and provide more meaningful in-depth data (Creswell & Pioano Clark, 2007; Wisdom & Creswell, 2013). This study employed with qualitative research design using structured interview with the residents and staffs in institutional care facilities. According to Patton (1990), qualitative data brings results to life through in-depth case elaboration. Besides, quantitative research is designed by observation process. The observation has utilized an environmental audit checklist by using the senior outdoor survey (SOS) as a research instrument to explore the requirements and essentials of the green garden for the elderly. All qualitative and quantitative data are collected in concurrent studies.

Context of the Study
The case study was conducted at RSK Taiping, Perak, Malaysia. The case study was selected based on Perak as the state with the highest percentage of the elderly, with 10.6% of the total elderly population in Malaysia as compared to other states. This study has determined dominant criteria that the case study targeted relatively the space of green garden facilities because these institutions are usually better designed, and RSK Taiping was the first RSK in Malaysia. The Figure 1 shown the location of RSK at Taiping, Malaysia. The RSK Taiping is located at Larut Matang District in Perak and adjacent to Jalan Stesyen Hulu, Taiping.

Figure 1: The location of RSK Taiping, Perak, Malaysia
Source: Author, 2021. Image retrieved from Google Earth, 2021

Structured Interview
A purposive sampling method was adopted in selecting respondents. The respondents were selected for the study interview were the residents and staff

with 16 elderly and 4 staff. Based on their health and ability to respond, the chosen respondents of elderlies were communicated well for the interview session, and they were aged 60 to 65 years (refer to Table 1). The elderly that was identified to have severe communication problems and illness were excluded from the interview. According to Patton (1990), there are no sample size rules for qualitative research because the emphasis is on quality rather than quantity. Its previous study recommends that qualitative studies require a minimum sample size of at least 12 respondents to reach data saturation (Clarke & Victoria, 2014; Fugard & Potts, 2015). As a result, a sample size of 20 appears to be adequate for this study.

Table 1: The respondent of residents and staffs at RSK Taiping, Perak, Malaysia

Respondent	Number	Gender	Age
Staff	4	Female	35-45 years
The Elderly (Residents)	16	12 (Female) 4 (Male)	60-65 years

The structured interview was conducted by carrying out a small interview study to explore the resident's living preferences about the design and requirements of the green garden at retirement homes. The purpose of the interview study was to comprehend which aspects or criteria of the green garden were essential and suitable for the elderly to improve their social and physical health. The interview session took between five to ten minutes on a specific topic for the green garden at RSK Taiping. Interviews were conducted in Bahasa Melayu (Malay) and transcribed into English. These interviews items included (i) what types of activities the elderly take part in the green garden, (ii) why they take part in this activity, (iii) what they satisfied or dissatisfied about the green garden, including the layout, design, and landscape elements and (iv) what might make the green garden space safer and better for their health, well-being and supportive for active ageing.

Observation
The observation method is a promising way to objectively measure physical activity and environmental data at a sufficiently detailed level (Maller et al., 2009). The primary purpose of observation is to find the green garden layout or space and relationship with the elderly. The community green garden was observed and documented at RSK Taiping by using an environmental audit. The environmental audit established by Rodiek and Shepley (2014) was known as the Senior Outdoor Survey (SOS). The SOS tool was recently developed as a validated instrument that aims to assist a range of stakeholders, including

researchers, designers, planners, and care providers, to effectively evaluate outdoor features in institutional care facilities (Bardenhagen et al., 2018; Bardenhagen & Rodiek, 2015; Rodiek et al., 2016). The SOS tool is a checklist that enables researchers to evaluate the presence of the green garden based on significant domains and items. The tools contain 60 items in 5 domains, that including's (i) access to nature with 14 items, (ii) outdoor comfort and safety with 15 items, (iii) walking and outdoor activities with 14 items, (iv) indoor-outdoor connection with 11 items, and (v) connection to the world with 6 items. After the survey this study identified 2 significant domains and 22 items applied. They domain are domain 1; access to nature and domain 2; walking and outdoor activities (refer to Table 2 & Table 3). The other 3 domains and 38 items were discarded from this study since the Malaysian geographical and cultural factors were considered. This Seniors' Outdoor Survey (SOS) survey checklist uses the Likert scale. The rank of Likert scale is 1 to 7 for each item. All the ticking of checklist calculates the subtotal number in each domain and divides it by the number of items of each domain to get an average number, representing the scores of each domain. The SOS tool helps researchers to audit and evaluate the supportive potential of green garden areas at retirement homes (Rodiek, 2018). This application-oriented tool can be applied to reliably measure and relate a wide range of senior amenities and green garden areas to support decision-making (Scopelliti & Giuliani, 2008; Shukor, C. Y. E., and S. F. A., 2016; Shukor, S. F. A., 2012). This tool is valuable and essential for long-term care administrators, planners, landscape architects, and designers when creating and designing outdoor spaces, particularly for senior citizens.

FINDINGS AND DISCUSSIONS
This section explains the findings and discussions of the study. It is divided into the following sections and data collection on environmental audit.

Preferences and Satisfaction of the Green Garden to the Elderly
Most of the respondents, 8 from 16 (50%) of the elderlies and 2 out of 4 (50%) staff in this study, described that they are satisfied and pleased with the living environment at RSK Taiping. The area of RSK Taiping was described to possess greenery elements with many areas or zoning of green garden. The following are statements from respondents involved in this study:

Male 2 & Female 1: "I enjoy living here because it's like being in a park and lots of plants, colourful and fascinating".

Female 4,5,6 & 9 and Male 1: "Every evening, I can go outside to see the plants and the sound of birds. It gives calmness and freshness".

Male 3: "Uncle like gardening. Usually, I've planted the lemongrass tree surrounding the green area in RSK. I've felt healthy and better physically ".

Staff 1: "Plants and green garden contributed significantly to the elderly by stimulating their sense and offering rewarding activities".

Staff 2: "We always hear about humans' negative impact on the environment, but by gardening, we can indeed "go green and food security" to benefit the elderly".

Based on these responses from respondents, it reveals that visiting and doing some activities at the green garden was perceived to be good for the mind and self-satisfaction of the elderly and staff. According Rappe (2005) and Rappe et al. (2006), seeing the green garden and self-rated health was strongly associated with the elderly living in long-term care facilities or retirement homes. Moreover, nurturing plants enables the respondents to use cognitive skills, offered emotional experiences and facilitated social relations among the elderly in care (Detweiler et al., 2012; Mousavi Samimi & Shahhosseini, 2020). The experiences being in the green garden areas is of great significance for most of the elderly, and they considered it essential to see plants and observe natural surroundings. The visit to the green garden affects their mood and emotion positively; almost all respondents addressed to be more joyful and cheerful. The respondents who are exposed to the green garden or outdoor also were found to have lower scores for anger and fear. Roger S.Ulrich et al. (1991) stated that changes in emotional states are associated with contact with the green garden. The green garden elicits more optimistically toned effects on the elderly. The study has also shown that the elderly (Male 3) was attached to the plant growth, and it has helped the respondent to improve his physical abilities and self-expression. These findings are similar to Meyer (2007) who found that the elderly could create new memories and meanings for their social lives among residents and staff through gardening. Performing gardening activities provide more benefits and can be applied as a therapeutic tool to improve the elderly well-being. Gardening or planting activities may help the elderly to maintain health, facilitate rehabilitation from and cope with chronic diseases and impairments, and alleviate symptoms of dementia (Brozen, 2014; Hawkins et al., 2011; Herrington, 2008; Scott et al., 2015; Soga et al., 2017; Toyoda, 2012).

Requirements of the Green Garden to the Elderly
Gardening or green garden have been used as a therapy tool for different groups of people in various settings to promote health, well-being, and social inclusion (Detweiler et al., 2012). Plants and greenery can improve the elderly well- being and provide positive physiological responses. However, the study also found that green garden for domain 1 (access to nature) in Table 2 with 79.4% was lacking with the diverse mix of plants and it did not have proper landscape elements (views and water features). The document is also supported by the statements of three respondents who are: "We are happy being here, but sometimes we really miss the environment and pleasant view like home-village with surrounding of river (water elements), diverse and edible plants". Based on these responses, the study identified that the elderly is generally happy with the retirement homes services, however there are need in better and supportive environment for the green garden. These finding revealed that plants and water (blue space) were essential elements to provide sensory stimulations to all the senses through texture, sounds, colours, and scents. Previous study by Kaplan (2001), Kaplan (1995), Kaplan & Berman (2010) and Pappas (2006) have reported access to nature or green environment in retirement communities and homes for the elderly is very significant for the elderly. Furthermore, Joseph et al. (2016) and Kothencz et al. (2017) also supported that involvement with a green environment by looking from windows and excursions into outdoor areas are essential constituents of well-being and life satisfaction for the elderly.

Table 2: The data of access to nature at RSK Taiping, Perak, Malaysia

Item	Rating Scale	1	2	3	4	5	6	7
Domain 1: Access to Nature	1. Abundance of greenery						6	
	2. Diverse mix of plants and trees				4			
	3. Easily reachable or raised plants							7
	4. Hard boundaries screened by plants						6	
	5. Seating has pleasant views						6	
	6. Water features available	1						
	7. Outdoor fairly quiet						6	
	8. Privacy from resident rooms						6	
	9. Private place to sit						6	
	TOTAL						**48 score**	
	Average Score						**76.2%**	

Domain 2: walking and outdoor activities was identified to be an essential item of environmental audit for the elderly outdoor activities. Walkability and outdoor activities were related to the themes of safety, comfort or convenience, and aesthetics (Rodiek, 2006; Wen et al., 2018). According to

(Khalid et al., 2020), for accessibility and environment for the elderly needs easily accessible for the elderly with greater consideration on mobility, security, and activity. In RSK Taiping, the walkway or pathway area facilities with 54.8% in domain 2 (refer Table 3) were lacking in providing walkways with different lengths. Some of the walkways' levels need to improve significantly for the elderly who use support equipment such as wheelchairs, crutches, and more for their ease of movement when having social activities. According to RSK Taiping staff respondents, the most problematic task is to manage a group of the elderly, especially in taking care of those in wheelchairs for outdoor activities.

Table 3: The data of walking and outdoor activities at RSK Taiping, Perak, Malaysia

	Item	Rating Scale	1	2	3	4	5	6	7
Domain 2: Walking and Outdoor Activities	1. Roundtrip walkways available				3				
	2. Paving level, easy for wheelchairs			2					
	3. Paving non-skid and non-glare			2					
	4. Handrails along some walkways					4			
	5. Walkways partly shaded					4			
	6. Interesting views from walkways						5		
	7. Frequent seating along walkways		1						
	8. Some walkway seating in shade			2					
	9. Destinations to walk toward					4			
	10. Places for social activities							6	
	11. Places for recreation and exercise							6	
	12. Place for gardening, horticultural therapy								7
	TOTAL								**46 score**
	Average Score								**54.8%**

This study findings also discovered that the materials of the walkway were not incorporated with paving non-skid and non- glare elements. The staff also reported that slippery paths were considered as a significant hindrance for the elderly who use wheelchairs and walking aids. Previous research recognizes that all these risks are regularly made poorly to the elderly physical (Tobi et al., 2018). Consequently, to make it safer for the elderly, it is essential to create a better design and facilities of a green garden in institutional care. Overall, a thriving green garden environment satisfies the physical, and social needs of elderly people. The green garden design, landscape, and social activities need to compensate for their physical and it has encouraged usage for the elderly. Identifying specific environmental audits at retirement homes will assist the

landscape architect, planner, and designer to provide better design solutions for the green garden.

CONCLUSION

Investigating the preferences and requirements of the green garden for the elderly are significant due to beneficial treatments as well as benefits for their mental and physical health. Through structured interview with 16 numbers of residents living and 4 numbers of staffs associated with observation, this study has tested the environmental audit domains (SOS tools) adopted by Rodiek & Shepley (2014). The findings revealed that the domain 1 'Access to Nature' with 48 scores (76.2%) average that represent as more favorable items compared to domain 2 'Walking and Outdoor Activities' items with 46 scores (54.8%). The study presented that the most required items for a green garden were the abundance of greenery, easily reachable or raised plants, and seating with a pleasant view. The preferences findings discovered that the respondents showed a significant correlation with greenery and safety, highlighted by Kaplan & Berman (2010) as the most effective environment content in retirement communities. Green garden was attempted that the study findings, specifically the senior outdoor survey (SOS) domains, can offer a better understanding in planning design, and proposed of the standard features of green garden elements for the elderly at retirement homes and become guidelines to further develop the resilient living environment for the ageing population in Malaysia. The senior outdoor survey (SOS) tools create a reliable and accurate way to determine the community's outdoor spaces based on how well the survey meet the needs and requirements of the elderly residents. Therefore, these findings boost physical and social contributions that pursuit the environmental audit investigations at a retirement home, specifically in the RSK Taiping, Perak. Furthermore, these domains would then provide better prospects for the institutional care facilities development in retirement care facilities for near future.

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HEDONIC REGRESSION ANALYSIS IN DETERMINING THE EFFECT OF GREEN ON HIGH RISE RESIDENTIAL

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Abstract

In predicting house price, there are many influential variables, and each variable is identified as a price determinant. Theoretically, variables are divided into categories, namely locational and neighbourhood attribute, structural attribute, time attribute, and environment attribute. Green element is one of the attributes as describe under environment category. The attribute is important as other variables which significantly explained how people willing to pay intangible variable. The relationship between property price and attribute needs to be examined to understand the influence of the green element on property price. Thus, this research attempts to demonstrate the independent variables correlated to the house price, including the green variable, by using hedonic regression analysis. Hedonic regression analysis is a well-known approach in determining the relationship between two or more variables. Green element represents the green-rated obtained by the housing scheme as evidence that the building possesses sustainable characteristics. The cost of green is relatively high than a conventional building. A dataset of 934 house price transactions with 14 variables was analysed. From the analysis, it is concluded that green has a significant effect on the house price. The result was interpreted by the β coefficient of 0.065 explained in hedonic regression analysis. It signifies that green can add premium to the house price. House price results from multiple determinants represented by house attributes and the findings confirm that one of the environment attributes do give effect on the house price in Malaysia property market.

Keywords: House price, green, house variables, hedonic regression analysis

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INTRODUCTION

From the global statistic, the leading sectors for carbon dioxide (CO2) emission are electricity and heat sector followed by transport, manufacturing and construction and building sector (Historical GHG Emission, 2020). In Malaysia, building sector significantly contributes 4.10 million tonnes of CO2 emission. As to date, residential sector in Malaysia still leading as the largest number by volume and value.

Green building has been introduced in Malaysia since 2009 with the establishment of Green Building Index (GBI). Today, up to 579 projects have been certified by GBI, the green building rating system which is initiate by PAM's Architect (GBI, 2021). The establishment of green rating system and the incentive given by the government are moving towards promoting sustainable development in order to reduce the impact of physical development on environment (Green Buildings and Townships Working Group, 2020).

GBI possess same objective as other well-known rating system, BREAM, LEED, Green STAR and Green Mark, their establishment in relation to promoting sustainable development. Each rating system have its own rating criteria according to the local context as it is much easier to incorporate the climate. Every rating system is unique and its effect toward local context is different. Thus, exploring the effect of this rating system on in the local context is significant.

The main objective of this paper is to assess whether green element, as measured by the GBI rating system, has an impact onto the price of housing market in Malaysia. Typically, the correlation between independent and dependent variables can be tested using regression (Yusof & Ismail, 2012). Hedonic price model has been used extensively in measuring the green effect on property price. Thus, the relationship between green and house price can be interpreted in hedonic regression analysis using dataset of sale transaction with information such as floor area, age of building, number of bedrooms, location, and green status.

LITERATURE REVIEW

Factors Affect Price

The housing market is inextricably linked to a country's economic wellbeing. Demand fluctuations would have an impact on growth in other economic sectors. In understand the demand, various factors were discussed and studies. There are significant amount of previous research discussing the factors or attributes that affect house price. The factors contribute and become the determinant of house price. Generally, these factors can be divided into four main categories namely locational and neighbourhood attributes, structural attribute, time-related attribute and environment attribute (Abdullah et al., 2016; Rashid et al., 2017; Kamarudin et al., 2008; Yusof & Ismail, 2012).

The location attribute is well known since there is a popular phrase: 'location, location, location'. Location is more than locality of the property. Furthermore, locational and neighbourhood attributes refer to the location of the property such as proximity to school, amenities, transportation and town and they also indicate the surrounding such as view of the building (Thanaraju et al., 2019, Abdul Lateef et al., 2018; Oloke et al., 2013; Kiel & Zabel, 2008). Structural attribute is another important factor that is related to the physical condition of the property. Among the factors are size of the building or floor area, age of the building, floor level, number of bedrooms and bathrooms and facilities of the building (Kamal et al., 2016) .

Next, time-related attribute is the date when the sales of the property take place. Typically, new or recent transaction will indicate increment of price as compared to the old transactions (Fesselmeyer, 2018). For this research, time attribute is represented by year of transaction for the unit of house. Finally, the environment attribute is one of category which significantly influence the property price. It can be interpreted as environment characteristics of property, where the green element was discussed. To assess the greenness of building, green rating system was introduced as one of the tools. In green rating system, there are few categories of rating such as platinum, gold, silver and certified (GBI, 2021). In other words, green element is associated with green certification, or some literature mentioned energy efficiency. Many previous studies revealed the positive impact of green-rated on residential property price (Zhang et al., 2017; Taltavull et al., 2017; Evangelista et al., 2019).

Hedonic Price Model

The first introduction of basic hedonic pricing framework is by Rosen (1974), where price can be explained by a package of goods characteristic. Hence, hedonic regression becomes a discovered preference technique to evaluate demand or value of good. The model of hedonic pricing in measuring real estate economics is widely used. It has given significant impact towards the exploration of variables on property price explicitly.

The hedonic price model has been extensively used to demonstrate the correlation between property characteristics and price. It becomes popular especially in relation to housing properties. Most of the published research studied on the effect of green such as energy efficiency or green certification use this modelling technique in their method (Taltavull et al., 2017; Fuerst & Warren-Myers, 2018; Fesselmeyer, 2018; Evangelista et al., 2019; Fuerst et al., 2016).

The formulation of prediction model using hedonic pricing is the price relation to its characteristic. The price of house in simple hedonic regression model can be expressed as follows:

$$\gamma = \propto + \beta\kappa1 + \beta\kappa2 + \beta\kappa3 + \cdots.$$

Where the **Y** is the sale price per unit of house, each **K** is set of house characteristic and $\propto$ and β is the vector of parameter to be estimated. The hedonic weights allocated by each variable and finally equivalent to this characteristic's overall contribution to the property sales prices (Rosen, 1974).

METHODOLOGY

The research paper exploits a dataset provided by National Information Centre (NAPIC) of condominium transaction in Penang over the time between 2016 and 2020. The variables available for each property include year of completion, occupancy rate, floor area, floor level, number of bedrooms, location described as town or Mukim, date of transaction, tenure, and price. Additional information such as green certification was extracted from GBI website, security, facilities, and view of the building from site inspection and Google Maps, and developer ranking as listed in The Edge website. Figure 1 showed the study area of Timur Laut District on Penang Island. The area was selected because according to GBI list, Penang ranked top 3 with most projects certified by GBI which is the indicator of green building. Furthermore, about 60% of the total project certified in Penang is housing, and most condominiums certified by GBI are in the district.
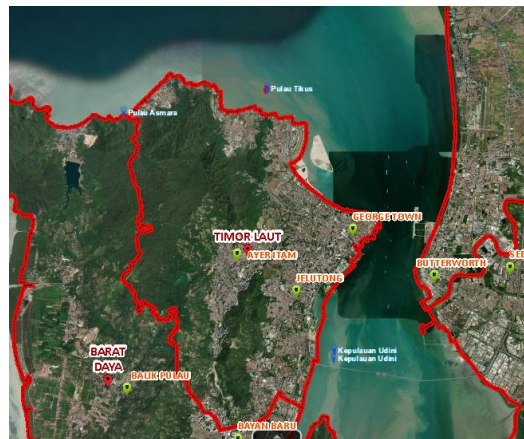
Figure 1: The map of Timur Laut District on Penang Island
Source: www.pegis.penang.gov.my

To test and analyse the effect of green certificate on house price, 934 database that were used involved GBI certified condominium and non-certified condominium. The sale transaction price is a secondary data of resale property (exclude sale from developer) to ensure that the price is representative of the

actual market and not influenced by any marketing or selling point. Summary of the description of the variables are provided in Table 1.

To estimate the contribution of each characteristic using regression analysis, there are two hedonic specifications: the first is the fully linear model, and second is the logarithmic-linear model or log model. The log model can be semi-log or log model. Logarithmic scale is more preferred due to its the skewness of data towards large value. Thus, using log scale can display the numerical data in better way. In Table 1, numerical data were transformed into log scale, while category data transform into dummy variable to incorporate qualitative data into regression. A total of 14 variables were transform.

Table 1: Description of variables for Case Study area

	Variable	Overview	Transformations
Dependent Variable (DV)	Price per Square Metre	Price divide floor area	log
Independent Variable (IV)	Town	Georgetown and Other Town/mukim	dummy
	Year	Year 2020, 2019, 2018, 2017, 2016	dummy
	Interest	Freehold and Leasehold	dummy
	Floor size	Floor area of unit in SM	log
	Number of rooms	Number of rooms	-
	Floor level	Level of unit	log
	View	Seaview, Hillview and Town view	dummy
	GBI certificate	GBI certified - 1, Non-GBI -0	dummy
	Facilities of scheme	Full facilities and semi-facilities	dummy
	Security	Single and double gated	dummy
	Occupancy rate	Rate above 75% and below	dummy
	Developer	Developer 30 and no ranking	dummy
	Age	Age of building	log

Sources: Author's research (2021)

RESULTS AND DISCUSSION

This section explains the result from the analysis using regression function. The descriptive analysis was summarised in Table 2. The table showed mean, median, standard deviation, minimum and maximum value of each variable. Transaction price and price per square metre indicate a minimum value of RM230,000 and RM2036 respectively and a maximum value of RM4,550,000 and RM14,507 respectively. The range of value is high for both variables, and this implies that the data should be presented in log form for better result. It is also being applied

to the other 4 variables: number of rooms, floor level, floor size of unit condominium and age of the building.

In exploring the relationship between price and house characteristic, price of house such as the condominium dependent variable is in square meter and the rest of the list become the independent variables for price determinant.

Table 2: Descriptive statistic for sale price and condominium characteristics

	N	Minimum	Maximum	Mean
PRICE PER UNIT	934	230000	4550000	988828.73
PRICE PER SQ M	934	2036	14507	6413.30
GEORGETOWN	934	0	1	.26
OTHER TOWN	934	0	1	.32
2020	934	0	1	.22
2019	934	0	1	.29
2018	934	0	1	.14
2017	934	0	1	.13
FREEHOLD	934	0	1	.91
FLOOR AREA SQ M	934	40.69	1001.00	155.9856
NUMBER OF ROOMS	934	1	5	3.38
FLOOR LEVEL	934	1	42	14.97
HILLVIEW	934	0	1	.34
SEAVIEW	934	0	1	.42
GREEN -GBI	934	0	1	.15
FACILITIES	934	0	1	.55
SECURITY	934	0	1	.04
OCCUPANCY	934	0	1	.62
DEVELOPER	934	0	1	.37
AGE OF BUILDING	934	3	33	9.87
Valid N (listwise)	934			

Sources: Author's research (2021)

There were a few tests and assumption that should be met before the regression analysis. The correlation analysis was carried out to check the correlation between independent variables. All 14 variables showed that there was no correlation in more than 0.80 among the independent variables.

Next, the data as illustrated in graph (Figure 2) below show normal probability plot and random pattern in scatterplot. These meet the assumption that all data are normally distributed and there is no outlier. This is also supported by the VIF value for each variable below 10 and tolerance value more than 0.1 which indicates no multicollinearity issue exists.
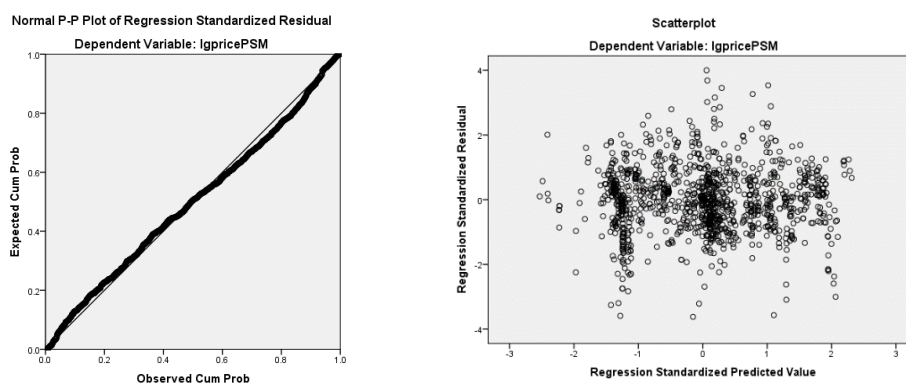
Figure 2: The normal plot and scatterplot of variables
Sources: Author's research, 2021

Table 3: The model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.600ᵃ	.360	.347	.2253281

b. Dependent Variable: LOGPRICE PSM

Sources: Author's research (2021)

Table 4: The model coefficients

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	26.111	18	1.451	28.570	.000ᵇ
Residual	46.457	915	.051		
Total	72.568	933			

a. Dependent Variable: LOGPRICE PSM

Sources: Author's research (2021)

The hedonic regression results for 934 of sale transaction data are presented in Table 3. The model has relatively good overall fit after it is revised with the R^2 at 0.360 and that explains the variables is 36% of the total variance of the condominium price. According to Cohen (1988), R^2 below 0.1 is very small, between 0.1 to 0.30 is small, between 0.3 to 0.5 is moderate and above 0.5 is high. A result of R^2 0.360, is at moderate level and acceptable. It also indicates that other variables which are not included may have also affected the price.

Statically, most independent variables show significant coefficients. The p-value in Table 4 shows that the model with green-GBI rated is significant.

Table 5: The model

Independent variables	Unstandardized Coefficients		t	Sig.
	B	**Std. Error**		
(Constant)	9.084	.105	86.147	0.000
GEORGETOWN	.067	.029	2.322	.020
OTHER TOWN	.097	.022	4.346	.000
2020	-.131	.024	-5.523	.000
2019	-.077	.023	-3.347	.001
2018	-.051	.027	-1.847	.065
2017	-.058	.026	-2.226	.026
TENURE	.022	.029	.745	.456
NUMBER OF ROOMS	-.003	.014	-.197	.844
HILLVIEW	-.056	.026	-2.131	.033
SEAVIEW	.155	.023	6.651	.000
FACILITIES	-.167	.020	-8.374	.000
SECURITY	.176	.039	4.529	.000
OCCUPANCY	-.077	.018	-4.304	.000
DEVELOPER	.180	.017	10.535	.000
GREEN -GBI	.065	.033	1.987	.047
LOGSIZE	-.080	.020	-3.979	.000
LOGLEVEL	.016	.010	1.564	.118
LOGAGE	.007	.019	.393	.694

a. Dependent Variable: LOGPRICE PSM

Sources: Author's research (2021)

Table 5 shows the $\propto$ and β coefficient value. Green-GBI variable indicates +0.065 coefficients. Other variables such as developer and security indicate high coefficient value of 0.180 and 0.176 respectively. All the transform variables that were included in the model together with the log form variable, i.e floor size, floor level and age of building. A linear combination form to explain β coefficient is as follows.

LN (Price per square metre) =
9.084 +0.067(GEORGETOWN) +0.097(OTHERTOWN) -0.131(Y_2020)
-0.077(Y_2019) -0.051(Y_2018) -0.058(Y_2017) +0.22(TENURE)
-0.003(ROOMS) -0.056(HILLVIEW) +0.155(SEAVIEW)
-0.167(FACILITIES) +0.176(SECURITY) -0.077(OCCUPANCY)
+0.180(DEVELOPER) +0.065(GREEN-GBI) -0.080(LOGSIZE)
+0.016(LOGLEVEL) +0.007(LOGAGE)

From this regression analysis, the selection of the **GBI certificate** variable suggests the positive sign of the variable. This shows evidence of support by other literature (Evangelista et al., 2019)(Li Zhang et al., 2017)(Jayantha & Man, 2013)(Fesselmeyer, 2018)(Limao Zhang et al., 2018) in which the discussion reported that there are differences in prices if the property is green or GBI certified increased. The beta coefficient is 0.065 and this associates with the p value. Therefore, the model obviously shows there is a statistically significant change in value if the property is located at Timur Laut District if it is certified green. Out of the 18 control variables entered in the model, 13 variables were statistically significant. Further, it can be defining trough t values of the independent variables.

CONCLUSION

This paper analyses the green certificate effect on condominium price in Timur Laut District in Penang Island. The analysis uses database which comprises of a combination of several data including information from condominium transaction sale data. The data was compiled and extracted by NAPIC, and it is to be used for the purpose of valuation and research related to property. NAPIC is an organisation responsible to promote and provide information on property market in Malaysia.

From the analysis done, it is found that green certification relatively gives an impact on property price. The percentage of premium if compared to non-certified building is about 6.5 per cent. The result is supported by a valuer who also estimated about 5-10 of price increment if condominium in Penang is green (Abdullah et al., 2018). Hence, the effect might vary according to the locality. Property market as well as green building should be explored differently in their local context. Even though most of the time green building is associated with high cost of construction, but the value of green is not only about cost. It represents the market, the demand, and the economics of the property. Value can be influenced by other factors. With more incentive, knowledge and promotion given by the government, green development can become the upcoming trend and demand.

Specifically, the contributions of these findings can be explained in several contexts. First, this research adds "green" into the residential hedonic pricing literature especially from the perspective of local context. It is estimated that green can become a common consideration in the hedonic research paradigm. Next, this study encourages additional research on the effects of green development on housing sector. The results of this research indicated a positive and statistically significant premium for transactions with green as a housing feature. The findings from this study are parallel with most of green effect studies done previously. The biggest challenge here is to educate public on the awareness of sustainability and green development. Empirical studies have shown

significant number of green effects towards price and value. But green is more than that.

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MOBILITY AND PROXIMITY COEFFICIENT TO HIGH-TRAFFIC VOLUME IN DAILY SCHOOL OPERATIONS

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Abstract

Heavy traffic volume especially in peak time led to bigger issue during daily school operating time. Drivers' behaviours are often seen as the central cause to the increased number of road accidents around school, particularly during morning hours when accompanying adults are in a rush to office. Good accessibility and connectivity are the main consent in a school planning guideline. However, the proximity to major roads results in a higher level of traffic around the school. The research hypothesis is to investigate whether the proximity distance playing a significant role in determining mobility choice to school. The Geographical Information System software was used to analyse the safety measures such as distance, coverage area and routes to school, while the mobility analysis is done using the SPSS. 553 samples of questionnaires have been distributed at six identified schools in Johor Bahru. The result from analysis shows 79.39% of children use motorised vehicle thus, contributing to poor traffic flow during peak hour. While in comparing the coverage of each school to the guidelines, 99.45% of children's houses are within the accepted radius distance. The findings of this study will highlight to some poor driving habits among parents, which are a major contributor to the heavy traffic flow surrounding schools.

Keyword: School location, traffic, proximity, accessibility, mobility

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INTRODUCTION

The statistics of road accident involving children around the world reported an overwhelming number of 500 death every day, thousands of injuries, and many sufferings lifelong disabilities (World Health Organization [WHO], 2013). The status has reached to 1.35 million in 2018 and most cases were associated to the age range from 5 to 29 years old (WHO, 2018). In the latest update report, the World Health Organization presented the percentage of road accidents involving children and young adult had increased and becoming the leading cause of death in that age group (WHO, 2021). It is also reported that 93% of road crashes are from the low and middle-income countries which made up of approximately 60% of world's vehicles. This has urged a call for global gathering ministers to determine road safety agenda 2030 targeting to halving the total number of road injuries and death cases (WHO, 2021).

In response to the Sustainable Development Goals (SDGs) agenda for targeting to reduce half of the number of road injuries and death in Malaysia, the Eleventh Malaysia Plan (2016-2020) has added the road safety strategy in *"Chapter Three; Improving Wellbeing for All"*. The key results in the year of 2016- 2017 have shown a slightly reduce in road fatalities index from 2.59 to 2.34 although the number of accident cases from 7152 to 6740 are still considered to be high as compared to other countries. In the mid-term of the plan reviewing period, it is stated that the reduction of accidents cases is due to the improvement of road at black spotted areas, road safety education, and the shortened emergency response time from 20 minutes in 2015 to 14.5 minutes in 2017 (Economic Planning Unit, 2020). However, having a more comprehensive statistical road fatalities data from 2016 to 2020 to obtain accurate road fatalities pattern within the 5-year plans will be beneficial in resolving the issue.

The strengthening of children protection and wellbeing agenda continues to be highlighted as the development of programmes to separate children from crimes or injuries and be given priority in the latest Twelfth Malaysia Plan (2021-2025) (Economic Planning Unit, 2021). In addition to this, the government's next recommendation is to have an effective urban planning model that encourage green mobility. The aim is to reduce congestion in urban area and the focus were on public transport, walking, cycling or the use of environmental-friendly vehicles. In relation to the research topic, currently most of parents are hesitant to allow their children walk to school because of traffic congestion near schools, road crashes, as well as other safety issues such as criminal activity, and a lack of safety measures that make them feel their children is unsafe walking or cycling alone on the road. A new approach of green mobility is expected to promote children to free walking or cycling where this could help reduce the volume of traffic to school in the future. However, safety measures must be seriously considered as to ensure the children are at utmost safest condition. In a research of the safe city programme, Lim et al. (2020) stated that

safety measures in all aspects must be thoroughly reviewed in all environments. A comprehensive plan for a safe environment especially for school children practices active mobility to school should be strategized.

Understanding the Safety Measures in Daily School Operations

Safety measures should be made aware to children at the very young age, and they must be continuously educated parallel to the present safety issues in preparing them to be alert at any situations. School safety anticipates the students to feel free, either physically, emotionally, or psychologically (Tabancali & Bektas, 2009). Not only to the school children, the drivers too, should also be educated with the safety measures aspects, especially when driving involve the road near the school.

Safety measures are not limited to providing good road condition or the availability of road infrastructure, but it needs to extend to the understanding theory that the children had small physical size, particularly primary school age children which make it difficult for the drivers to see them. The children also tend to be active and inexperienced in making prompt responses in risky situations and more inclined to make errors in their decision making (Yue, 2018). With the numerous accident cases involving school-aged children, in addition to the lack of assurance regarding the safety of the children walking to school among parents, thus the use of motorised vehicle is seen as the most viable option. A study on mobility choices to school reported that more than 60% of parents choose to send their children to school by own motorised vehicle (Yusoff et al., 2017). The percentage appears to be steadily rising, making school a high-risk location for accidents.

According to the Clinical Research Centre Malaysia, 1 in 3 primary school students were dropped off and picked up in a dangerous manner (The Borneopost, 2018). Some of the parents quickly drop and went off while the children are crossing the road. Even though awareness is an important element, the safety component should also be regulated and made a priority matter of safety parameters in a school planning guideline (Zhu & Lee, 2008). Schools that are located near major road are presumed to be at the highest risk for accident cases due to the road connectivity allowing the motorised vehicle to reach other junctions easily. There should be a limit number for each road to be linked especially near the school area. The common issues to be undertake for school safety measure are the increase off-site parking cars, the drop-off cars, and the public road user. The traffic volume at the roads around the schools is inevitably higher than any public spaces which makes it difficult to control. The demand of mobility and accessibility nowadays often sees as parallel to urban growth rate and effect to road efficiency (Abd Rahman et al., 2018).

Malaysia School Planning Guidelines

In Malaysia, school planning guidelines is classified under amenities, and it is falls under the responsibility of PLANMalaysia or previously known as the Town and Country Planning Department. The decision to develop a new school is made by the District Education Office (DEO), the State Education Department (SED), and the Ministry of Education Malaysia (MoE) where all of them are involved in the procedures at the earlier stage. When a school is overcrowded with pupils and surpassed the allowance number, the school management will send a report to the DEO. Then, a meeting will be held to discuss the issue together with the SED before sending over to the MoE for a consideration and approval allotment. If agreed, the next process would be handled by the PLANMalaysia and local authority for the area identification and implementation following the school planning guidelines.

The guidelines are divided into two sections, the first of which outlines broad requirements and the second of which focuses on specific restrictions. The extracted points in table 1 are from the public daily school category. Eleven elements were identified as the most relevant to safety measures and the requirement for each primary and secondary schools were similar with the exception to the walking distance. The first important point to be highlighted in this research is the school coverage area. The limits of school coverage area indicate the allowable number of children in each class. This guideline was strictly applied, to ensure that the school is not overcrowded, and it can be easy controlled by the school management. Overcrowded school will also affect to the road congestion during peak hours.

Next is to study the school location by comparing the school planning guideline with the current implementation. According to the guidelines, a school is required to be placed at acceptable walking distance and it should be in the range of 400m to 800m for the primary school; while 800m to 1600m for the secondary school. The guidelines were designed with the intention to encourage children to walk or cycle to school and this is in line with the government policy, to promote a healthy lifestyle. Moreover, students who practise active mobility will benefit to a healthy body and could also prevent from being obese (Yusoff et al., 2017). Therefore, other than the school coverage area and mobility analysis, the proximity distance between houses and school is also part of safety measures, and this will be the main research focus.

Table 1 shows the criteria related to safety measures that were summarized from the school planning guidelines and interview with the officer of PLANMalaysia.

Table 1: Safety measures of school planning guidelines

School Planning Guidelines	Primary School	Secondary School
Coverage from the total number of populations	10% Category A:45/class Category B:35/class	13% Category A:45/class Category B:35/class
Located at walking distance	400m to 800m	800m to 1600m
Located at conducive area, far from noise of industry, airport, highway	Not mentioning the req. of buffer zone	Not mentioning the req. of buffer zone
Located separately to the high rise residential/flat houses but closer to school	No specific minimum of distance	No specific minimum of distance
Crime Prevention Through Environmental Design (CPTED) based design	No specific items and measurement	No specific items and measurement
Safety environment	Avoid form crime hotspot	Avoid form crime hotspot
Safe connectivity road	Near collector road and avoid direct access from major road	Near collector road and avoid direct access from major road
Near to public transport; bus/LRT	No specific distance	No specific distance
Providing a drop off and pick up point	Separate lane/road	Separate lane/road
No school located near front/main road	Specific category of road (major/collector/arterial)	Specific category of road (major/collector/arterial)
No school located at risky area such as flood flash area, landslide, high volume of electricity cable	Avoid from steep slope ≥25°	Avoid from steep slope ≥25°

Source: PLANMalaysia (2018)

Aim and Objectives

The research aim is to study the mobility and proximity effects to heavy traffic flow around school during peak time. Three objectives were laid out that are:

i.   To identify the safety elements in school planning guidelines and the practices among the selected school

ii. To analyse the mobility mode to school for primary and secondary school children

iii. To explore the relationship between the mobility mode choice with proximity factor.

The Study Area

The study area is in Johor Bahru district, Malaysia located at coordinate $1^0 29'00''N\ 103^0 44'00''E$, consisting of sub-district Plentong, Pulai and Tebrau. Six schools were selected with three secondary schools which are SMK Bandar Baru Uda, SMK Sri Rahmat and SMK Taman Daya. The remaining three schools are the primary school namely SK Kompleks Uda, SK Taman Bukit Mewah and SK Taman Daya 2. These schools were selected because of its location that is near of major road and have direct access. Table 2 shows the calculation of the total sample number.

Table 2: Total number of samples for each school

No	School's Name	Number of Students (N)	Sample size $1+N\,(0.01)$	$\dfrac{N}{1+N\,(0.01)}$	Sample Number
1	SMK BBU	1959	20.59	95.143	95
2	SMK Sri Rahmat	1901	20.01	95.002	95
3	SMK Taman Daya	1437	15.37	93.363	93
4	SK Kompleks Uda	1090	11.9	91.596	92
5	SK Taman Bkt Mewah	681	7.81	87.195	87
6	SK Taman Daya 2	1008	11.08	90.974	91
	Total				**553**

DATA AND METHODOLOGY

This research employs the quantitative methods for the statistical analysis that will involve the mobility studies. This phase begins with the interviews and distribution of questionnaires at six schools. The total of respondents involved are 553 school-aged children with 270 respondents are from the primary school and 283 are from the secondary school. Specific questions about safety measures and children background were also structured. Next phase is the study on the coverage and proximity using the GIS. The data were gained from a series of topographic Johor Bahru map that was obtained from the Department of Surveying and Mapping Malaysia or *Jabatan Ukur dan Pemetaan Malaysia* (JUPEM). Buffering analysis was employed to check the school coverage area and house distribution. Finally, the results are discussed in phase four. Figure 1 shows the overall research methodology.
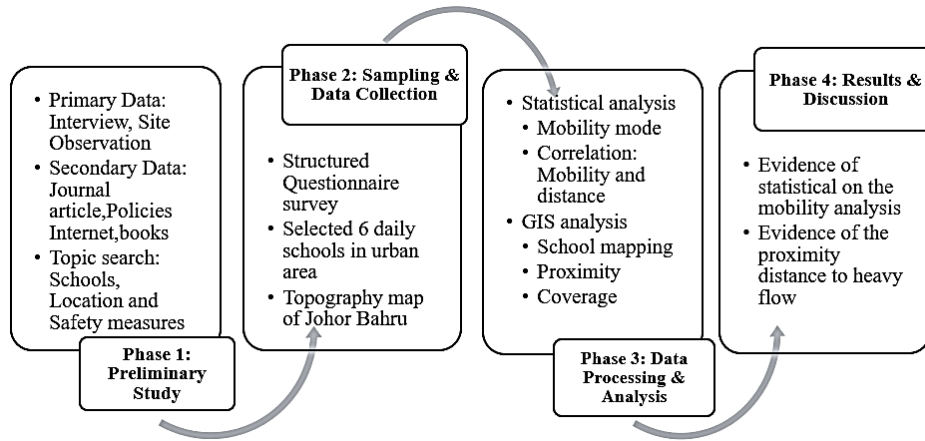
Figure 1: Research methodology

RESEARCH FINDINGS

This section discusses the findings from the mobility, proximity, and the coefficient correlation analysis as the main caused to the congested problem around school.

Mobility Mode Analysis

The mobility to school pattern graph in figure 2 clearly shown that all schools had similar pattern. Motorised vehicles are the most favoured mode of transport, while walking and cycling were the least favoured choice in mobility mode although the location between houses is within walking distance. This proved that distance is not necessarily the key factor in choosing mobility mode to school. From the graph, 42.8% respondents are sent to school with parents' vehicle, 36.5% respondents riding the school bus, 18.8% respondents are walking, and 0.02% respondents are riding bicycle to school. This result signifies that the total of 439 respondents or 79.4% of respondents uses motorised vehicles on daily basis even though the distance to school is within walking distance.
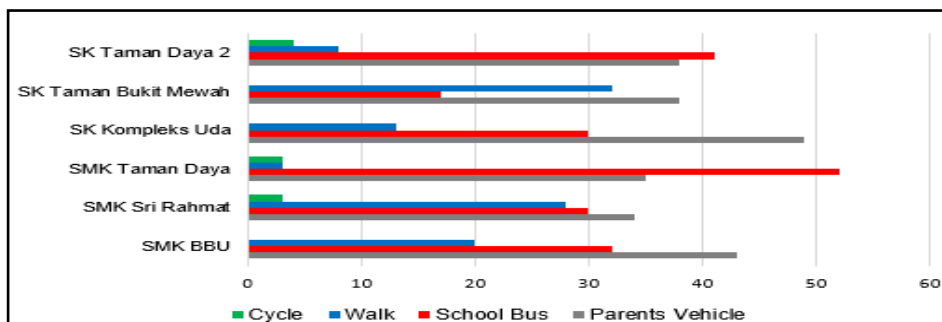

Figure 2: Mobility mode analysis

Mobility Mode and Distance Cross Tabulation Analysis

This analysis is to identify the individual percentage between the mobility mode used and distance from house to school. Table 4 shows the results by each individual. The percentage (%) in the column of within distance is the percentage value of a distance categorized by mobility mode, while the percentage (%) within mobility mode is the percentage value for each category of mobility mode used. From the analysis, 39.8% of school children live at 1600m from school. Within the distance, 50% of the students use parent's vehicle and 36.4% travel by bus. The chosen of motorised vehicle is as expected, because the distance is beyond the acceptable walking distance, and it is not safe. At the distance of 400m from the school, it was tabulated that 21% children lived here. The distance is the shortest from the school and it had been clarified as a suitable walking distance. Surprisingly, 37.9% children sent to school by parent's vehicle. These results proved that, even for a short distance, motorised vehicles are still preferred by parents.

Table 4: Mobility mode and distance cross tabulation

Distance		Mobility mode (%)				Total (%)
		Bus	Parents Vehicle	Walk	Cycle	
<400m	%within Distance	25.0	37.9	37.1	0.0	21.0
	%within Mobility Mode	14.3	18.6	41.0	0.0	
<800m	%within Distance	53.3	23.3	23.3	0.0	5.4
	%within Mobility Mode	7.9	3.0	6.7	0.0	
<1200m	%within Distance	40.3	34.9	20.9	3.9	23.3
	%within Mobility Mode	25.6	19.1	25.7	55.6	
<1600m	%within Distance	44.8	51.7	3.4	0.0	10.5
	%within Mobility Mode	12.8	12.7	1.9	0.0	
≥1600m	%within Distance	36.4	50.0	11.8	1.8	39.8
	%within Mobility Mode	39.4	46.6	24.8	44.4	

School Coverage and Proximity Analysis

The school coverage analysis was carried out to study the admission of students in each school. This analysis is to look at the practises by the school management whether the admission to the school is followed the rules as stated in the guidelines. Figure 3 shows the number of respondents and the distance to school location.

As shown in Figure 3, almost all respondents are within radius distance suggested by the planning guidelines with only minimal cases that the school management must accept with strong justifications from parents or legal guardians. 2 cases or 0.004% from secondary school are from Taman Cempaka and Taman Dahlia respectively, which are outside the radius distance in the planning guidelines. While for the primary school, only 1 case or 0.002% from Taman Munsyi with similar situation to the cases in the secondary school.
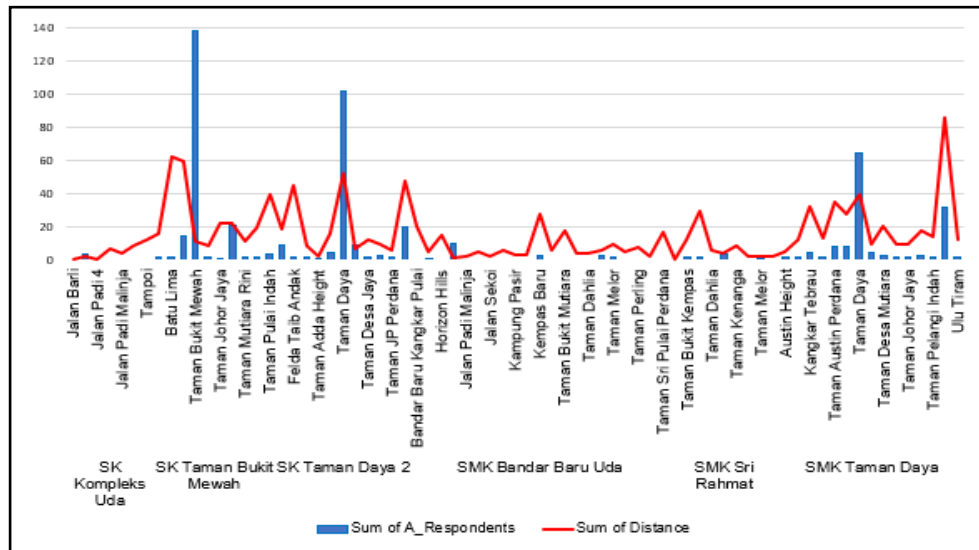
Figure 3: Number of respondents and distance to school location

Next analysis is the proximity analysis calculation from the map using GIS. Each of the schools was mapped and buffered by the maximum of 800 meter for the primary school and 1600 meter for the secondary school. The route names were extracted from the map where the school children are also using it. Analysis shows that two secondary schools; SMK BBU, SMK Taman Daya and one primary school; SK Taman Daya 2 are in good coverage of walking distance. Other school's route shows that 1 out of three is not in acceptable walking distance.

Figure 4 shows the school location, chosen routes by children and the proximity distance compared to the acceptable walking distance.
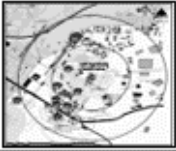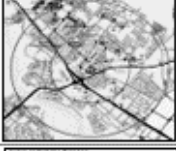
Name of School	Proximity Max of 800m-primary & 1600 m- secondary	Route	Distance to School (Meter)	Compared to Acceptable Walking Distance
SMK BBU		Jalan Padi Ria 18	1148m	√
		Jalan Padi Malinja 1	1076m	√
		Jalan Mahsuri 2	688m	√
SMK Sri Rahmat		Taman Cempaka	1806m	x
		Taman Dahlia	1979m	x
		Taman Kenanga	901m	√
SMK Taman Daya		Jalan Rumbia 39	362m	√
		Jalan Rumbia 18	550m	√
		Jalan Nibong 20	947m	√
SK Kompleks Uda		Jalan Susur Barli	979m	x
		Jalan Barli 1	950m	x
		Jalan Padi 4	307m	√
SK Taman Bukit Mewah		15C Flats	1252m	x
		Taman Munsyi Ibrahim	708m	x
		Jalan Mewah Ria 3/8	466m	√
SK Taman Daya 2		Taman Delima 2	382m	√
		Taman Delima	540m	√
		Jalan Nipah 8	646m	√

Figure 4: School, housing location and acceptable walking distance

Correlation Coefficient of Mobility Mode and the Proximity Factor
The correlation results present the number of sampling size, where r is the correlation coefficient sign, (2-tailed) is the significant level, and α of mobility mode when the distance changes. The value of correlation coefficient, r was -0.50, which suggests that there is a negative relationship between distance and mobility mode choice because -0.05 is approaching 0. However, the relationship was very weak considering that -0.05 is approaching 0. The significant level was 0.25, which is bigger than 0.05, this means that the significant level falls outside the critical region. H_o is not rejected as it is proved that there is no significant relationship between distance and mobility factor. This signifies that the choice

of mobility mode is not affected by the distance from house to school.

The setting of school location to be near the houses is to encourage the students to walk to school is implied to be not relevant in this case. From the interview with school children and parents, the road condition and safety are the main factors for not choosing to walk or cycle to school. Poor road safety aspects were the main setback that made walking to school impractical and unreliable. Fear of road accidents, congested roads, and insufficient road facilities are the main reasons walking is not favoured as a mobility mode. These aspects should be highlighted by the related authorities, in ensuring that the safety of children is thoroughly covered. Table 5 shows the correlation result.

Table 5: Correlation result for mobility mode and distance factor

		Distance	**Mobility Mode**
Mobility Mode	Pearson Correlation	1	-0.05
	Sig. (2-tailed)		0.25
	N	553	553
Distance	Pearson Correlation	-0.05	1
	Sig. (2-tailed)	0.25	
	N	553	553

CONCLUSION

Accepting students to school is normally based on the school coverage area that involves two or three neighbouring residential districts. A new residential development project might add demands to the existing school's capacity not only to the increased number of children per classroom, but to the road traffic around the school as well. This research has presented that the choices of mobility mode are overwhelmed by parents' motorised vehicle albeit the house is within walking distance. Active mobility seems to be ignored by the public as the fear of crime on the road are still the main concern and made walking, and cycling were less popular among school children. The correlation coefficient analysis also proved that the result showed a negative relationship between mobility and proximity distance to school. Insufficient road safety aspects made the routes to school risky to road accidents. This has led to parents reckons that walking to school is dangerous and willing to send their children with own vehicle or use the school bus. The research has provided evidence to the practices of mobility, proximity distance and coverage of daily school operations and all these aspects have also been highlighted in the school planning guidelines. What is lacking here is the public confidence on the safety measures of the routes to school, thus contributed to the heavy traffic flow around the school.

ACKNOWLEDGEMENTS

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USER PERCEPTION OF NATURAL VENTILATION STRATEGY AT INPATIENT WARD, KUALA KANGSAR HOSPITAL

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Abstract

Hospitals and healthcare facilities are known to be among the most energy-intensive buildings. This concern has resulted in a resurgence of sustainability awareness in the built environment. Nowadays, many have adopted environmental strategies such as natural ventilation. It offers a low-cost alternative to remove stale air and replace fresh air efficiently through cross ventilation. Studies have shown that natural ventilation is one of the most energy-efficient solutions to improve thermal comfort and hospitals and healthcare facilities will greatly benefit from this initiative. Passive Design has been valued as a key strategy in controlling airborne infection, especially in hospital wards with limited resources. Comparatively, the installation of ceiling-mounted mechanical fans will create a negative ventilation pressure difference. This paper explores the potential of the passive design method based on the experience of inpatient ward users. The study utilised questionnaires based on the end user's experience in a naturally ventilated inpatient ward area. The survey administration method ensures the 51 respondents' anonymity is preserved especially in a healthcare setting. This investigation shows that natural ventilation provides a higher ventilation rate and is more energy-efficient than mechanical ventilation. Therefore, natural ventilation is a suitable solution in public buildings such as hospitals' inpatient wards. The outcome of this study will be paramount for designers to meet passive design objectives. Consequently, these will be the guidelines and outline information for hospital design in the future.

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INTRODUCTION

In 2021 Malaysia has allocated a sizable RM31.9 billion budget for the healthcare sector, a slight increase of RM30.6 billion from the previous year. The building sector is the sector that is responsible for the use of energy for high operational purposes. From 2005 to 2010, the trend for energy consumption in buildings in Malaysia increased by 34%. Public hospital buildings are among the buildings that utilise high energy levels (Ab. Azis et al., 2019). Hospitals and healthcare facilities are among the most energy-intensive buildings in Malaysia and are currently facing a more significant challenge due to the Covid-19 pandemic. Operating non-stop 24 hours a day, hospitals and healthcare facilities consume extensive energy sources from medical equipment, lighting, heating, ventilation and air condition (HVAC), sterilisation and others. This paper explores the potential of using natural ventilation to improve energy efficiency at inpatient wards in Kuala Kangsar Hospital. Several studies have shown that HVAC contributes 40% to 65% of the energy bill (Ahmad Ludin et al., 2020); therefore, the passive design method is believed to help in cost reduction. Natural ventilation utilises natural forces such as pressure and thermal differences to move air to pass through the building. Although this natural ventilation offers a low-cost alternative, it is efficient as it eliminates polluted air quickly compared to mechanical ventilation.

The World Health Organization (WHO) has created a comprehensive guideline concerning natural ventilation in hospitals and healthcare facilities. For instance, some of the selected health treatment facilities are mandatory to use natural ventilation. Natural ventilation has a higher ventilation rate than mechanical ventilation, therefore an effective tool for reducing the cross-infection risk of airborne diseases in hospitals. Control of these airborne infections should be maximised in health facilities with limited resources (Qian et al., 2010). A review of the literature found that the guidelines on this design explain that the general hospital's design criteria are necessary and the importance of having natural ventilation is vital (Escombe et al., 2019). So, designers need to understand the factors that can influence the performance on energy efficiency for this natural ventilation and subsequently plan better against it. Disease control and energy efficiency for natural ventilation will be realised if the designers understand the scenarios that occur in the hospital (Morgenstern et al., 2016).

Some may argue that the pattern of air movement from natural ventilation is difficult to predict and unreliable. Many studies have been conducted to understand the movement of ventilation in hospitals. These include aspects related to the design and performance of ventilation systems in hospitals for treatment through simulation. However, the simulation study results did not consider additional factors obtained at the actual study site, such as openings or windows design, mechanical fans, and user experience in the interior that can affect the ventilation pattern (Jamshidi et al., 2019). Therefore, only a handful of

studies have been evaluated concerning natural ventilation performance in actual hospitals. Todd et al. (2014) state that high natural ventilation rates will be achieved in isolation chambers and exhaust fan installations. It will produce sufficient negative pressure when the force of air production from the environment is not strong enough. Meanwhile, a study by Maraqa et al. (2016) also found that the openings from windows and doors only produce moderate natural ventilation of 28 ACH (Air Changes per Hour). Therefore, the objective of this study is to obtain data from users who use the space through the experience they feel about this natural ventilation.

NATURAL VENTILATION
According to the technological point of view, natural ventilation can be classified into two: a simple ventilation system and a high-tech natural ventilation system. A simple ventilation system is operated by circulating fresh air naturally into the building. On the other hand, a high-tech natural ventilation system is operated by a computer and assisted by a mechanical ventilation system (Ahmad Ludin et al., 2020). Natural ventilation with a mechanical system is known as hybrid ventilation or mixed mode. In general, natural ventilation holds several advantages compared to mechanical ventilation, such as higher air exchange rate or ventilation rate and low-cost operation. This design for natural ventilation will provide a way for airflow in the interior, but it can also have a detrimental effect on the spread of fire and smoke that flows in the event of a fire in the building (Ab Ghani & Aripin, 2018).

Furthermore, due to the passive operation of natural ventilation, it can provide a high ventilation rate more economically (Escombe et al., 2019). Although the air change rate can be unreliable and not substantial, thorough planning in the design stage will maximise natural ventilation potential. Hospitals and healthcare facilities utilise massive energy to operate; therefore, natural ventilation is one of the passive design strategies that can help to reduce operational cost by maximising air change rate and efficiency. Moreover, planning for natural ventilation at an early design stage will reduce the maintenance cost of space cooling and thus, energy efficiency will be achieved (Palm & Kokko, 2018). Moreover, natural ventilation can result in energy consumption to be more efficient, especially if the façade of the hospital building has large openings and no additional heating is not required. Finally, well-planned natural ventilation will be able to be used to access higher levels of daylighting.

Natural ventilation is known for its capacity to minimise the risk of cross-infection of airborne disease in hospitals. Airborne infections are among the diseases experienced by all countries around the world, including Malaysia. Some examples of airborne diseases are common cold, chickenpox, measles, influenza, tuberculosis, and pertussis. But in 2019, the world was shocked by the

new strain of the virus, coronavirus or Covid-19. Although Covid-19 is not generally considered to be an airborne disease, the symptoms are almost identical to such diseases. Before the Covid-19, several studies have shown a decline in the global prevalence of mortality rate, but this number is increasing, especially in the Southeast Asian region. Airborne transmission of the disease is very high risk because anyone can contract the disease (Peavey, 2015). Thus, the World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC). CDC informed that these infections can be minimised and has recommended guidelines for infection control with three levels of control, namely administrative control, environmental control and personal respiratory protection. Natural ventilation has been shown to minimise the risk of airborne infection. Historically,100 years ago, tuberculosis disease was treated outdoors and might be more effective than indoor settings. Furthermore, during the SARS outbreak in 2004, a large opening in hospitals and healthcare facilities was utilised to reduce the risk of infection among healthcare workers. Natural ventilation has also been performed efficiently by diluting airborne pollutants such as airborne infectious pathogens (Qian et al., 2010).

STUDIES ON THE ENERGY EFFICIENCY OF HOSPITAL BUILDINGS
The hospital building, a type of commercial building, has gained much interest from researchers to research it. Various strategies and approaches have been taken to implement energy efficiency in this hospital building because it operates 24 hours a day non-stop and uses high energy (Table 1). Strategic approaches and techniques are implemented, such as heating system improvement, ventilation use, air conditioning (HVAC), electricity use, central heating, refrigeration equipment, energy management control, thermal energy storage (TES), heat recovery, and water management (Khakzand, 2018). The same goes for financial schemes or policies/regulations. For example, the Kuala Kangsar Hospital is considered a semi-specialist hospital. Even though the 4-storeys inpatient ward in this hospital is naturally ventilated, the estimated energy consumption is over 2,000,000 kWh per month (Perak, 2020). Here we can see the magnitude of energy consumption in a district hospital; comparatively, the number will be astronomically higher at a premier or specialist hospital. For instance, a public hospital near Kuala Lumpur consume 4,000,000 kWh per month which is equivalent to RM 1.5 million in electricity bill (Ahmad Ludin et al., 2020). However, very few research have used approaches to natural ventilation that do not involve high costs. Therefore, the emphasis on energy efficiency in the hospital building is studied from the natural ventilation aspect, especially in the ward building, which is the heart of the building.

Table 1: Approaches and strategies for energy efficiency in hospital buildings

Year	Location	Strategy	Author
2010	Malaysia	using a high-efficiency mechanical system using a variable speed drive	Saidur, Hasanuzzaman, Yogeswaran, Mohammed, & Hossain
2016	Egypt	Application of protection from the sun, the use of window glazing, airtightness and insulation on the facade of the hospital building	Radwan, Hanafy, Elhelw, & El-Sayed
2016	China	Emphasis on policymakers on projects, technical and operational procedures aimed at improving energy efficiency	Wang, Li, Liao, & Fang
2017	China	Using a web-based online control system for chiller plant use	Ma, Zhao, Shen, & Liu
2018	Italy	Use of simulation - Using hydraulic gaskets to produce and install rotating windows and LED systems for energy saving	Silenzi, Priarone, & Fossa
2019	Spain	Perform proper maintenance by increasing the time to reduce energy consumption	García-sanz-calcedo
2019	India	The use of lot (application of light consumption) for modification of hospital building infrastructure	Reddy, Sandbhor, & Dabir
2020	Malaysia	Reduce electrical consumption so that energy efficiency is achieved	Ahmad Ludin et al.

Source: Jamaludin Muhamad (2021)

METHODOLOGY

The first modern Kuala Kangsar Hospital was built on a 22-acre land in 1993, replacing the old hospital established during the 1890's era. This hospital is identified as a semi-specialist hospital, and the inpatient ward consists of a naturally ventilated 4-storey building. The windows in this hospital building are of the adjustable glass louvers window type. The respondents comprised of patients and staff working in the adult inpatient ward of Kuala Kangsar Hospital (Photo 1). A total of 51 respondents of 20 males and 31 females aged 18 and above were involved in this questionnaire inpatient ward (Photo 2). This questionnaire was constructed from the literature of previous studies as shown in Table 2 (see results and discussion section). The questionnaire encapsulates the importance of the placement of natural ventilation, the mechanism to control natural ventilation, the importance of natural ventilation, natural ventilation on

work performance, benefits and location of natural ventilation. This method has effectively measured preferences, therefore providing standardised stimulus to the respondents and eliminating bias. Their responses were documented and analysed using Statistical Package for Social Sciences (SPSS) program. This study highlights the potential of natural ventilation as a passive cooling strategy and energy efficiency in hospital design. The research framework delineates the objectives, data collection methodology, data analysis and research outcomes are shown in Figure 1. This section also outlines the flow of data collection on users' experience of natural ventilation in the indoor space of the selected wards. This case study was selected as it coincides with the scope and parameters of the objectives. The decision was also bound by the strict limitations set by the Malaysian Ministry of Health.

Photo 1: Kuala Kangsar Hospital
Source: Jamaludin Muhamad (2021)

Photo 2: Inpatient (ward) Kuala Kangsar Hospital
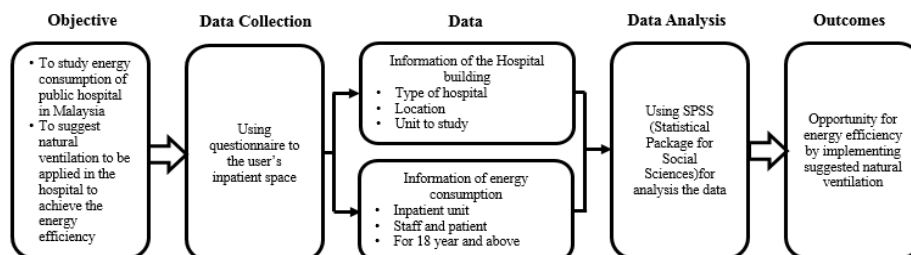*Source: Jamaludin Muhamad (2021)*

Figure 1: Research framework design
Source: Jamaludin Muhamad (2021)

RESULTS AND DISCUSSION

User experience was gauged through the questionnaire that was based on the six dimensions of natural ventilation strategies as listed in Table 2.

Table 2: Questionnaire construction from previous literature reviews

No	Questions	Source
1	The importance of the placement of natural ventilation	Monodraught, (2013)
2	The mechanism to control natural ventilation	Escombe et al., (2019)
3	The importance of natural ventilation	Maraqa et al., (2016)
4	Natural ventilation on work performance	Omrany, (2016)
5	The benefits of natural ventilation	Totaforti, (2018)
6	Location influences the natural ventilation	Ang & Clements-Croome, (2013)

STRATEGIC PLACEMENT OF NATURAL VENTILATION

Hospitals and healthcare facilities are usually built with a more stringent building code. Even though this hospital was completed in 1993, almost three decades ago, we can witness that the openings and windows were properly planned and designed. Strategic placement of natural ventilation will provide optimum ventilation rate to clients in the hospital, especially in the ward space. If full attention is not given to natural ventilation, it is feared that the potential for infection may occur.

Fifty-one respondents have submitted their response on proper planning and placement of casement windows are vital to achieving good natural ventilation in the inpatient ward of Kuala Kangsar Hospital. It was found that 55% agreed with the statement, and 29% strongly agreed that the windows are strategically located for optimum natural ventilation. 12% voted for neutral, and 2% each voted to disagree and strongly disagree (Figure 2).
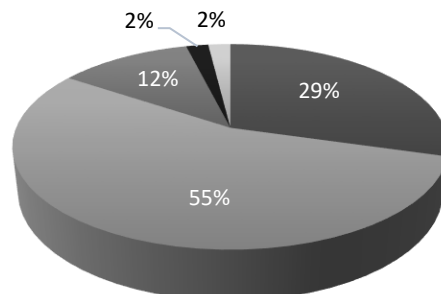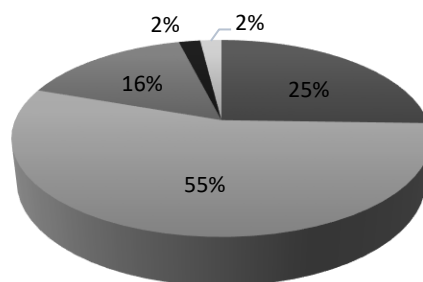
■Strongly Agree ■Agree ■Neutral ■Disagree ■Strongly Disagree

Figure 2: Strategic placement of natural ventilation
Source: Jamaludin Muhamad (2021)

MECHANISM TO CONTROL NATURAL VENTILATION

Natural ventilation relies on passive cooling strategies. In this ward, the mechanism to control ventilation rate is performed manually by regulating the opening of the casement windows. Operable windows are essential to allow fresh air circulation into the building. It can not only control the disease from being contagious but can also contribute to energy efficiency. 55% of 51 respondents agreed, and 25% strongly agreed that they could control the openings for the reception of natural ventilation in the hospital ward space. On the other hand, 16% of respondents chose a neutral stance, and 2% disagreed and strongly disagreed with the statement that the openings for the reception of natural ventilation can be controlled (Figure 3).

■Strongly Agree ■Agree ■Neutral

Figure 3: Mechanism to control natural ventilation
Source: Jamaludin Muhamad (2021)

IMPORTANCE OF NATURAL VENTILATION

Natural ventilation is essential to the respondents in the ward space. Regular fresh air cycle into the ward space will help to give a sense of connection to the natural setting, thus aiding the process of healing. Therefore, 49% of respondents agreed, and 29% strongly agreed that natural ventilation is important, especially in the

ward environment. Furthermore, 20% of respondents chose to be neutral, and only 2% of 51 respondents disagreed with the importance of natural ventilation (Figure 4).
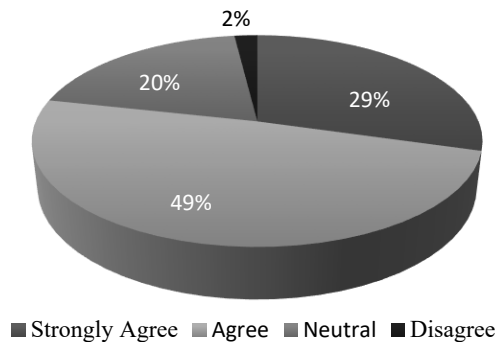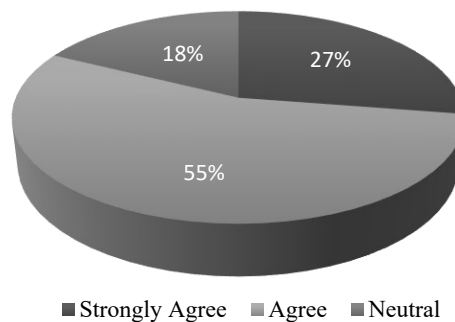

Figure 4: Importance of natural ventilation
Source: Jamaludin Muhamad (2021)

NATURAL VENTILATION INCREASES PRODUCTIVITY

Hospitals and healthcare facilities are operating 24 hours daily and this could lead to a stressful environment with all the swarming tasks faced by the workers. However, there is no refuting that natural ventilation benefits the users in hospital wards. 55% of respondents agreed, and 27% strongly agreed that good natural ventilation would increase productivity and work performance. At the same time, 18% of respondents chose to be neutral about the role of natural ventilation as a contributing factor for better productivity (Figure 5).


Figure 5: Natural ventilation increase productivity
Source: Jamaludin Muhamad (2021)

THE BENEFITS OF NATURAL VENTILATION

In addition, this natural ventilation is also very important and benefits the users of the ward space. The study has shown that 49% of respondents agreed, and 35% strongly agreed that natural ventilation is beneficial. On the other hand, only 12%
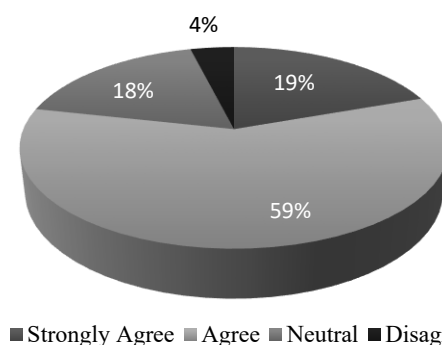
chose neutral, and 4% did not agree that natural ventilation is somewhat beneficial to them (Figure 6).
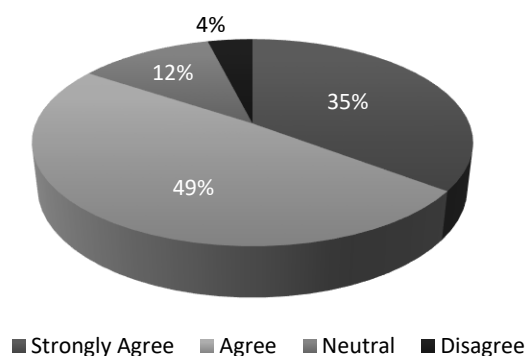
Figure 6: Benefit natural ventilation
Source: Jamaludin Muhamad (2021)

LOCATION INFLUENCES THE NATURAL VENTILATION

In the hospital and healthcare setting, there are two main categories which are the staff and patients. The staff will carry out their duties while patients are generally in their beds. Therefore, the location of individuals carrying out activities in the ward space influences the reception of natural ventilation. The staff in this ward space provide treatment to patients and work in the workstation provided. As for the patients, they seek treatment in bed to restore their health. Thus, this study found that 59% of the respondents agreed, and 19% strongly agreed with the statement (Figure 7).

Figure 7: Location influences the natural ventilation
Source: Jamaludin Muhamad (2021)

While 18% are neutral and only 4% do not agree that the presence of a person in a location will influence him to receive this natural ventilation to carry out activities (Figure 7).

CONCLUSION

Based on the potential for energy efficiency, it is recommended that these six natural ventilation strategies be used as a guide in public hospitals in Malaysia. The data obtained shows the importance of natural ventilation to consumers, and at the same time, the use of energy in the ward space is more efficient and effective. Therefore, public hospitals must implement this natural ventilation that can curb the spread of disease and supply fresh air to the users, thereby increasing health. The results have shown that most respondents agreed on the potential of natural ventilation and the application of passive design strategies will help to increase energy efficiency in hospitals and healthcare facilities. Based on the six strategies addressed, natural ventilation is technically advantageous and beneficial in the healing process. Their opinions regarding assessing natural ventilation in the actual ward are crucial in complementing the ventilation performance and simulation-oriented research. Thus, it will be an essential tool to improve the overall experience. However, some new energy-saving technologies might be incompatible with the existing building and require high initial costs. Passive cooling offers a low-cost solution, and some hospitals might require minor architectural interventions to get the optimal benefits of natural ventilation. It will be a positive change to raise awareness of passive design for energy efficiency and consequently to improve the public image of hospitals and healthcare facilities in Malaysia.

ACKNOWLEDGEMENTS

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EVALUATING DETERMINANTS OF PROPERTY TAX REASSESSMENT: MALAYSIAN PRACTITIONERS' PRELIMINARY OBSERVATIONS

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Abstract

Property tax plays an essential role in funding local government overheads to provide basic services for residents. However, too little research has stressed the importance of property tax assessment quality, especially in terms of reassessment. The absence of a regular and frequent reassessment process leads to distortions in tax payments, lower revenue generation, and a higher risk of significant increases in tax liability. A preliminary survey was conducted to unpack the determinants of property tax reassessment to address this issue. Survey data from 37 officers revealed that nine of the identified determinants have a significant and positive impact on the successful implementation of property tax reassessment in Malaysia, with staff capacity an essential aspect. The neighbouring municipality influence appears to play a less impactful role. These findings highlight the success factors in conducting property tax reassessment activity, which would assist the long-term success of local authorities. Despite the importance of property tax implementation for the local authorities, this research suggests that organisations should also ensure the quality of property tax and its frequent reassessment to enhance overall performance.

Keyword: Property tax, property tax reassessment, assessment quality, local authorities

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INTRODUCTION

The urban population has been undergoing rapid and extraordinary economic development over recent decades. This has forced the government to provide adequate public services, such as housing, electricity, water supply, health care, education, and jobs (Ashmat, 2016). As government organisations, the local authorities' role is essential in addressing the basic needs of all communities. The Local Government Act 1976 (Act 171) specified that each local authority has control over and responsibility for all locations within its area for a public purpose. The Act further granted local authorities the right to impose rates on all properties within its boundary, with the state government's approval (section 127, Act 171). Rates, broadly known as property taxes, are tax levies imposed on personal property and contribute about 60% to local authority finances (Daud et al., 2013).

Although executing property tax is becoming an aim for all local authorities, their role in the policy is not always adequately understood. One key obstacle to executing property tax is periodic reassessment (Abd Rahman et al., 2021; Agnoletti et al., 2020; Ashmat, 2016; Daud et al., 2013; Piracha & Moore, 2016). Malaysia's property tax reassessment practices have recently revealed a hidden phenomenon, whereby most local authorities did not undertake any revaluation for almost 35 years (Abd Rahman et al., 2021). Previous evidence shows that an absence of frequent reassessment leads to distortions in tax payments, lower revenue generation, and greater risk of significant increases in tax liability (Bidanset et al., 2019; Hughes et al., 2020; Mccluskey, 1999; Stine, 2010).

Consequently, it is undoubtedly valuable to explore the success factors behind practising property tax reassessment to ensure local authorities undertake reassessment that follows a periodic cycle. Regular reassessment would contribute to a uniform property tax policy with substantial and heterogeneous impacts across different income groups and regions (Cao & Hu, 2016; Zhu & Dale-Johnson, 2020). Therefore, this research was conducted to ascertain the property tax reassessment determinants needed to address the uniformity issue.

LITERATURE REVIEW

This study differs considerably from the existing studies based on its contribution to the literature. Prior work has been limited to utilising a subset of property tax revaluation performance, leading to theoretical and evidence gaps. Most research in this area is in its early stages, and it is limited in exploring how property tax revaluation can be successfully implemented, rather than just highlighting its impacts on the quality of property tax assessment and performance (Kim et al., 2020; Ross & Mughan, 2018).

Besides, property tax collection arrears have been the most common theme for previous researchers, but too few studies have examined property tax

reassessment matters. As such, previous research in Malaysia has mainly discussed the issues of tax arrears, property tax non-compliance, property tax appeal procedure, and the general property tax performance of Malaysian local authorities (Ashmat, 2016; Atilola et al., 2017, 2019; Mohd et al., 2018; Sahari et al., 2020). This research trend is similar in other countries as collection, arrears, and tax compliance are observable priorities for many studies of overseas contexts, whereas the property tax reassessment is not (Carrillo et al., 2021; Jashari, 2020; Piracha & Moore, 2016).

A recent study in Malaysia highlights various impediments to property tax revaluation practices but only focuses on the internal aspect (Abd Rahman et al., 2021). The findings outline four main impediments: a lack of knowledge, the lack of a workforce, cost constraints, and time consumption. Similar conclusions were drawn in a recent literature report measuring the factors that influence property tax reassessment performance in New York State (NYS) in the context of policy diffusion and institutional differences (Eom et al., 2017; Kim et al., 2020). By contrast, NYS's nature of the laissez-faire policy orientation limits this research context, as pointed out in the research limitations. It was agreed that local governments operate in very different demographic, cultural and political environments. The study also used secondary data in its quantitative approach.

This paper proposed a preliminary overview of the property tax reassessment determinants by examining various internal and external characteristics. The proposed determinants were evaluated using a quantitative approach with a small-scale survey using primary data. This differs from previous research on property tax reassessment, which has used focus group discussion and secondary data.

Property Tax and Its Reassessment

The rates imposed by local authorities are represented by various terms across the world, such as "property tax", "assessment", or "rates". In Malaysia, property tax can be referred to as "rates", as stated in Part XV of Act 171. Nevertheless, the eminent term is "property tax", as applied in the United Kingdom (UK), which is the highest property-related tax in developed countries (Erdem, 2020).

On the other hand, in West Malaysia, a revaluation of all properties is conducted once every five years or within such an extended period determined by the state government (Section 137, Act 171). However, the provision varies between countries, as stated in their respective legislation. For example, some countries may revalue their properties every three to five years or annually. In contrast, several countries have no legal provision for a specific revaluation cycle. The reassessment cycle details of different countries are presented in Table 1.

Table 1: Property tax reassessment cycles in different countries

Reassessment cycle	Country	Sources
Annually	Netherlands, Singapore	Grover et al. (2017); Mccluskey (2018); Nyabwengi et al. (2020)
Every three years	Lesotho, New Zealand, Philippines, Hong Kong	Mccluskey (2018); Nyabwengi et al. (2020)
Every four years	Washington, South Africa, Thailand	Mccluskey, 2018; Propheter, 2016
Every five years	UK, Lithuania, Botswana, Jamaica, Pakistan, Malaysia	Abd Rahman et al. (2021); Erdem (2020); Grover et al. (2017); Mccluskey (2018); Nyabwengi et al. (2020)
Not specified	New York, Tanzania, Moldova, Brazil	Grover et al. (2017); Massawe (2020); Mccluskey (2018)

Determinants of Property Tax Reassessment

Despite the lack of discussion on the determinants of property tax reassessment performance, several authors have highlighted such factors in research on the different contexts of property tax issues. Generally, these factors can be divided into two main types, internal and external. A summary of the determinants is shown in Figure 1.
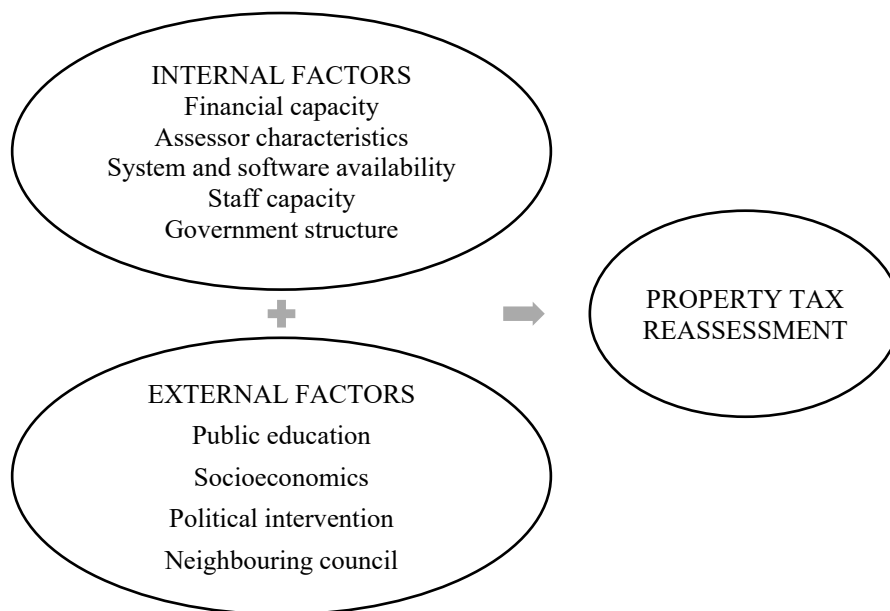
Figure 1: Determinants of property tax reassessment

From the literature synthesis, the factor acknowledged as the critical driver of property tax reassessment performance is the use of property systems and software. Applying a property system such as a Computer-Aided Mass Appraisal (CAMA) is crucial, especially during the valuation phase. Instead of conducting a physical inspection, using a system may facilitate the revaluation process and save time. This was supported by Nyabwengi and K'Akumu (2019), who agreed that an appropriate system would reduce the intervals between revaluation cycles. This finding was consistent with the study by Awasthi et al. (2020), which reported that using a system like CAMA offers many time-saving advantages when many properties need to be valued.

On the other hand, an inadequate number of skilled and qualified human actors in property tax assessment can become a significant impediment to the proper functioning of the property tax (Abd Rahman et al., 2021; Daud et al., 2013). A recent finding by Zulkifli et al. (2021) agreed that a lack of human resources was the main reason why reassessments failed to be completed. A shortage of resources generally forces the local authorities to outsource their reassessment works. Therefore, effective assessor characteristics such as in-house or outsourced services can make reassessment successful. Awasthi et al. (2020) agreed that outsourcing revaluation activities make the implementation more successful than internal resources. By contrast, Ross' (2012) finding showed greater property tax regressivity when the assessment was contracted out. Evaluating another aspect, Eom et al. (2017) claimed that appointed assessor characteristics significantly impacted property tax reassessment performance compared to the elected assessor.

Another relevant factor that affects the reassessment process is financial capacity (Mahieu et al., 2017). A recent study in Malaysia identified cost constraints as an impediment to performing property tax revaluation (Abd Rahman et al., 2021). Moreover, costs can be a significant obstacle that prevents local authorities from performing property tax reassessment (Mahieu et al., 2017) and smaller councils from performing to a higher standard. Other evidence has highlighted that administrative overheads are higher for councils in the lower tier (Andrews & Boyne, 2009). It can be concluded that more prominent local authorities representing all city-municipal councils prioritise property tax revaluation over smaller bodies. A finding on property tax revenue from Malaysia also indicates that property tax is more important for cities and municipal councils (Daud et al., 2013). The above discussion proves that the structure of governance influences reassessment activity since a large council performs better in its property tax collection than a smaller one.

In different circumstances, the performance of property tax reassessment can be successfully implemented with institutional (internal) support and external influence. The similarities in the findings suggest that external reasons such as public education (Brandt, 2014; Massawe, 2020),

socioeconomic factors (Eom et al., 2017), political issues (Eom et al., 2017; Mahieu et al., 2017; Mishra et al., 2020) and neighbouring municipalities' influence (Eom et al., 2017) may impact reassessment activities.

To conclude, very few studies exist on the factors contributing to property tax reassessment activity. The previous work can be divided into two main sub-fields: internal and external factors. The latter, such as socioeconomic conditions and political interference, is not easily controlled and lead to property tax uncertainty. Internal factors, however, are manageable and can be improved further to maintain high-quality property tax reassessment performance.

RESEARCH METHODOLOGY

A preliminary study was conducted due to a small set of surveys undertaken, as Fraser et al. (2018) explained in their pilot testing research. The research approach for this study consists of three main steps: (1) conduct the literature review, (2) undertake a survey, and (3) perform statistical analysis. The rationale for this deductive approach was based on the generalisability of the finding (Bougie & Sekaran, 2020). The survey questionnaire comprised two distinct sections: (1) demographics and (2) determinants. Part two of the questionnaire also involved an open-ended question about other determinants.

Survey Administration

The survey correspondence was conducted via electronic mail. Purposive sampling was used in collecting the required relevant information from the targeted population: the valuation and property management department employees of West Malaysian Local Authorities. Of the 80 questionnaires administered to the targeted population, 37 were valid, indicating a 46% response rate. Since the primary purpose of a preliminary study is not hypothesis testing, the sample size is often not calculated (In, 2017). Browne (1995) recommended over 30 samples per group as a magic number for the scholar to apply to a pilot study. Therefore, the sample size used for the study was indicated to be appropriate.

Data Analysis

Quantitative data were analysed using IBM SPSS Statistics (SPSS) computer programme *version 27.0*. The SPSS procedure comprised the following two techniques: (1) descriptive statistics tests using measures of central tendencies and frequency analysis and (2) parametric tests, that is, one-sample *t*-tests.

The factors were ranked based on frequency analysis, which was undertaken using the values generated from the central tendencies, such as the standard deviation and mean scores. Frequency analysis enabled the ranking of the determinants that influenced property tax reassessment performance. This

analysis was based on the mean scores generated from the SPSS descriptive techniques.

On the other hand, a one (single)-sample *t*-test of the mean was undertaken to measure the significance of the determinants influencing property tax reassessment. Rather than simply assuming mean values above 3.0 to be essential or critical, it was deemed appropriate to conduct statistical tests, such as *t*-tests, to determine whether the mean values differed significantly from 3.0 or even 3.5 (to agree on a five-point scale). Previous studies have used a cut-off point of 3.5 for a five-point scale in a one-sample t-test analysis. According to Kavishe et al. (2019), the value of '3' would be the mid-point of the identified variables, equivalent to 50% success and resulting in equidistance. This study applied the same logic and set the μ value at 3.5. The hypothesis formulated was as follows: the determinants mentioned above significantly affect the property tax reassessment performance.

Respondent Characteristics

The characteristics of the survey respondents are displayed in Table 2. An examination of the table shows that in specific job positions, a higher proportion (51.4%) of the survey respondents were assistant valuation officers, while the remainder were valuation officers, assistant valuers, and others.

Table 2: Frequency distribution of job position and council type (n=37)

Variables	Freq.	Per cent
Job Position		
Valuation Officer	5	13.5
Assistant Valuation Officer	19	51.4
Assistant Valuer	10	27.0
Others	3	8.1
Council Type		
City council	7	18.9
Municipal council	11	29.7
District council	19	51.4

Table 2 also shows that the most prominent local authority type was the district council based on the 19 (51.4%) respondents. The remaining participants were 11 (29.7%) from the municipal council category and seven (18.9%) from the city council category. This demonstrates that all management levels and council types were involved in the survey, thus enhancing the reliability and validity of the findings.

RESULTS AND DISCUSSION

The practitioners were requested to rate the importance of nine determinants influencing the performance of property tax reassessment using a five-point Likert scale. The results of the practitioners' perceptions are shown in Table 3 below.

Ranking of Property Tax Reassessment Determinants

The factors determining property tax reassessment were ranked in descending order, as presented in Table 3. One-sample *t*-tests were conducted to determine whether these factors significantly affected the successful performance of property tax reassessment.

Table 3: Ranking of property tax reassessment determinants by mean importance rating

Variables	Mean	SD	t	p
Staff Capacity	4.35	0.79	6.560	.000
Financial Capacity	4.30	0.81	5.973	.000
System and Software Availability	4.19	0.81	5.169	.000
Political Intervention	4.14	0.92	4.209	.000
Socioeconomics	4.14	0.82	4.700	.000
Government Structure	4.08	0.83	4.262	.000
Assessor Characteristics	4.05	0.85	3.974	.000
Public Education	4.00	0.85	3.579	.001
Neighbouring Council	3.95	0.85	3.119	.003

Generally, the importance rating of all nine determinants was higher than 3.0. All the factors were statistically significant ($p < .05$), indicating their positive effects on the success of property tax reassessment. The results also indicate that seven out of the nine determinants had a mean score above four, signifying their relatively high importance in affecting the success of property tax revaluation. As shown in Table 3, most respondents believed staff capacity, financial capacity, and software availability to be the three most important factors affecting the successful performance of property tax reassessment. Examining the internal and external determinants reveals that both aspects contributed to compelling property tax reassessment. However, internal factors were more impactful since the top three factors were associated with in-house resources. The high ratings obtained by these three factors suggest that substantial management resources are required when implementing property tax revaluation.

Top Three Most Important Determinants

Staff capacity was a critical determinant in conducting property tax reassessment, with the majority (86.5%) of the respondents ranking it highly (*M*= 4.35, *SD*= 0.79). This result corresponds to the literature review of previous local and international research on property tax reassessment (Abd Rahman et al., 2021;

Atilola et al., 2019; Daud et al., 2013; Eom et al., 2017; Kim et al., 2020; Mishra et al., 2020). The capacity of the staff refers to the aspect of the number of employees, including their skills and knowledge. Highly skilled and experienced workers are needed to facilitate and maintain the quality of the valuation process to ensure uniformity of assessment.

In addition, the financial capacity of local authorities needs to be excellent when conducting property tax reassessment. Although cited less frequently in the literature, this aspect is essential when executing fieldwork and inspection during reassessment. If hiring a private valuer, their valuation fees also contribute to higher costs. This finding aligns with a recent report from Malaysia highlighting that engaging an additional labour force increases the revaluation cost (Abd Rahman et al., 2021), which impedes its process. The hiring of contract staff means the existing workforce must be supported during the reassessment process.

Beyond the staff and financial capacity, system and software availability is another crucial determinant of property tax reassessment. A majority (81.1%) of the practitioners agreed that connecting property land records, inventories and computer software can lead to a successful reassessment process. The existing literature aligns with this result since most researchers agreed that using software like the CAMA system for mass valuation will ensure successful revaluation (Daud et al., 2013; Dimopoulos & Moulas, 2016; Nyabwengi & K'Akumu, 2019; Ross, 2013). This type of innovation may ease the revaluation process since the traditional method involves physical inspections of many rateable holdings.

In conclusion, the top three most important determinants all reflect the internal management aspect of local authorities. Internal factors are easier to manage than external factors, and these findings will assist local authorities and encourage them to strengthen their internal resources.

Other Determinants

Part two of the questionnaire also involved an open-ended question about other determinants influencing property tax reassessment. Only four respondents acknowledge the question, highlighting that support from the top management may result in high-quality reassessment performance. A lack of knowledge and understanding among the upper-level management was considered to impede the process since the valuation and property management department needs the management's support, especially in the financial approval. In addition, one respondent underlined a legal situation regarding a lack of enforcement over property tax reassessment implementation in Act 171. This result enlarged the list of property tax reassessment determinants, as represented in Figure 2 below.
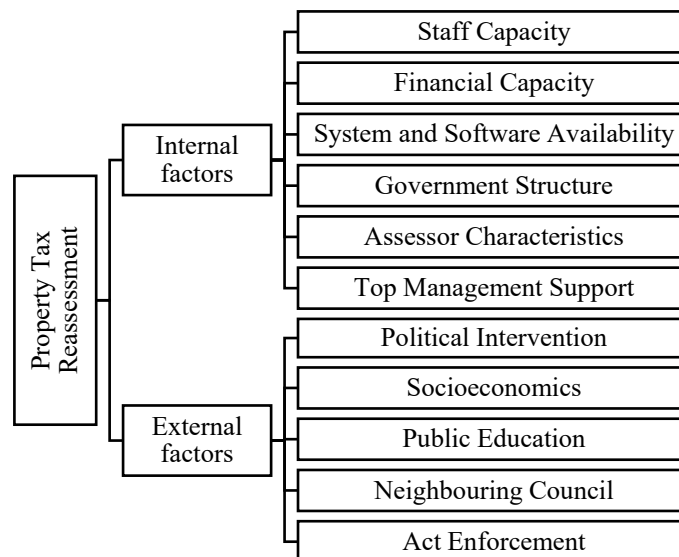
Figure 2: Final list of property tax reassessment determinants

CONCLUSIONS

Little prior evidence for the drivers of property tax reassessment is available in the literature, especially in Malaysia. To the best of the authors' knowledge, this empirical scoping study is among the first to identify and rank the determinants that contribute to property tax reassessment performance.

Further to its contributions, this study's findings should be interpreted in conjunction with the following limitations related to the instrument measurement, geographical setting, and cross-sectional context. First, the instrument used for this study can be extended by exploring its measurement items through more rigorous analysis. Second, the survey was conducted only in Malaysia, so the results may not be generalisable to neighbouring countries or those sharing similar economic conditions. The use of different local settings is suggested to extend this research work. Lastly, this research relied on self-reported data, and the variable may have been sensitive for the respondents. A longitudinal research design is recommended in future research.

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COMPARING ENVIRONMENTAL MANAGEMENT AND CITIES SUSTAINABILITY AS A BASIS FOR SUSTAINABLE DEVELOPMENT IN NIGERIA

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Abstract

Nigerians Over the last decade, there has been a greater awareness of the complex relationship that exists between the growth of cities and the state of the environment. However, much work remains to be done to improve the quality of cities' environmental conditions to achieve developmental goals. Like most developing countries, faces environmental management challenges such as waste management, water pollution, air quality, carbon emissions, conservation and preservation of nature, climate change, city transportation, housing development, park, and gardens. The evidence suggests that adequate measures have not been taken to balance development goals with the need to maintain environmental quality. This paper investigates the strategies associated with environmental management and the success of sustainable cities. The Likert scale was used in the study. The study also used simple regression and Chi-square goodness of fit to determine the relationship between the study variables. According to the findings, the critical p-value of 9.487729 is greater than the computed value x2 0.1844. The coefficient of r 0.0001 is greater than the critical value of 9.487729. The study discovered a strong link between environmental management and the long-term viability of cities. This research will provide a foundation for stakeholders, government, and environmental management challenges.

Keywords: Environmental, management, sustainable cities, development, strategies

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INTRODUCTION

A successful, knowledgeable, and functional city is unable to operate optimally in isolation from its environment. In such a scenario, a city must balance its social, economic, physical as well as environmental needs. Making cities sustainable refers to creating career and business opportunities, safe and affordable housing, and building resilient societies and economies (Powe, 2020). Inadequate policies In Nigeria, operations for the coordination and monitoring of environmental management and sustainable development result in a lack of implementation of environmental protection regulations. (Chinago Budnukaeku, 2021).

Green initiatives have become a global challenge, taking environmental factors and measures into consideration for sustainable development (Mohd Isa et al., 2021). The urban population increasing while the rural population is declining, giving rise to imbalances in the development between urban and rural areas (Johnston, 2016) (Biswas et al., 2021). The environment includes water, air, land, all the plants, people, animals that inhabit them, and the interrelationships that exist between them (Romoke Monsurat et al., 2019; Ladan, 2010).

This paper assessed environmental management strategies in line with Sustainable Development Goal 11 and the New Urban Agenda targeted to enhance inclusive sustainable urbanisation, capacity for participatory, integrated, and sustainable human-environmental settlement planning and management across the globe (Powe, 2020). It is important to take note that, Habitat Country Programme Document HCPD 2015-2043. Allied currently, the United Nations Development Assistance Framework (UNDAF) and the United Nations Sustainable Development Cooperation Framework (UNDCF) (UNSDCF) to achieve the Sustainable Development Goal accorded some priority sustainable development projects (UN-Habitat, 2015).

In this regard, it is obvious to state that a lot of research had been carried out through insufficient research that simultaneously addressed sustainable cities and environmental management challenges. The objectives of this paper are to examine environmental management and focus on the strategies for achieving Sustainable Development Goal 11 and New Urban Agenda. Public participation has more recently been showing change towards waste management in Abuja the Nation's capital. Pollution, awareness of unavailability of other natural resources, the need for conservation, and addition, the relationship between environmental management and sustainable cities development currently receives attention. To achieve the objectives, conceptual challenges relating to sustainable development are identified. The policy responses over time were examined. Finally, the study argued that systematic adoption of environmental management strategies is one the first measure required to address cities sustainability and environmental objectives.

This study would significantly contribute to knowledge and help stakeholders, decision-makers, academia, environmental managers, and City planners to look forward and recognize cities as not just a place where the population is concentrated but as a class of people from different backgrounds. The best alternative to ensure environmental management and sustainable cities development is to attribute the concept of equity and distribution of social justice to making cities a conducive, pleasant environment to live, commute and work.

STUDY BACKGROUND

The rate of community waste poses a high concern to city sustainability in the less developing regions leading to environmental pollution in China's metropolis (Kuang & Lin, 2021). Nigeria has National and regional development policies of international standard. The Federal Government of Nigeria Formulated the National Integrated Infrastructure Master Plan between 2014 to 2043 (UN-Habitat, 2015).

The World Bank, the European Union, and the African Development Bank are the country's major development partners, Department for International Development, and the United Nations System to identify major infrastructure bottlenecks affecting the country's competitiveness and provide a capital allocation framework identifying the required investments to bring infrastructure to the country in line with the country's growth (UN-Habitat, 2015).

LITERATURE REVIEW

The study compared smart city ideas of a few countries using assumed ground theory, derived inductive logical motion summarised the structure, uniqueness, and prediction of the smart city (Shamsuzzoha et al., 2021). Habitat Country Programme Document HCPD 2015-2043, currently, the United Nations Development Assistance Framework (UNDAF) and the United Nations Sustainable Development Cooperation Framework (UNDCF) (UNSDCF) to achieve the Sustainable Development Goal (UN-Habitat, 2015). The study examines the factors confronting the implementation of green technology policy to measure and improve green campuses (Mohd Isa et al., 2021). The study investigates the Spanish and Portuguese language literature both in Latin America and in Latin America to update the outcome that emerged in the field and knowledge derived as a lesson for other regions (Edelman et al., 2017). The study describes how local authority management system' s condition and the potential for integrated environmental sustainability into strategic spatial planning.

The researchers examine the degree of the use of sustainability and resilience in formulating fundamental issues of development (Satterthwaite, 2016). The study examines the relevance of the green cities concept, its suitability, and the challenges of implementing green agenda in Nigeria (Ekong, 2017).

The study employed quantitative analysis and found that physical development plans and enforcement orders were weak in some urban areas resulting in uncoordinated open green space. The researchers examine the role of public infrastructure to determine the social sustainability of the two traditional communities in Kuala Terengganu (Harun et al., 2021). The study examined the changes in space formation using urban space converted from housing to Small and Medium Scale Enterprise, as well as Indonesia's major corridor city (Haryanto et al., 2020).

This study is guided by two research questions. The first question, is what existing scientific literature says about how environmental management policies inculcated into cities sustainability aimed to achieving sustainable development. Second question is how these findings be applicable to Nigeria's National Development Programs, with the aim of achieving sustainable development. These question examines in page 2 (UN-Habitat, 2015; Powe, 2020).

Environmental Management and Sustainable Cities Development

The major challenge for today's cities is to manage the heavy reliance on ecosystem services, which leads to the depletion of natural resources and biodiversity, as well as the effort to mitigate and adapt to climate change, while prioritising public health and quality of life (Powe, 2020). Sustainable urban development is a strategy centered on land, water use, housing, transport, water management, waste management, sanitation, education, healthcare, and energy.

The landscape is a dynamic entity in space that has a spatial form created by nature and cultural interference (Harun et al., 2021). Physical development of cities and towns in Indonesia experienced fast changes in old traditional space to accommodate modern activities (Haryanto et al., 2020). Environmental sustainability is a way of promoting clean energy, sustainable use of land and resources in urban development, protecting ecosystems and biodiversity in harmony with nature, promoting sustainable consumption and production patterns, building urban resilience, reducing disaster risk, mitigating and adapting to climate change (Edelman et al., 2017). Sustainable development is defined as development that meets the needs of the present without jeopardising future generation's ability to meet their own needs (Barrow, 2006). Urban sustainability indicators are tools that allow environmental managers, to gauge environmental impact such as policies, waste disposal systems, pollution, and access to services by citizens.

Conceptual Issues of Environmental Sustainability

One of basis for sustainable development is the identification that environmental management and sustainable cities development are completely different of each

other but are complementary and interconnected as well mutually correlated (Shamsuzzoha et al., 2021).

The ability and capacity, a country support or maintain itself, taking into account the complex interaction of environmental, social, and economic factors, as well as determinable natural resources, is referred to as sustainability (Winter, 2018; Brilhante & Klaas, 2018).

Agricultural lands meant for development and improving food security were converted to built-up areas (Weiland et al., 2021). Environmental behaviour is a manifestation of personability to contribute based on individual understanding (Bakar et al., 2020). Urbanisation is the symbol of the progress of civilisation in the cities of the world (Latip et al., 2020). Large numbers of urban governments in the low- and middle-income Commonwealth nations have the capacity to plan or to implement agreed plans as well as manage urban expansion as a major priority attached to such a country (Biswas et al., 2021).

Works of literatures has shown that challenges of environmental management are accrued to the limited resources on the carrying capacity of a delicate ecosystems. Resilience cities require development activities to meet human needs and must advance within acceptable environmental control. The adjustment between development and environmental management is the only alternative in which the objective of sustainable development can be achieved. To strive the relationship between development and environmental quality transpire to the concept of 'eco-development' This is an ecologically sound development process that focuses on reducing the negative impacts of cities on the environment, especially by improving air quality; provide safe, affordable, accessible, and sustainable transport systems, improving road safety notably through a larger public transport network.

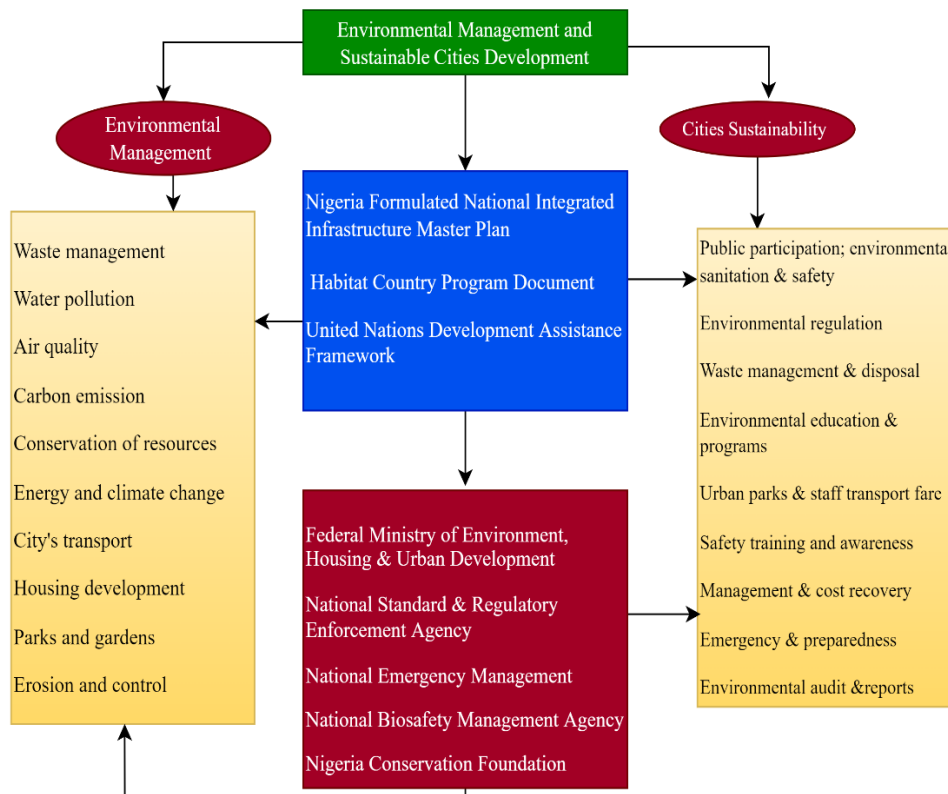**Role of Environmental Management Agencies in Nigeria**
- The Federal Ministry of Environment, Housing, and Urban Development provide innovative, efficient, and effective environmental regulation and waste management services to ensure a healthy, clean environment.
- National Emergency Management Agency coordinates resources towards efficient and effective disaster prevention, preparedness, mitigation, and response in Nigeria.
- Nigeria Conservation Foundation promotion nature conservation and environmental protection in collaboration with other agencies to build and sustain a more lasting union to safeguard the environment
- National Oil Spill Detection and Response Agency responsible for preparedness, detection, response to oil spillages, and use of oil in the guest to achieve sustainable development in Nigeria

- Forestry Research Institute of Nigeria ensures sustainable forest resource management and products, food production and security, forest-based industrial raw material provision, and biodiversity utilization.
- National Standards and Regulations Enforcement Agencies (NSREA) is the embodiment of law that focused on the protection and sustainable development of the environment and its natural resources and ensures compliance with environmental laws.
- National Biosafety Management Agency provides the regulatory framework to adequately safeguard human health and the environment from potential adverse effects of modern biotechnology for the benefit of Nigeria.
- Friends of the Environment Nigeria create awareness, enlighten and educate people about the environment.

Goal 11: Ensures that Cities and Human Settlements are Inclusive, Safe, Resilient, and Designed for Long-Term Sustainability
- Make accessible to all citizens have access to adequate, safe, and affordable housing and basic services and upgrade slums.
- To provide safe, affordable, accessible, and sustainable transportation systems, with an emphasis on optimizing transport infrastructure through a relatively large public transportation network.
- Strengthen global capacities for inclusive and sustainable urbanization and participatory, integrated, and sustainable human settlement management throughout the world.
- Promote the conservation and preservation of the natural and cultural heritage.
- Significantly reduce the number of deaths and the number of people affected by disasters, including water-related disasters, and reduce the direct and indirect economic losses through the protection of people in the affected areas.
- Reducing the negative impacts of cities on the environment, especially by improving air quality, municipal, and other waste management.
- Ensure universal access to green and public spaces that are safe, inclusive, and accessible for all, particularly for women and children, and for elders and people with disabilities
- Strengthening national and regional development planning, Supporting the establishment of positive economic, social, and environmental links between urban, peri-urban, and rural areas.
- Significantly increase the number of cities and human settlements implement
- integrated policies, plans, inclusion, resource efficiencies, mitigation and adaptation to climate change, resilience to disasters, and to develop policies in line with these goals.

- Support least developed countries in creating sustainable and resilient structures using local resources, particularly through financial and technical aid (Satterthwaite, 2016).

Figure 1: Environmental Management Strategy Plan
Source: Adapted from Federal Ministry of Environment Nigeria (2021)

METHODOLOGY

The section provides empirical research work similar to the study. For this study, researchers; drew materials from in-depth review of literature related to environmental management and sustainable cities development in line with Sustainable Development Goals 11, and New Urban Agenda. The study explores increasing access, and formulating ideas in developing countries of the Arab region specifically, Jordan (Shamout et al., 2021). The study adopted document quantitative analysis as a primary technique. The study employed the Likert scale, responses to variables, and a one-way Multi-Analysis of Variance to determine

the mean distribution of ten variable items of environmental behavior (Bakar et al., 2020).

The researcher used new techniques to propose solutions and collaborated with urban planning party officials to combat change (Latip et al., 2020). The paper assessed the role of management and the reality of urban plans and management. The researchers employed the relative importance index (RII) and revealed that noise and air pollution are considered the most significant environmental factors (Kuang & Lin, 2021). The study examines the pattern and changes in rural communities of Kuala Nerang, Kedah, Malaysia between 2001 and 2018 using the GIS application (Weiland et al., 2021). The study revealed a decline of 1.3% in agricultural land converted to residential, commercial, and roads. The researchers discussed the challenges of landscape violation using the available environmental laws and management agencies (Chinago Budnukaeku, 2021).

The study focused on globalization and sustainable growth, bioethics and poverty, organizational performance and sustainability, environmental management and individual progress, human and ecosystem health, and water resources (Goosen, 2012). The study provides a literature review on the issues related to the planning, development, and management of sustainable cities (Satterthwaite, 2016). The study employed Logit regression and coefficients to determine the existence variables. The study revealed positive and significant public participation. The study used Logit Model provided dependent parameters comprises of Willingness to Classification (WTC) and Behaviour Garbage Classification (BGC) as a wide choice technique (Shamsuzzoha et al., 2021).

Table 1: Environmental management and cities sustainability

S/N	Independent variables (X)	5	4	3	2	1	Total
1	Do the agencies aimed at reducing urban waste?	2	1	0	1	1	5
2	Does the agencies help in minimizing water pollution?	1	2	0	1	1	5
3	Does the agency contribute to the enhancement of air quality?	2	1	0	1	1	5
4	Does the agency handle the issue of carbon emission judiciously?	2	1	0	1	1	5
5	How often have the issues of conservation of resources been addressed?	1	1	0	1	2	5
6	Does the agency educate people on the effect of energy and climate change?	2	1	0	1	1	5
7	Does cities transportation contribute to air pollution?	1	2	0	1	1	5
8	Does the housing development by following per under the design plan?	2	1	0	1	1	5

9	How efficient is the management of Parks/gardens?	2	1	0	1	1	5
10	Does the agency consider causes of erosion/control?	2	1	0	1	1	5
	Total	**17**	**12**	**0**	**10**	**11**	**50**

5=Strongly Agreed, 4=Agreed, 3 = Neither Agreed-Nor-Disagree, 2=Disagreed, 1= Strongly Disagree

Table 1, is structured on environmental variables as an independent component to assess urban environmental quality. Likert was used to weight the level of each variable. 58% of respondents agreed with the operational performance of environmental management towards city's sustainability.

Photo 1a shows the nature and characters of urban population towards disposal of garbage's along the road. The agency took a rigorous clearing of corridor road to provide adequate space parking and road visibility. Photo 1b shows intensity of urban road congestion along Maraba-Abuja, the Nation's capital.

Photo 1a: Waste disposal along Abuja-Maraba

Photo 1b: Traffic congestion along Abuja-Maraba

Table 2 discusses the environmental management and cities sustainability to coordinate and educate the public on the factors that contributed to poor environmental quality. The defined a high level of assessment from the regulatory body indicates 45% compliance with management strategies.

Table 2: Environmental management strategies

S/N	Dependent variable (Y)	5	4	3	2	1	Total
1	Does the public participate in environmental sanitary & safety?	3	2	0	1	0	5
2	Does the agency take environmental regulation into action?	2	1	0	1	1	5
3	Does the agency manage waste/disposal?	3	2	0	0	0	5

4	Does the design environmental education programs simultaneously?	3	2	0	0	0	5
5	Does the agency provide adequate motor park transport fare for staff?	2	2	0	1	0	5
6	Does the agency provide adequate training & awareness of safety?	2	3	0	0	0	5
7	Does the agency Manage & recover the cost?	2	2	1	0	0	5
8	Does the agency equip to handle emergencies & preparedness	2	2	1	0	0	5
9	Does the agency updates issues/challenges?	3	2	0	0	0	5
10	Do the Audit and review reports?	3	2	0	0	0	5
	Total	**25**	**20**	**2**	**1**	**1**	**50**

5=Strongly Agreed, 4=Agreed, 3 = Neither Agreed-Nor-Disagree, 2=Disagreed, 1= Strongly Disagree

Table 3 provides a relationship between environmental management and sustainable cites development $x^2 = 0.1844 <$ critical value 9.487729. The observed value of 0.1844 is less than the critical value of 9.487729. This indicates that a relationship exists between environmental management and cities sustainability. The analysis shows that environmental management and cities sustainable cities development are cordially related.

Table 3: Environmental management and city's sustainability

S/N	O	E	O - E	(O - E)^2	$\dfrac{O - E)^2}{E}$
1	3	5	-2	4	0.8
2	3	3	0	0	0.0
3	3	5	-2	4	0.8
4	3	5	-2	4	0.8
5	2	4	-2	4	1.0
6	3	5	-3	9	1.8
7	3	4	-1	1	0.25
8	3	4	-1	1	0.25
9	3	5	-3	9	1.8
10	3	5	-2	4	0.8
Total	$\sum x =29$	$\sum y =45$	$\sum xy= -18$	$\sum x^2= 40$	$\sum y^2= 8.3$

Table 4: Relationship between environmental management and city's sustainability

S/No.	X	Y	XY	X^2	Y^2
1	3	5	15	9	25
2	3	3	9	9	9
3	3	5	15	9	25
4	3	5	15	9	25
5	2	4	8	4	16
6	3	5	15	9	25

7	3	4	12	9	16
8	3	4	12	9	16
9	3	5	15	9	25
10	3	5	15	9	25
Total	**∑x =29**	**∑y =45**	**∑xy=131**	**∑x²=85**	**∑y²=207**

Table 4 presents the coefficient of correlation between environmental management and cities sustainability. The result would be compared with that of Chi-square goodness of fitness to generalise the argument amongst the two results. The study revealed that; the Critical p-value = 9.487729 is greater than the observed value of 0.0001. Therefore, there is a strong correlation between environmental management and cities sustainability.

DISCUSSION

Based on reviewed literature and theories, literature provides the concepts, approaches, and strategies within the context of sustainable cities development. The study used a weighted score Likert scale analysis and based its findings on five agencies: The Federal Ministry of Environment, the Ministry of Housing and Urban Development, the Nigeria Conservation Foundation, the National Biosafety Management Agency, as well as the National Standards and Regulations Enforcement Agency.

This section discussed the assessment of all of the tables and the results. Table 1 is organised around environmental variables as a separate component for assessing urban environmental quality. The performance in mathematics was weighted using the 5-point Likert. (58%) agreed with the management strategies, while (42% disagreed) with the regulatory authority's efficiency in environmental management for the city's sustainability. We talked about environmental management strategies for coordinating, fostering, and educating the public about the factors that contribute to poor environmental quality.

The study shows a moderate level of policies adoption of 45% active toward environmental management (Table 2). The study used Chi-square goodness of fittest to identify a relationship between environmental management and sustainable cites development. The result shows that regression analysis $x^2 =$ 0.1844 < critical value 9.487729. The observed value of 0.1844 is less than the critical value of 9.487729 indicate that a relationship exists between environmental management and cities sustainability (Table 3).

The analysis shows that environmental management and cities development are cordially related. We calculated the coefficient of correlation between environmental management and cities sustainability (Table 4) in essence to compared the result of the two-method employed to generalise the uniqueness in applications.

According to the table, the Critical p-value = 9.487729 is greater than the observed value of 0.0001, indicating a strong relationship between environmental management and city sustainability. The null hypothesis H_0 was not true while, the alternate hypothesis H_1 proof be correct that a relationship exists. This is an indication that the component of cities development was dependent on environmental variables.

Water pollution, air quality, carbon emission, conservation, energy and climate change, cities transport, housing development, parks and gardens, erosion, and control were the independent variables, while, public participation, waste management and disposal, environmental programmes, loading, and parking space, training and awareness, emergencies and preparedness, reported issues, audit, are significantly managed.

CONCLUSION

Environmental management requires proactive measure to develop and must inculcate closely to suit conditions, which progressively have to improve without adequate environmental management measures. The projection and target for Sustainable Development Goals 17 Agenda in line with Goal 11 of which present a roadmap for future development trajectory globally is imperative for all nations. It is a fact that, to improve the quality of life and protect the urban and rural environment from uncoordinated uses, sustainability must be thoroughly taken into cognisance to ensure a cordial relationship between quality and sustainable cities development.

This study drowns more light on the new dimension and practice of environmental managers, urban planners, and other allied professionals within the context of sustainable urban development. Environmental managers and town planners look forward in recognising cities not just a place where population is concentrated, but as a class of people from different backgrounds and how the system will make their socio-cultural diversity key to contemporary city plans. The study revealed a significant relationship between environmental management and sustainable city development. Comparably, the methods employed indicate that a relationship exists between environmental management and cities sustainability

RECOMMENDATION

This study will throw lighter upon environmental management and the challenges. Environmental control, coordination, and urban development can ascertain the existing practice and forester for a better understanding of the relationship between environmental management and sustainable cities development. The study placed more emphasis on environmental management and awareness as a tool for educating the general public on the danger of inconsequential activities of urban dwellers. Environmental managers and cities

planners ensure that the urban environment is healthy for the dwellers and offer good quality services in response to challenges.

Environmental managers and cities planners ensure that cities give their inhabitants a sustainable healthy environment and employment. Environmental managers and city development planners require adequate services, enforcing environmental and urban planning laws. Implementing protective measures by looking at the needs of the community. Building a strong relationship between environmental management to ensure a sustainable cities development. Their relationship should influence the quality and sustainability of the community in which people live.

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