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UNDERSTANDING ISSUES OF AFFORDABLE HOUSING IN MALAYSIA TO ATTRACT INVESTMENT: AN EXPLORATORY INVESTIGATION

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Abstract

This study attempts to investigate the issues that impede the provision of affordable housing for Malaysian population. These issues need to be identified and addressed, as they hinder potential private investments in affordable housing projects. In order to achieve this aim, a qualitative method was adopted, in the form of interviews with several developers and institutional investors. Seven areas were recognised to be the sources of major problems with affordable housing in Malaysia namely, the lax policy; poor urban design and planning; supply and demand; property overhang, financing, and price; lacking innovation and research and development; escalating development costs; as well as obsolete quota and subsidy programmes. These findings may provide invaluable insight for policymakers in identifying and resolving the issues of affordable housing, which may then create potential avenue for private investment to alleviate the issue of shortage of affordable housing.

Keywords: Affordable Housing, Issues, Social Investment, Institutional Investors

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INTRODUCTION

Shelter, like air, water, food, and clothing, is a type of physiological requirement in Maslow's hierarchy of needs. Housing, which is at the base of the pyramid, is necessary for human beings to function properly as individuals and as members of a community (A.H. Maslow, 1943). Concern regarding affordable housing is less common in Malaysia, until recently, when house prices increased by 9.6% from the standard rate between 2010 and 2014, about three times faster than the average increase between 2001 and 2009 (Suraya Ismail et al., 2019). Using the median multiple approach, Malaysia's housing affordability has declined from 2002 to 2016 ranging between 4.0 and 5.0, surpassing the 3.0 threshold for housing affordability. A significant decline occurred between 2012 and 2014, in which housing affordability worsened from 4.0 to 5.1, putting housing in Malaysia in the severely unaffordable category (Suraya Ismail et al., 2019).

The government has subsidised numerous low-cost housing units for the poor, while the private sector has built many high-end and luxurious units for the upper and middle classes. However, rising housing prices in recent years have altered the equilibrium. People's complaints are growing louder, particularly from the middle class and those just entering the labour force and looking for a home. They are ineligible for government-subsidized low-cost housing yet unable to purchase properties on the open market due to the outrageous prices (Shuid, 2015).

Because housing has become pricey, particularly in urban regions where economic possibilities abound, some parts of the population have been compelled to relocate to the outskirts. Traveling becomes a high expense for people with limited economic prospects, public transportation, and public services at their locations, which may affect their long-term well-being (Zou, 2014). Other segments of the population, on the other hand, are obliged to live in overcrowded and dense housing as they desire to reside in cities. Such circumstances degrade their life quality, negatively impacting their health, cognition, education, job, and earnings (Massey, 2015). Apart from that, housing is crucial for the stability of family institutions. The area becomes more vulnerable to crime when it loses its sense of belonging and communal spirit (Jacobs, 1993). This would impact in many ways for instance, in social issues especially among children.

Against this background, this study seeks to explore the issues of affordable housing in Malaysia. Understanding these issues is crucial in developing real solution(s) to this conundrum. This study adds up to the knowledge in two ways. First, research on understanding the root issues of affordable housing is scarce, despite its urgent need in the current context. With clear objectives, this issue can be addressed, thus lead to resolutions. Affordable housing can potentially become an asset class that might attract private investment to invest in. Secondly, this research is among a few that has gathered

insights from institutional investors and developers, who are the main stakeholders of the potential investment initiatives. The rest of this article covers the review of the literature, followed by a description of research methodology and analysis of results. We conclude this paper by outlining the key discoveries and its consequences for policymakers.

LITERATURE REVIEW

A comprehensive agreement on the definition and notion of affordability remains elusive, causing difficulties for academics and policymakers alike (Mulliner & Maliene, 2015). Different interest groups strive to impose their own definitions of the problem and ways to address it, as Gabriel et al. (2005) pointed out. Comparing the association between housing expenditure (rent or mortgage) and household income is the most popular way to determine home affordability (Whitehead, 1991). Scholars have suggested that housing affordability should include social and environmental factors as well as financial factors. Measuring it solely based on its financial value ignores other significant aspects of housing, such as the structure's quality, location, amenities, and accessibility to services and transportation (Fisher et al., 2009; Gabriel et al., 2005).

People, according to Hausman (2013), require habitats instead of houses. He defined a house as an object, whereas a habitat is a node of three overlapping networks: physical, which includes power, roads, water, and sanitation; economic, which includes urban transportation, labour markets, entertainment, distribution, and retail; and social, which includes education, health, security, family, and friends. Consequently, to connect all three networks to create a functional environment seems challenging. The problem with a low-cost public housing is that developers and governments tend to maximise the density of housing units, encouraging developers to use the cheapest land available, which is often remote and far from the networks. As a result, residents of low-cost public housing must travel greater distances and spend more to get to work thus affect their work productivity.

Mattingly & Morrissey (2014) also emphasised the need of factoring transportation costs in determining affordability. They used data from Auckland to prove when transportation costs are included in, more regions become unaffordable. They advised that transportation costs be included in, in addition to the development of places with decent accessibility. Olanrewaju et al. (2016) who investigated the factors that determine the cost of affordable housing in Malaysia supported this. They argued that using market price as a baseline for the cost of affordable housing is problematic since it ignores other important aspects of housing provision such as location and size of the building.

Population, demand and supply, location, physical attributes, accessibility, developer, cost of material, and income are among other factors that influence house prices in Malaysia, according to Osmadi et al. (2015).

Neighborhood characteristics, they believed, may also have an impact. While T. H. Tan (2013) on the other hand, noted that Malaysia's urbanisation rate has risen from 34.2% in 1980 to 62% in 2000, and 71% in 2010. Furthermore, rising costs of regulation/compliance, labour, materials, and land has contributed considerably to the rising house prices.

Su Ling et al. (2018) discussed three important causes that contributed to housing unaffordability in Malaysia: a mismatch between housing supply and demand; expensive new launches, and the rate of household income growth that could not match with the rise in house prices. On the other hand, Zyed et al. (2016) argued that the inadequate supply of affordable housing in Malaysia particularly in Kuala Lumpur has created a fierce competition between the young households and other income groups in securing affordable housing. In order to resolve this, Mohd Daud et al. (2020) highlighted that there should be calls for more supply of affordable housing by attracting more investment from institutional investors in such projects. However, progressive affordable housing policy is a prerequisite for such investment to materialise.

RESEARCH METHODOLOGY

Interviews let academics to dig further into a topic since they allow for intricate and follow-up questions. As a result, the researcher can gain useful information from the interviewees' diverse experiences and opinions (Merriam & Tisdell, 2016). Prior to the actual interviews, pre-testing was performed to ensure that the questions were accurate. Two investment researchers with more than 20 years of expertise proofread the draft interview questions to ensure uniformity and eliminated any ambiguity. In addition, two pilot interviews were conducted – one with a real estate sector employee, and the other with an executive from an institutional investment company.

Semi-structured interviews were conducted with participants whose positions were that of senior managers or higher, with enormous experience and involvement in institutional investment firms in Malaysia, which might include the Employee Provident Fund (EPF), Retirement Fund Incorporated (KWSP), Permodalan Nasional Berhad (PNB) to name a few. Besides that, insights from developers were also considered to understand their points of view concerning affordable housing. A representative from the National House Buyers Association (HBA) was also engaged to speak from the house buyers' perspective. In total, 15 individuals were interviewed, comprised 5 participants from the senior management of developers with over 127 years of cumulative experience, 1 representative from the National House Buyers Association, and 9 interviewees from the senior management of institutional investor firms with collective experience of over 205 years. The number of interviews was deemed appropriate once theoretical saturation was achieved (Merriam & Tisdell, 2016). The interviews were transcribed and analysed using content analysis method.

ANALYSIS

From the interviews, seven areas were identified as the sources of major impediments to providing affordable housing in Malaysia. Namely, the policy; urban design and planning; supply and demand; property overhang, financing, and price; lacking innovation in research and development; costs, as well as; quota and subsidy.

Policy

The current housing policy allows for a free market to reign supreme with minimal interference from the government, particularly for middle and upper-income category households in society. Despite real estate being the most regulated industry in Malaysia as posited by Developers 4 and 5, current regulations mostly relate to density control and consumer protection, rather than direct interventions in the form of planned developments. Although developers are obliged to build a specific number of price-controlled or subsidised houses for lower-income groups, they have complete flexibility over the pricing of other units. The government however has been aggressively addressing the housing needs of the middle-income community in recent years apparently, it is seen as an impact of the political pressure, as claimed by Institutional Investor 6. Nonetheless, Institutional Investors 6 and 8 opined that there is a possibility that the affordable housing initiative will mirror the mishap that happened with low-cost housing schemes in the future because the construction seems to be for political mileage rather than serving the actual needs of the people.

Despite the risk of being a political tool, government intervention is still deemed necessary to help with this issue of insufficient supply of affordable houses in the country. Institutional Investors 7, 8 and 9 argued that the intervention is required, otherwise, there will be more undesirable effects on the people. If all is left to the market, more people will not be able to afford a home. Essentially, according to Institutional Investor 4, housing should be seen as a basic need instead of an economic burden that governments must provide for to foster sustainable economic and social growth. A laissez-faire policy will eventually stifle economic growth as it seems unfeasible for the support staff in the capitalist economy to pay for a home.

Urban Design and Planning

The interview has highlighted another key area that needed serious improvements which is urban design and planning. The goal of urban design is to make a city that is both sustainable and accessible, with each location having its unique qualities that can interact with one another. Institutional Investor 3 posited that before a viable investment alternative for affordable housing can exist, the urban planning strategy must first be enacted and adopted.

Inclusivity and sustainability are two important elements of urban design. They were specifically stated in the United Nations (UN) Goal 11 of the 2030 Sustainable Development Agenda, titled “Make cities and human settlements

inclusive, safe, resilient and sustainable". Ten mechanisms were identified to achieve this aim, four of which are directly related:

> *"11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services and upgrade slums*
> *11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons*
> *11.3 By 2030, enhance inclusive and sustainable urbanisation and capacity for participatory, integrated and sustainable human settlement planning and management in all countries*
> *11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, in particular for women and children, older persons and persons with disabilities"* (United Nations, 2015)

In essence, these frameworks emphasise that a sustainable city is one that is inclusive - ensures all strata of society have equitable access to affordable housing, public transport, facilities, essential services as well as green spaces. On top of that, affordable housing should be integrated within the city instead of situated at the outskirts or suburban areas, as Institutional Investor 3 put it. Lacking facilities for instance; public transportation could increase the cost of housing - something that is often overlooked. The HBA, Institutional Investors 5 and 9 pointed that current house prices do not describe the real cost of housing. For example, a price-friendly house in Rawang (about 30 km from the centre of Kuala Lumpur) would incur more such as the cost of transportation, school, and other amenities. As such, they argued that the overall cost of housing should capture all other indirect costs previously mentioned.

Incidentally, this makes a case for better connectivity and accessibility in urban design and planning. Institutional Investors 1 and 3 proposed that the authority develops a measurement index to assess the connectivity of a township – to ensure that it is well connected, thereby eliminating the need for private transportation. Institutional Investors 1 and 3 proposed to properly map the areas for such housing together with the necessary facilities, services, and protected connectivity. For young millennials who work in the city, they prefer to live in urban area (Suhana Ismail et al., 2021). They initially do not require a large room to stay and parking bays. Nonetheless, the authorities that limit unit size to some size (plus parking requirement) cause this to be unfeasible. Institutional Investors 2 and 3 highlighted that a possible solution to this dilemma is an urban design and planning whereby it removes liabilities from people such as the need for private vehicles. One-bedroom apartment may be leased, and the lessor can move as soon as the family grows bigger or becomes more secure, financially.

Supply & Demand

The mismatch between the supply and demand for affordable housing is one of the important areas to be addressed. The supply of affordable housing is inadequate, yet the data show a huge number of unsold housing units, including those that were priced below RM200,000. Such contradiction baffled the interviewees. Institutional Investor 9 asserted that the supply of affordable houses is indeed inadequate as developers tend to build more pricey homes. This was substantiated by Developers 2 and 3, who highlighted that developers' role of maximising profit as a private entity. Thus, developing homes that creates the highest profit is their objective. Institutional Investors 2 and 9 believed that the supply of such houses remotely matched the real demands on the ground. Evidently, it is not enough just to boost the availability of affordable housing in the market. In the past, the government had developed and directed developers to construct low-cost homes. Unfortunately, the units appeared to be of poor quality, and they were frequently located in the least accessible locations. Che Embi et al. (2021) posited that location and infrastructure are two important house characteristics that buyers look into.

Property Overhang, Financing Issue & Price

Data from the first half of 2020 indicate that there are 31,661 units classified as overhang units with a value of RM20.03 billion. Property overhang exists when residential units remain unsold nine months after the Certificate of Completion and Compliance (CCC) and Temporary Certificate of Fitness for Occupation (CFO) are issued. Out of the total overhang units, 10,032 units or 32% are priced below RM300,000. Although the houses appear to be affordable, the developers are having difficulty selling them. For example, there are 1,284 unsold units priced below RM100,000. Developers 3 and 5 argued the reason for the unsold units is primarily due to their locations, especially for the low and medium cost types. Another cause for the overhang, according to Developers 1 and 4, is the lengthy bureaucratic procedures such as requirements in getting approval from government authorities. Developers of the low-cost housing have to go through state governments when selling the units due to procedures regulated. The state government will have a list of applicants and screen for eligible candidates before they sell the units to the potential homeowners. Once declared eligible, the applicant can apply for funding from financial institutions. If the application for funding denied, the state government will reopen the sale to other applicants; a lengthy process which ultimately poses a financial burden on the developers.

One of the major problems that leads to property overhang is the rejection from financial institutions to finance house purchases by low-income applicants, this is to avoid putting the buyers at financial risk. It is possible to link this to tightened financing requirements by Bank Negara Malaysia as they intervene to curb excessive house-price inflation. On this note, the HBA, Institutional Investors 2, 3 and 9 agreed that younger people should not be granted easy financing to housing

and be indebted for up to 35 years. Because their income could rise in the future, they may contemplate buying or moving to other residences. Since house prices in the city are escalating, more housing projects are now being constructed further from the city. Despite being sold at a lower starting price, these house projects are still less affordable. Institutional Investor 5 and 6 affirmed that this event was called as imported inflation.

Lacking Innovation and Research & Development (R&D)

According to Institutional Investor 9, the lack of research and development is likely owing to a lack of resources devoted for it, which necessitates an investment with a possibly long gestation period. This effort may not be funded by the government. Similarly, private companies are profit oriented which concern with their own interests, so they focus on making profits now than later. On top of that, developers are sceptical about the potential of modern construction techniques that are believed could reduce the cost. Developers 1 and 4 have outlined that Industrialized Building System (IBS) can cost 20% to 25% higher. They also argued that the IBS has many limitations such as needing a big volume and enormous project sites for its use. However, Institutional Investor 9 disagreed with the evaluation, citing the example of foreign contractors who, due to their enhanced efficiency, can build houses faster and at a lower cost. Local developers, according to Institutional Investor 9, must innovate or risk losing opportunities with overseas developers if they keep to their current ways.

Development Cost

Another important challenge preventing developers from creating affordable homes is the increasing costs. The compliance cost, land cost, and building cost are the three key costs highlighted.

The costs that developers must borne while supplying utilities and public amenities for a development project are known as compliance costs. They include reserving a portion of the land for road, constructing public utility infrastructure, telecommunications, water, sewage, and electricity fees. It is worth noting that utility providers are for-profit businesses and they will not be affected in any implications in the development. For example, the Indah Water Konsortium (IWK) imposes a 1% charge of the total gross development value of the project. Tenaga Nasional Berhad (TNB) instructs developers to construct power substations and charges a fee for each connection established. There are other fees levied by telecommunications companies (such as Telekom Malaysia Berhad) and water companies in each state. In this case, the developer absorbs all upfront expenditures and then passes them on to the buyers. On this issue, the HBA and all developers agreed that compliance costs should be reduced. Since utility providers are profit based organisations, they should absorb the cost of providing infrastructure as an investment for future earnings.

Another issue for the developers is the rising cost of land. All expenses associated with acquiring a piece of land for a new development, as well as those costs related to readying the land for construction is referred to as land costs. When new developments are planned, it may also be the land currently held by developers that is priced at market value. For example, developer A, who bought 500 acres of land for a township development and launched the project only after 15 years later, hence, the land cost now is higher – as based on current market value, not the value when it was purchased. From this viewpoint, developers who actively engage in land-bank activities would benefit from a real estate market boom since they can profit from unit sales as well as capital gains from the land they hold. In this regard, Developers 4 and 5 argued that this practice is a norm and emphasised that the holding cost of the land must be considered as well. Even with holding costs accounted for, developers and investors can still anticipate a massive profit from the land's capital gains. The value of land only appreciates further when the government invests in the infrastructures, for instance by enhancing the public transport facilities in the area. Institutional Investors 2 and 3 argued that the state valuation and the land office should play a greater role in mitigating the rising land costs through price control to avoid excessive profit from land value. Land value tax and capital gain tax should also be considered.

Developers also highlighted construction costs as a factor that contributes towards higher house prices. The costs include expenditures for the construction materials, labour, equipment, and services. Institutional Investor 5 opined that with continued crackdown on illegal foreign workers and high charges levied upon foreign employees, developers must expect rising labour costs. Simultaneously, developers have been under the pressure of demand and supply of materials on the global scale. All developers interviewed generally agreed with this fact. Figure 1 data, on the other hand, appears to contradict this, where it is shown that the construction costs for almost all house types remained stable in the recent years.

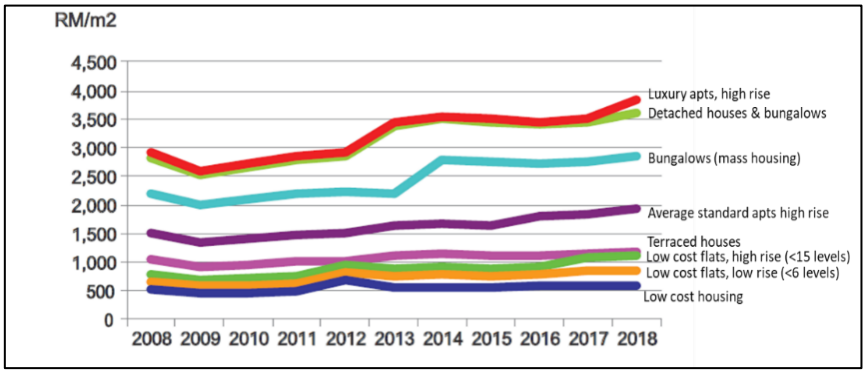

Figure 1: Construction Costs Trend for Houses in Kuala Lumpur from 2008 – 2018
Source: Jubm Sdn Bhd, Arcadis (Malaysia) Sdn Bhd, & Arcadis Consultancy Sdn Bhd, 2019

The HBA suggests the government to establish a committee of quantity surveyors to monitor and control housing prices and limit developer profiteering. Furthermore, the government should agree to a specific de-tariffing of crucial goods required for affordable housing building as well as to impose import tariffs on essential construction materials like iron. While a tariff is in place to protect local industry, an exemption for affordable housing projects should be given to reduce construction costs.

Bumiputera Quota & Discount Allocation

Another issue to address is the quota allocation for Bumiputera buyers. The Bumiputera in Malaysia refers to a person whose race is considered native of the country. The current policy stipulates that 30-60% (varies according to the state) of the development projects should be allocated for Bumiputera buyers plus they are entitled for special discounts. Developers 2 and 3 highlighted that the discounted Bumiputera units are cross subsidised by the higher purchase prices of other home units. Whilst the Bumiputera quota for affordable housing projects has already been abolished in some states, developers are still obliged to build a certain number of affordable units with a price cap. Developer 4 was concerned that there could be an oversupply of certain types of affordable housing due to this regulation, as the demand may not exist in the area where they are located.

CONCLUSION

This study outlines the key issues regarding affordable housing in Malaysia. As it turns out, affordable housing projects face major challenges from the lax policy; poor urban design and planning; supply and demand; property overhang, financing, and price; lacking innovation and research and development; escalating development costs; as well as obsolete quota and subsidy programmes. Understanding and resolving these issues are crucial especially for policymakers to pave the way towards making affordable housing an asset class that can attract private investments. A new business model for housing development should be explored for this to succeed. This may include introducing a profit limit and cost rent capped housing. Essentially, a holistic approach to home financing and development must be employed to provide sufficient affordable houses for the people. The understanding of the approach would eventually lead to revamped policies and comprehensive structures for investment vehicles to attract supports from institutional investors.

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MOTIVATIONAL FACTORS IN INFLUENCING THE INTERNATIONAL TOURISTS TRAVEL TO TOURISM ATTRACTIONS IN PENANG

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Abstract

The generation of international travellers is no longer considered a barrier to tourists to visit places of interest during leisure time. Travelling is about learning, knowledge, and thinking channels. However, most tourists will not travel long distances efficiently, contributing to the lack of interest in international tourist visits. This study aims to identify the motivational factors driving international tourists to travel to Penang based on travel motivation, characteristics, and sociodemographic. The three objectives prompted the investigation. First, to identify the demographic characteristics of international tourists to Penang. Second, to explain the motivation to want to 'seek knowledge and innovation' is the main thrust that drives travel generation. Third, to determine the motivation of the main attractions that can attract international tourists. A set of questionnaires was used to obtain the quantitative data. The questionnaire was distributed and a total of 370 international were in the tourist attractions around Penang. The data was obtained as analysed using the SPSS software. The study results explained that these international tourists consist of young people aged between 21-20 years. Next, there is a significant relationship between sociodemographic and tourist travel characteristics. The main push factor, 'desire to seek knowledge and innovation,' is the motivational factor that brings tourists to Penang, and the main attraction factor is the 'cultural and historical' factor that is possessed in each state.

Keywords: International travellers, travel motivation, attraction motivation, repulsion motivation, sociodemographic

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INTRODUCTION

The implementation of 'tourism' and 'recreation' has somehow long been intertwined from the effects of postmodernity (Asan, 2016). Although considered a different phenomenon, these two activities have a close relationship because they share the same resources and ultimately give similar satisfaction, pleasure, and experience. Therefore, looking for more opportunities for its implementation can be judged as recreational and leisure activities. This study focuses on the factors that drive international tourist travel, primarily related to exciting activities in the tourism sector.

Travel and tourism activities essentially involve the movement of individuals from one place to another or moving from one destination to another, from a familiar environment to a newer and refreshing atmosphere, from one country to another, from mental/self-stress factors to opportunities to relax, from desires then being fulfilled and subsequently from different expectations to frustrations (Beeton, 2015). Destination selection is a complex and challenging process. Due to the involvement and consideration of internal and external attributes, numerous contextual influences (Decrop & Snelders, 2005), and preferred destination, consumers obtain benefits based on what they want (Klenosky, 2002). For example, each trip will involve the choice of the intended destination, the safety factors of the intended destination, and the satisfaction gained from the visit to that destination. Travel is also used as a channel for learning, acquiring new knowledge, and improving one's thinking skills.

Travel generally involves visits to recreational areas consisting of various sources (such as water and natural nature) and exciting tourist areas in various locations such as the city centre area, warring islands, village areas, mountains, heritage areas, and history. Mc Kercher (2015), every trip done is considered an activity of choice, and it becomes a reality if adequate and robust financial resources, free time possessed, and when significant needs have been given priority. This concept of travel is very closely related to humans and nature. This situation makes it very complex to study why people travel and why such pleasure is needed (Yoon and Uysal (2005). Motivational factors are one of the difficult branches in the study of tourism (Sharpley, 2006). This is because motives will always change with the passage of time and circumstances (Seaton & Bennet, 1996). Understanding traveller motivation is critical for marketers and market segmentation (Crompton, 1979). It is different for each place and time for motivational studies. In the involvement of tourism activities, each tourist is different based on age, motivation, and desire (Pearce, 2005), and among the examples of international tourist motivation are leisure purposes. Landscape attraction factors (Correia et al., 2008), knowledge factors, and cultural and historical attractions lead to international travel generation (Assiouras et al., 2014).

The tourism industry is among the most dynamic sectors in the economy today. The increasing international tourist arrivals, which has increased throughout the year, has increased world economic growth. Malaysia is the second destination of choice for tourists in Southeast Asia. Promoting a country's destinations internationally is essential in attracting tourists. However, most countries compete aggressively in promoting their tourism in the market (Crouch, 1994), and the results obtained are unexpected, which is considered an 'information gap.' Malaysia, for example, through the Ministry of Tourism, Arts, and Culture, Malaysia has promoted Malaysia as 'Malaysia Truly Asia' because it has cultural diversity, uniqueness, historical elements, various elements of natural attractions, and various food choices and tastes and so on.

Overall, past studies have discussed the motivational factors that lead to the generation of international tourist travel where it includes the characteristics of tourists' sensitivity (Nicolau, 2008) to international travel behaviour using trains (Georverden, 2008). Bao and McKercher (2008), McKercher (2008) have focused on international travel more on distance. Whereas for Correia et al. (2008), Cai and Li (2009), Lie et al. (2013), and Assiouras et al. (2014), the motivational factor of international tourists are more focused on tourist segmentation. Based on several studies stated, it is seen that these international travellers have various motivations and fulfil self-satisfaction and experience of the trip.

Based on previous studies, what can be seen is that it is done on international travel in Europe and America, which involves various aspects of tourism. However, there is still a lack of focus on research conducted in Southeast Asia and Malaysia in general. Therefore, this study will identify the sociodemographic and characteristics of international tourist travel to Penang, determine the main push motivations that drive international tourists to Penang, determine the primary attraction motivations attention of international travellers to Pulau Pinang, and assess the relationship among sociodemographic, travel characteristics, and motivations for repulsion and attraction of international travellers to Pulau Pinang.

LITERATURE REVIEW

Travel Motivation

The desire to travel causes motivation. The motive for travelling is due to meeting emotional and cognitive needs. Swain and Mishra (2011) the purpose of motivation is to escape from the actual routine by finding something new, i.e., being in a different atmosphere. Figure 2 explains the relationship between travel needs and motivation, finding that when individuals desire to travel, they will seek and collect information of preferred destinations and, in turn, realise the motivation of the trip. Travelling helps in providing psychological satisfaction and psychological needs of the individual.

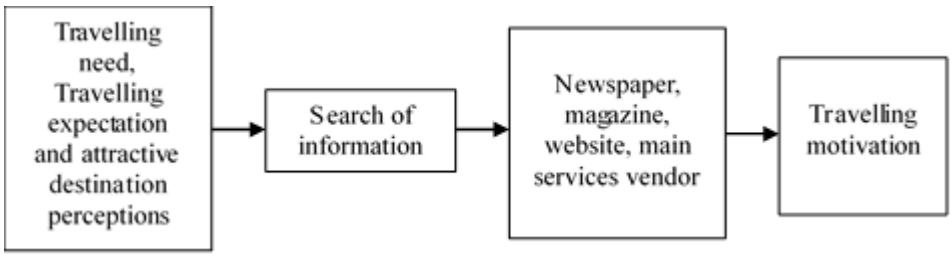

Figure 2: A correlation between travelling needs and motivation
Sumber: Swain dan Mishra, 2011

Motivation is the will or drive and emotion that leads someone to act. Motivation and emotion are elements that are closely related. The user causes will feel positive if their wishes and desires are achieved and will be harmful if otherwise (Kardes et al., 2011). This is because a psychological will is a basic need every human being faces. Travel motivation factors can be seen in various forms of disciplines that have led to methods in tourism. Tourism motivation can be seen in four primary categories, namely cultural motivation (personal desire), physical motivation (physical fitness), interpersonal motivation (new experience), and learning motivation and prestige (self-development) (McIntosh et al., 1995).

Relationship Between Sociodemographic, Travel Characteristics and Travel Motivation (Repulsion and Pull Factors)

The demographic profile is a significant factor in generating individual travel such as adventure, resort and nature, urban environment, values and budget, history and culture, friendly environment, and outdoor sports activities (Baloglu, 1997). This finding has been substantiated by studies of travellers' motivation to enter Pulau Pinang, where demographic factors such as age and income ratings have provided the primary motivations for travellers' trips (Bashar, 2011; Yousefi, 2011). Factors of age and total income influence the selection of tourist destinations as well as the determination of the distance of the destination (Zimmer et al., 1995; Weaver et al., 1994) and so encourage individuals to go out on vacation more often and choose locations farther from their homes to fill leisure time, enjoy nature and experience. The push factor is based on the desire to escape, relax, unwind, health, fitness, adventure, and social interaction. According to You et al. (2000), repulsive factors can explain the reason and purpose of a person travelling because it is closely related to external motivational forces. Other repulsive factors are ego enhancement and self-improvement, knowledge-seeking, relaxation, and socialising. While from the perspective of attraction factors, it is closely related to the destination of choice or tourism resources such as beaches, offering consumer facilities, scenery services, and cultural activities. The attraction factor of this destination is to cover the aspect

of the equipment that causes tourists to come to visit and stay without any hesitation (Swain & Mishra, 2011). The strength of this pull factor indirectly continues to drive travellers' movement and helps decide to go to a destination. According to Bieger and Laesser (2002), all demographic factors (gender, age, education, occupation, number of households, and income) and travel characteristics (destination, transportation, and length of stay) had a significant relationship with push and pull motivation.

METHODOLOGY

Study Area

The selection of international travellers is based on the distance between Pulau Pinang (Georgetown) and the country involved. Tourism in Penang started around the beginning of 1834 and was marketed as a 3S destination, namely, sun, sea, and sand. In 1990, heritage tourism focused on preserving and conserving historical and cultural buildings (Omar et al., 2015). As a result, George Town and Melaka have been recognised by UNESCO as a World Heritage City, and the number of tourist visits is increasing. Penang is famous for having various tourism assets such as historical relics, heritage, culture and food. Remains of history can still be seen around George Town, lined with rows of old shophouses and buildings, dating back to British colonial times. Multiculturalism as Malays, Chinese, and Indians can be seen around the path of harmony in the Little India area, Lebuh Armenian and Jalan Masjid Kapitan Keling. Some various attractions and products have been marketed by the Pulau Pinang Kingdom, such as physical and natural attractions and the heritage trail that is also promoted, namely the Penang Heritage Trails, which started at Fort Cornwallis-Penang Town Hall-Convent Light Street-Love Lane- Goddess of Mercy Temple and ended him Little India. The scenario of international tourist arrivals to Penang is very encouraging based on the statistics of tourist arrivals that increase throughout the year.

DATA COLLECTION AND ANALYSIS

This study had employed a quantitative approach. The questionnaires were distributed to 370 international tourists through random sampling around the tourist attractions in Penang. The Respondents must complete the survey regarding sociodemographic, travel characteristics, and travel motivation. The data obtained from the respondents were analysed using SPSS, and the findings were compared and used as a guide in developing criteria and strategies for the tourism development framework in the study area.

RESULTS

The demographic characteristics of international tourists to Penang

Demographic	Kategori	Frequency	Percentage
Region	Asia	5	1.4
	Europe	289	78.1
	Africa	8	2.2
	America	54	14.6
	Oceania	14	3.8
Sex	Male	191	51.6
	Female	178	48.1
Age	Below 20	27	7.3
	21 - 30	208	56.2
	31 - 40	79	21.4
	41 - 50	22	5.9
	51 - 60	19	5.1
	60 keatas	14	3.8
Education level	No formal education	1	0.3
	Primary School	3	0.8
	Secondary School	54	14.6
	Diploma	46	12.4
	Bachelor Degree	139	37.6
	Master	98	26.5
	Phd	12	3.2
	Others	16	4.3
Occupation	Professional	107	28.9
	Government sector	26	7.0
	Private sector	44	11.9
	Self-employed	31	8.4
	Own business	13	3.5
	Retired	10	2.7
	Housewife	2	0.5
	Student	68	18.4
	Unemployed	48	13.0
	Others	21	5.7
Continuation from previous table			
Travelling mode	Solo	113	30.5
	Couple	129	34.9
	Group	82	22.2
	Family	28	7.6
	Relatives	9	2.4
	Business partners	5	1.4
	Travelling package	1	0.3
	Others	2	0.5

Income (USD)	<1500	110	29.7
	1501 – 3000	92	24.9
	3001 – 4500	48	13.0
	4501 – 6000	18	4.9
	6001 – 7500	6	1.6
	More than 7501	22	5.9
	No income	58	15.7
Trip	First time	299	80.8
	Repeat	71	19.2
Duration staying in Penang	2 days	76	20.6
	3 days	102	27.6
	4-7 days	143	38.6
	>15 days	14	3.8
	Not sure	1	0.3
Duration staying in Malaysia	Less than 7 days	84	22.7
	8-14 days	122	33.0
	15-29 days	76	20.5
	>1 month	83	22.4
Getting information about Penang via	Internet	189	51.1
	Travel package	13	3.5
	Newspapers, magazine, brouchers	21	5.7
	Previous travelling	34	9.2
	Air lines agencies	4	1.1
	Tourist Information Center	6	1.6
	Family/friends	186	50.3
	Reference books	129	34.9
	Tv & Radio	9	2.4
	Word of Mouth	95	25.7
	Others	18	4.9

Results from the demographic analysis of respondents (Refer to Table 5.2) found that 78.1%were tourists from Europe followed by America (14.6%), Oceania (3.8%), Africa (2.2%) and Asia (1.4%). There is a significant difference in the percentage of tourists by continent, especially tourists from Asia, this is due to the reluctance of tourists to cooperate when conducting the survey. The main factor is due to the language, most of the long -distance tourists from Asia are composed of tourists from Japan and middle eastern countries, they are not very fluent in using English is difficult to get a response from them. Among these long -distance tourists, there are those who use tour package services, and most 'tourist guides' do not want their tourists to be disturbed. This makes it difficult for researchers to obtain a large sample of Asian tourists.

A total of 51.6% of respondents are male compared to 48.9% are female. Most of the respondents are aged between 21-30 years which is 56.2%. A total of 67.3%of respondents have higher education, namely degree and above, secondary school (14.6%), diploma (12.4%), others (4.3%), primary school (0.8%) and no formal education (0.3%). Respondents comprised professionals of 28.9%, followed by students (18.4%). The highest income among respondents was less than USD1,500 (29.7%), followed by USD1,501-3,000 (24.9%), while 15.7%had no income. The majority of respondents are first -time tourists (80.8%) compared to repeat tourists which is 19.2%. In addition, the highest length of stay of respondents in Penang was around 4-7 days (38.6%), followed by 3 days (27.6%), 2 days (20.6%). The period of 8-14 days (33%) is the highest period of respondents living in Malaysia followed by less than 7 days (22.7%), more than 1 month (22.4%) and 15-29 days (20.5%).

The first objective was to identify the demographic characteristics of international tourists to Penang, and the results of the study explained that these international tourists consist of young people aged between 21-20 years. However, the findings obtained are different from the results of the studies by Crouch (1994) and McKercher (2008), which states that international tourists consist of older people who have the time and income or savings to be able to cover their expenses while travelling to gain experience from it (Pearce & Lee, 2005). Most of these tourists are involved with various destinations, and they spend most of their time visiting several countries before reaching Penang. These tourists also do not continue to return to their country of origin but continue to travel to other countries. This can be seen based on whether they travel from countries around the Southeast Asian region. Based on the observation by Mill dan Morrison (1998), Tideswell and Faulker (1999), and Hwang and Fesenmaier (2003), explained that every international traveller is involved with travel in various destinations and involves different purposes of satisfaction. The study also revealed that the tourists who come to Penang are young tourists with a limited budget and have travel characteristics such as backpackers. These findings are based on the amount of shopping, types of budget lodging (housing houses), the use of public transport, and trips to various destinations (most of them travel before and after around the Southeast Asian region before returning to their home destinations).

The motivation to want to 'seek knowledge and innovation' is the main thrust that drives travel generation

The second objective explains that the motivation to want to 'seek knowledge and innovation' is the main thrust that drives travel generation. Tourists usually only know their neighbours, not distant countries (Crouch, 1994). Each complete piece of information will allow tourists to draw a more profound curiosity to explore a different experience from their everyday lives. Aggressive promotion and

effective delivery of information to tourists will indirectly provide knowledge and stimulate international tourists to generate trips to travel to places of interest, as it is known that these international tourists are first-time tourists. Effective marketing and delivery of information to international tourists will attract them to come and travel to exciting places in Malaysia, such as Penang.

The motivation of the main attractions that can attract international tourists
The third objective is to determine the motivation of the main attractions that can attract international tourists. The results explain that the 'cultural and historical' factor is the most influential motivation to the generation of tourist travel. This 'cultural and historical' factor is to feel the local community's experiences and cultural differences. What is emphasised is that each country has a different charm, uniqueness, local authenticity. For Penang itself, it is a state located in the North of Peninsular Malaysia offering diversity and identity in terms of culture (multi-racial society, different foods, practices, and beliefs), and even has historical relics that can be seen and lived around George Town). This has been confirmed when Penang has substantial tourism assets and products such as the World Heritage Site in George Town, which has received recognition from UNESCO.

DISCUSSION

The travel motivation factor is a significant factor in explaining and understanding international tourists' travel behaviour that varies from wants and desires. In this study, the travel motivation of international tourists to Penang is based on sociodemographic, travel characteristics, and travel motivation. The push and pull theory (Dann, 1977; Crompton, 1979) has been used to determine the relationship between each variable of international travel, based on the urge (desire or desire) and attraction (destination) to take a vacation. Motivation for 'seeking knowledge and innovation' is a motivational factor that drives the movement of international tourists who aim to recognise and learn about the value of a place. The element of 'culture and history is an attraction that is a factor that makes international tourists enter Penang because it has assets and tourism that can meet the needs of every tourist to meet their satisfaction and desires.

CONCLUSION

This study is seen to give implications to several aspects: theoretical and practical. First, motivational factors also have implications for the theory of international tourist travel. The generation of international tourist travel is influenced by tourist behaviour and the motivation of the push and attraction of tourists to determine international travel. Next is the practical implications of where it is possible to understand the phenomenon of international tourists itself.

Finally, practical implications can contribute to understanding the contribution of international tourist groups to the tourism sector in Penang.

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PROPERTY CRIME INCIDENCE AND PATTERNS IN MALAYSIA FROM 2007 TO 2017

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Abstract

Crime is a social problem faced by all communities and ranges from property loss or damage to violent events such as murder and robbery. Crime trends are associated with many factors including mental health, unemployment rates, educational status and policing strategies. In this article, we provide property crime datasets for Malaysia from 2007 to 2017. The data were gathered from all reported cases at district police stations and contingent (state and federal territory levels) headquarters. This information was extracted from the Malaysian Police Reporting System (PRS) and divided into five categories; theft, car theft, motorcycle theft, van/lorry/heavy machinery theft and housebreaking. Overall, there were 1,361,320 property crime cases were reported from 2007 to 2017. Theft and motorcycle theft were observed to be the most common types of property crime in Malaysia. In general, property crime cases continue to decline from 163,317 cases in 2007 to only 77,562 in 2017 due to government initiatives and a proactive policing policy. The same downward trend in overall property crime was also observed at state and federal territory levels and is mainly due to a drop in the volume of theft and motorcycle theft cases.

Keywords: Property crimes, housebreaking, crime trends, proactive policing policy, Malaysia

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INTRODUCTION

Public safety is a critical aspect of community welfare. Many countries are facing public safety disturbances due to increases in criminal activity and changes in crime trends. These crimes range from property loss or damage and housebreaking to violent events such as murder, robbery and rape. Crime trends are associated with many factors, including, but not limited to, socio-economic conditions, social inequality and unemployment rates (Hale, 1998; Talha, 2008; Fougère et al., 2009; Newburn, 2016). They are also related to the effectiveness of pragmatic actions such as policing strategies for crime prevention and the efficiency of the criminal justice system.

The Royal Malaysia Police (RMP), a leading law enforcement agency in Malaysia classifies crime into two indices, property and violent crimes. Property crimes include theft, car theft, motorcycle theft, other motor vehicle (van, lorry, heavy machinery) theft and housebreaking cases while murder, rape, robbery and voluntarily causing hurt are classified as violent crimes. Other crimes such as domestic violence are broadly classified as non-index crimes. However, both index and non-index crimes are recorded in the Police Reporting System (PRS), the online platform developed by the Royal Malaysia Police to record and store data on crimes reported by the public (Hakim et al., 2019a).

In this study, we provide recent data for property crime in Malaysia over the period from 2007 to 2017 extracted from the PRS. Combined with our previous report on violent crime cases (Hakim et al., 2019a), the property crime statistics presented here provide more extensive documentation of index crimes in Malaysia. Both, property and violent crime datasets can thus made more widely available to potentially interested groups of readers including the general public, the forensic community and the entire body of law enforcement practitioners. These data can now further be aligned with other socio-economic factors that may be associated with property crime and can be used as guidelines to evaluate and revise existing enforcement practices, legislation, crime awareness programs and policing strategies.

MATERIALS AND METHODS

This is a retrospective study based on property crime data extracted from PRS with written permission from the Inspector General Police of Malaysia, as previously described for violent crimes (Hakim et al., 2019a). Current practice at Royal Malaysia Police (RMP) is to group property crime cases into five classes; theft, car theft, motorcycle theft, van/lorry/heavy machinery theft and housebreaking; refer to Table 1 for legal definitions. Therefore, the reported property crime cases deposited with this data article only represent those classes of property crime cases as investigated by RMP in Peninsular Malaysia, Borneo

(Sabah and Sarawak) and Federal Territory of Kuala Lumpur. It is important to note that reported property crime cases in the Federal Territories of Putrajaya and Labuan were included with the Kuala Lumpur and Sabah records, respectively. Data were analysed using descriptive analysis implemented in a Statistical Package for the Social Science software IBM SPSS version 25 (released 2017, Armonk, NY: IBM Corp) and shown in the forms of tables and line charts.

Table 1: Legal definition of property crimes in Penal Code (Act 574), Laws of Malaysia

Type	Definition
Theft	Is defined and classified based on Section 378-379 Penal Code (Act 574), Laws of Malaysia: *Whoever, intending to take dishonestly any movable property out of the possession of any person without that person's consent, moves that property in order to such taking, is said to commit "theft". Whoever commits "theft" shall be punished with imprisonment for a term which may extend to seven years or with fine or with both, and for a second or subsequent offence shall be punished with imprisonment and shall also be liable to fine or to whipping.*
Theft of a motor vehicle (motorcycle; car; van; lorry; and heavy machinery)	Is defined and classified based on Section 379A Penal Code (Act 574), Laws of Malaysia: *Whoever commits "theft of a motor vehicle" or any component part of a motor vehicle shall be punished with imprisonment for a term of not less than one year and not more than seven years, and shall also be liable to fine. In this section— component part, in relation to a motor vehicle, includes any tyre, accessory or equipment; motor vehicle means a mechanically propelled vehicle intended or adapted for use on roads, and includes a trailer drawn by a motor vehicle.*
Housebreaking	Is defined and classified based on Section 457 Penal Code (Act 574), Laws of Malaysia: *Whoever commits "lurking house-trespass" or "housebreaking", in order to commit any offence punishable with imprisonment, shall be punished with imprisonment for a term which may extend to five years, and shall also be liable to fine; and if the offence intended to be committed is theft, the term of the imprisonment may be extended to fourteen years; and for every second or subsequent offence shall in either case be liable to fine or whipping.*

RESULTS

The incidence of property crime cases in Malaysia over the last decade is shown in Table 2 and Figure 1. Overall, there were 1,361,320 property crime cases were reported from 2007 to 2017 with motorcycle theft and theft being the most common types of property crimes in Malaysia (Table 2 and Figures 1-6). In general, property crime cases continued to decline steadily from 163,317 cases in 2007 falling to 77,562 by 2017 (Table 2 and Figure 1). However, car theft, van/lorry/heavy machinery theft and housebreaking cases do show small year to year fluctuations in this trend between 2008 to 2014, 2007 to 2013 and 2007 to 2009, respectively (Figures 2-6). The downward trend in property crime was also observed at state and federal territory levels (Table S1-S14 and Figures S1-S14) which may be due to particularly large declines in the volumes of theft and motorcycle theft cases. Sabah, Sarawak and Negeri Sembilan are exceptions where the drop of property crime cases was also due to substantial decreases of housebreaking cases (Figures S6, S11 and S12 and Tables S6, S11 and S12).

Table 2: The total number of property crime cases in Malaysia

Year	Theft	Car Theft	Motorcycle Theft	Van/Lorry/Heavy Machinery Theft	Housebreaking	Total cases
2007	44,646	12,428	67,606	5,047	33,590	**163,317**
2008	41,215	15,198	67,359	6,263	35,588	**165,623**
2009	40,864	14,222	61,394	5,524	38,570	**160,574**
2010	36,406	15,290	54,557	4,774	35,052	**146,079**
2011	30,502	16,110	50,896	4,472	30,200	**132,180**
2012	24,299	16,196	51,259	4,526	24,939	**121,219**
2013	21,405	16,733	49,133	4,981	23,317	**115,569**
2014	19,664	13,407	43,025	4,076	20,587	**100,759**
2015	18,078	12,049	38,565	3,395	19,286	**91,373**
2016	19,894	10,607	34,754	3,050	18,760	**87,065**
2017	19,204	8,482	31,577	2,099	16,200	**77,562**
Total	**316,177**	**150,722**	**550,125**	**48,207**	**296,089**	**1,361,320**

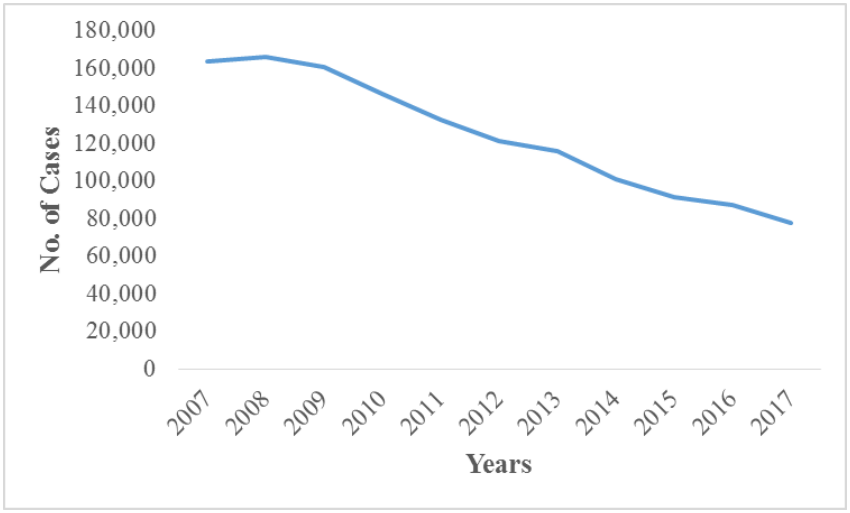

Figure 1: The pattern of total property crime cases in Malaysia from 2007 to 2017

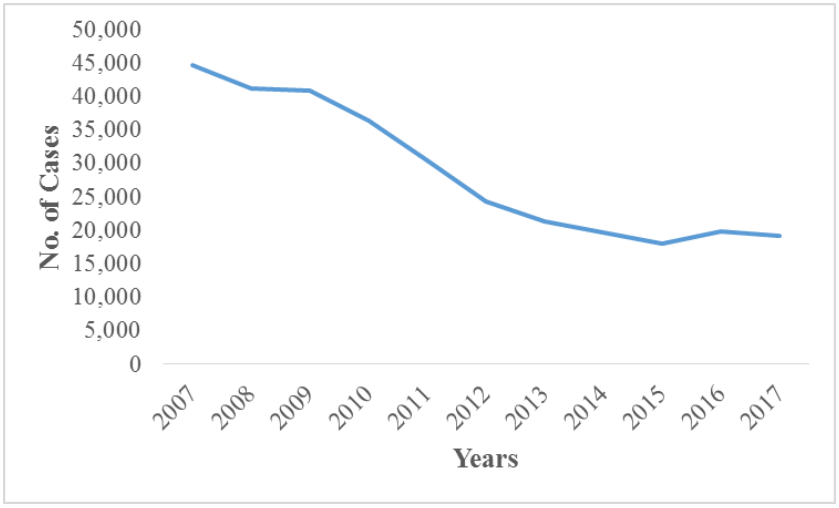

Figure 2: The pattern of theft cases in Malaysia from 2007 to 2017

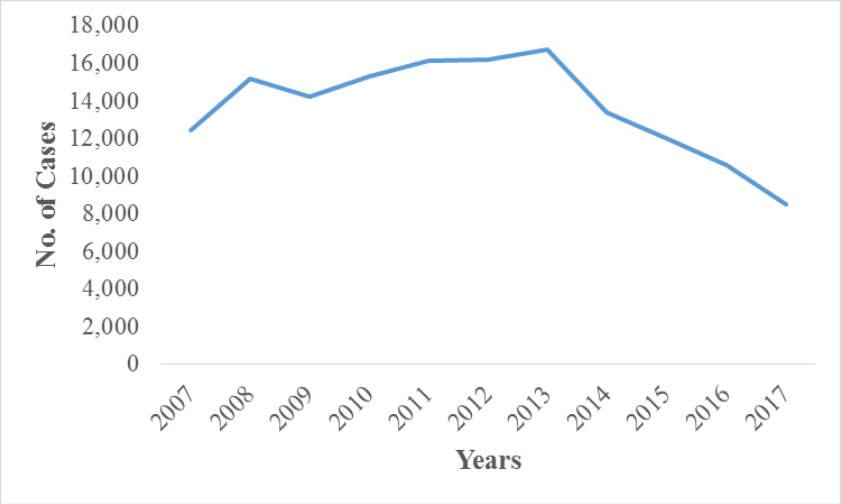

Figure 3: The pattern of car theft cases in Malaysia from 2007 to 2017

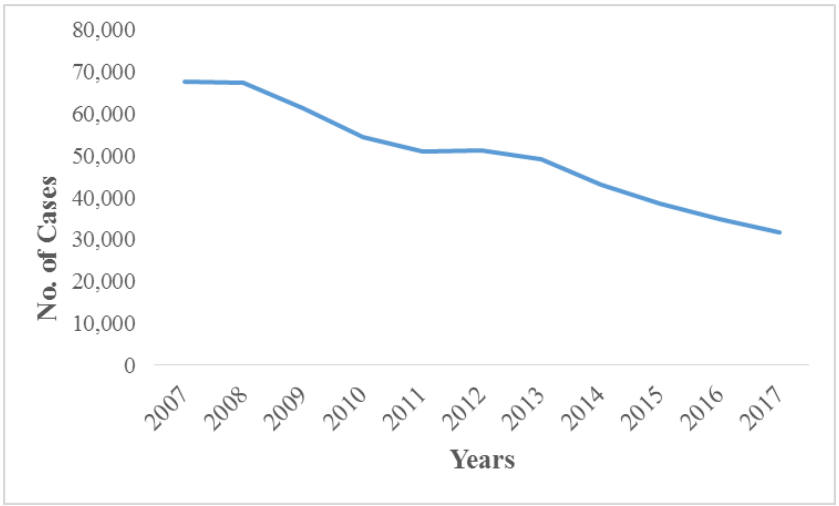

Figure 4: The pattern of motorcycle theft cases in Malaysia from 2007 to 2017

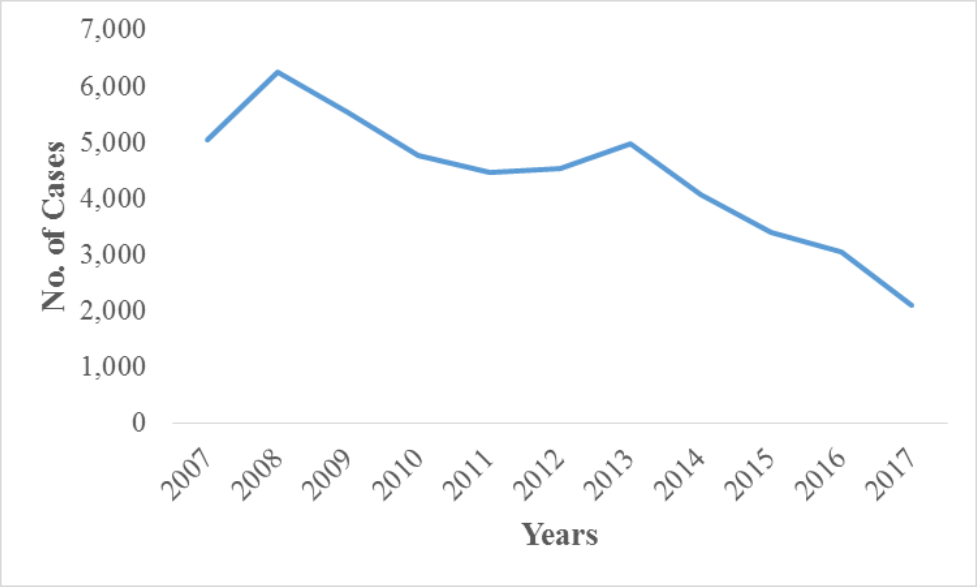

Figure 5: The pattern of van/lorry/heavy machinery theft cases in Malaysia from 2007 to 2017

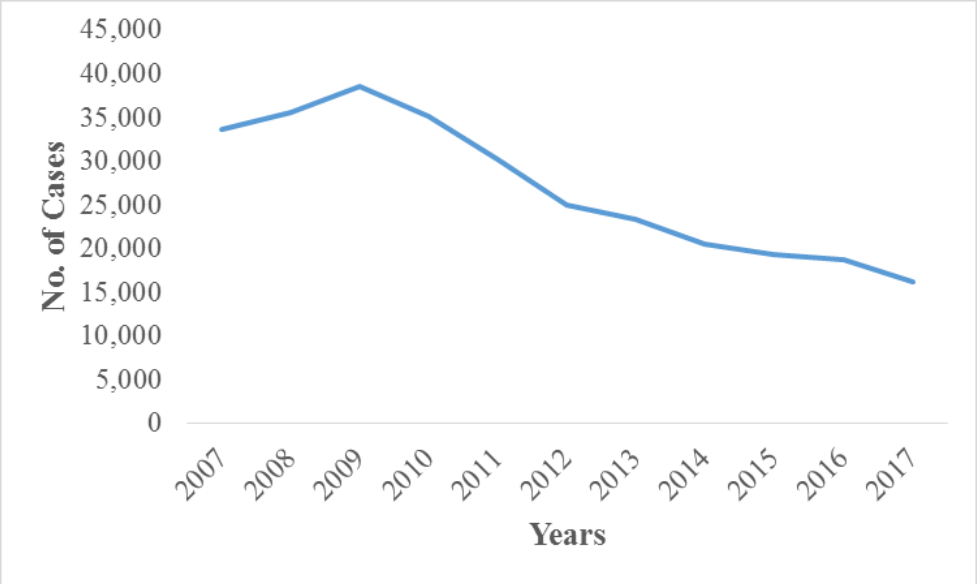

Figure 6: The pattern of housebreaking cases in Malaysia from 2007 to 2017

DISCUSSION

A total of 1,361,320 property crime cases were reported in these 11 years (Table 1). The property crimes are thus the most common (80.5%) index crimes compared with violent crimes cases (19.5%) reported in the same period in Malaysia (Hakim et al., 2019a; Jubit et al., 2020). A descriptive analysis shows that, the total property crime cases increased by 1.4% only in the year 2008 compared with 2007. In 2008, Asia and many other regions faced an economic downturn due to the global financial crisis (Keat, 2009; Lai & Ravenhill, 2012). This observation suggests that property crime rates may be driven by monetary returns (Soh, 2012; Ghani, 2017; Ishak & Mhd Bani, 2017). However, in general, the incidence of property crimes does continue to show a decreasing pattern from 2007 to 2017 and a similar trend was observed and reported for violent crime cases for the same 11-year period (Hakim et al., 2019a).

The downward trend of property crime in Malaysia is also derived from various social initiatives and proactive policies, which include the National Transformation Programme launched in 2010. In this program, seven National Key Results Areas (NKRAs) were identified following a series of dialogues, interviews and surveys with the public, focus groups, practitioners, academicians and experts. These NKRAs include improving student outcomes, increasing the living standard of a low-income families, improvements to basic infrastructure in the rural areas and to public transport in urban areas and reducing living costs, crime and corruption (PEMANDU, 2010; The Star Online, 2011). Accordingly, many crime prevention initiatives were launched such as increasing police presence, establishment of a new court for hearing of street crime cases and empowerment of community-oriented policing (e.g., *Rakan Cop*). The Safe Cities program led by the Ministry of Housing and Local Government in 2004 for example was expanded to include 151 local authorities across the country following the introduction of Government Transformation Programme (Shamsudin, 2008; PEMANDU, 2010; Shamsudin et al., 2013). The Safe City program is delivered via several crime prevention initiatives including installation of close circuit television monitors (CCTVs), safety mirrors, motorcycle locking systems and the integration of geographic information system methods (GIS) into Police Reporting Systems located at each police station for crime mapping (Muhamad Ludin et al., 2013; Lim et al., 2020). These measures have undoubtedly helped to reduce crime rates in Malaysia. In particular, index and street crimes decreased by more than 11% and 45% in 2012, as compared with figures recorded in 2011 and 2009, respectively (Shamsudin et al., 2013).

We would note two main limitations of the property crime data reported here. The first limitation is that there may be many crimes that were not reported and thus not recorded in the Police Reporting System. For example, it was estimated that there were more than 10 million crime cases in England and Wales

in 1981, but less than 3 million cases were reported and included in the official police count (Jansson, 2008). The large number of unreported crime cases is due to the nature of the crimes committed (e.g., ones where there is no loss or damage to the property) and to negative perceptions of the criminal justice system (e.g., delay, ineffectiveness or with the assumption that the crime cannot, or will not, be solved by enforcement agencies or perhaps will not even be investigated). Therefore, several initiatives to improve the public perception of safety and performance of our criminal justice system are warranted. These include those listed in the Government Transformation Programme (e.g., to improve response time to emergency calls, increase the number of investigating officers and clear up the backlog of thousands of relatively minor criminal cases) should be delivered to increase the fraction of crime cases reported in Malaysia (PEMANDU, 2010, Hakim et al., 2019b, Hakim et al., 2020).

The second limitation is the accuracy of criminal case classification by the police. Currently, only those crime cases classified under the Malaysia Act Penal Code 574 are officially recorded and included in national crime statistics. Other crime cases classified as No Further Action (NFA), Refer to Magistrate (RTM), or No Offence Declared (NOD) were not included in these statistics, even when there is evidence of direct participation by criminal elements (Amar Singh, 2005).

CONCLUSION

This article provides novel data for five categories of property crime cases extracted from PRS for the years 2007 to 2017 and are divided into five indices (theft, car theft, motorcycle theft, van/lorry/heavy machinery theft and housebreaking). Overall, property crime cases in Malaysia declined continuously throughout this period falling from 163,317 cases in 2007 to only 77,562 in 2017.

ACKNOWLEDGEMENT

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ENFORCEMENTS AND OFFENCES UNDER THE STRATA MANAGAMENT ACT

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Abstract

The rise in the number of strata residential buildings calls for the need for enforcement of governance relating to the wellbeing of strata residents as well as its management. The establishment of Management Body at the stage of Joint Management Body as well as the Management Corporation are both results of the enforcement of the Strata Management Act, that requires their registration with the Commissioner of Buildings (COB) to be given the rights to collect, manage and maintain the assigned residential strata properties. The aim of this study is to identify the most common issues occur under the legislation of strata management that results in the interference and enforcement by the COB, as replicated through to the number of enforcements taken by the COB. The result of the study shows that despite the enforcement of the Strata Management Act over the years, there are still a significant number of enforcement actions by the COB against the reported offences made with regards to the rights of both the residents as well as the management bodies. The constant rate of actions taken proves that there are still rooms for improvements within the Strata Act 757 itself to reduce issues, towards a more enforceable roles, standards and rules for future reference and service quality.

***Keyword**:* High-rise Residential, Strata Residential, Commissioner of Building, Strata Management Body

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INTRODUCTION

The increasing trend of high-rise strata living in urban Malaysian cities have further encouraged the growth of strata developments. Two Acts plays significant roles in ensuring the well-being of the purchasers, strata home owners as well as administering the developers and the management bodies, which is the Strata Title Act 1985 (Act 318) and the Strata Management Act 2013 (Act 757). Under the Act 757, with each completion of a stratified development, requires a management body to manage and maintain the building, facilities and the overall quality and sustainability of the common properties within the strata property, as well as the responsibilities of parties involved within the strata development.

Several studies have argued and concluded that the reality of the strata law that has given broad powers to the Management Bodies, but has failed to instil good governance. The law introduced does not counsel enforceable standards of good governance (Wong, 2019). Gaps were also found between the responsibilities of the management bodies and the residents' role in ensuring smooth management and maintenance works.

The objective of this paper is (i) to highlight the role of the strata management stakeholders, namely the Commissioner of Buildings (COB) and the management bodies, (ii) to analyse enforcements taken by the COB failure to comply with the Act 757 and (iii) to identify the most common issues raised based on the frequency of the enforcement taken. The outcome of this paper will identify whether the current existing Act 757 is sufficient and able to sustain the overall strata management ecosystem.

LITERATURE REVIEW

Commissioner of Building (COB)

The COB in respect of a local authority area is necessary to be appointed for the purpose of administering and carrying out the provisions of the Act 757. According to the Act 757, the COB under this act may perform the duties and powers as conferred upon. The COB's responsibilities include overlooking the registration of each Joint Management Body (JMB) and the Management Committee (MC) in fulfilling their responsibilities towards the residents and the residential strata properties. The Strata Management (Compounding of Offences) Regulations 2019 allows the Commissioner of Buildings (COB) to compound offences committed by strata owners as well as developers.

Management Bodies

The management bodies that may be in the form of a Joint Management body (JMB) or the Management Corporation (MC) varies according to different stage of strata management operation. The JMB, which consists of purchaser and tenants occupying the strata building and the strata developers is intended to

ensure self-management prior to the formation of MC (Khalid et al., 2017). The MC that comes into existence upon the expiry of the preliminary management period, post JMB period. Both the JMB and MC plays significant roles and duties in managing and maintaining strata buildings, delegated responsibilities under the provision of Act 757. Their responsibilities include the duties in relation to account, including the opening and managing the said account, the duty to convene first annual general meeting, to inform its name to Commissioner, as well as the duty and power to maintain and manage the strata buildings as registered. These duties will be the baseline of focus for this study, determining the most common and significant issues in operating a strata management body after the gazettement of the Act 757 in 2013.

Quality Components

Based on the responsibilities of the JMB and the MC, each strata schemes are then evaluated into star-rankings by the COB, according to the components of quality management. The quality components include (i) establishment & operation of management bodies, (ii) finance, (iii) maintenance, (iv) risk security management, and (v) population well-being. The evaluated strata schemes are assessed into 5-star ratings, 5-stars being the highest quality management. Based on the published COB Annual Reports, the following Table and Figure shows the distribution of strata schemes according to their star ratings:

Table 1: Total and Distribution of Strata Schemes' Star Rating

	2016	**2017**	**2018**	**2019**
5 Star	1%	1%	1%	1%
4 Star	3%	9%	10%	10%
3 Star	9%	18%	20%	18%
2 Star	7%	22%	31%	25%
1 Star	19%	50%	37%	47%
No record	61%	0%	0%	0%
Total Schemes	**19,886**	**8,275**	**4,364**	**5,739**

Source: COB Annual Report (2016-2019)

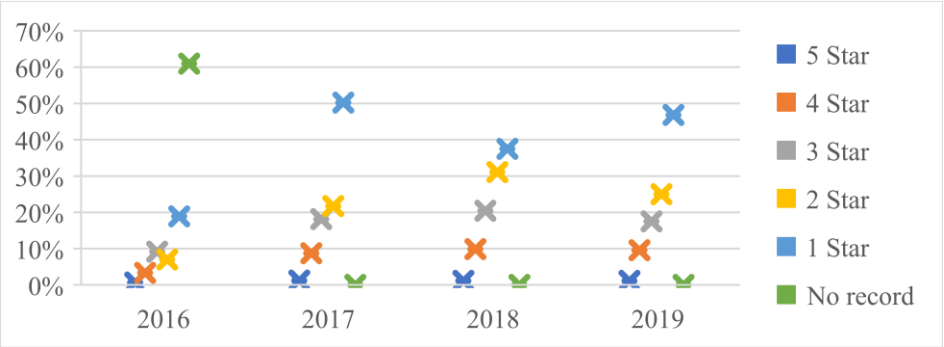


Figure 1: Strata Schemes Star Ratings
Source: COB Annual Report (2016-2019)

Each of the quality components are briefly defined as follows:

Establishment & Operation of Management Bodies
This component reflects the overall condition throughout the establishment of the JMB or MC, that typically involves the voting during the Annual General Meetings. This meeting will unanimously collect the agreement of the residents in forming the MC, or the annual report by the management bodies. This general meeting is conducted on annual basis, which would allow time for the operating management body to ensure quality management and to allow time for its operation to create significant impact to be assessed by both the residents as well as the COB. The baseline of a quality operation is the JMB or MC's ability to ensure all recordings and issues are taken care within accepted and reasonable time frame with utmost quality and assurance (KPKT, 2020).

Finance
The registered and established management bodies need to possess a stable and well audited finance statement that becomes a form of warranty that the appointed management bodies are able to conduct works related to management and maintenance without obstructed by any financial issues. Financial state includes the track record of every procurement processes conducted by the JMB or MC throughout their operation, the collection of the management fees as well as the management of the sinking funds. To ensure that the financial state of the management bodies is secured and well managed, the COB plays a huge role in conducting periodical assessment of audited management accounts. With this periodic practice, in which may be of surprise assessments, management bodies are expected to maintain and manage their bills and fund records organised throughout operation without fail.

The most common issue faced by the MC is poor collection of maintenance fee and sinking fund (Mohd Tawil et al., 2012). The actual cost to maintenance ration is a significant matter of discussion as it ensures the efficiency of the strata's management and maintenance works.

Maintenance

According to the Strata Management Handbook 2.0 (2020) by the Ministry of Housing and Local Government (Kementerian Perumahan dan Kerjaan Tempatan, KPKT), the facilities and amenities that should be managed and maintained by the JMB and MC includes leakage between levels, elevators, water tanks, and every other shared property to name a few. The procedures to reporting a maintenance or repair works was also provided in the Strata Management Handbook by KPKT. The procedure involves reporting, assessment by the JMB/MC, acknowledgement of damages and finally the repair works. However, common issues involve disagreement on the damages or maintenance claims, if such dispute occurs, the management body shall make a reference or consultation with the COB, to resolve the disagreement between both the resident and the management body. This consultation or negotiation phase may lead to a Tribunal or a mutual agreement for an actual repair works. The main goal to an efficient maintenance work is to achieve housing quality that associated with positive affect towards those living independently in the community (Evans et al., 2002). Other issues include those related to the condition of existing facilities within strata developments. According to a study done by Rabe et al., (2021), properties' that requires high maintenance and repair works includes items damaged due to vandalism, leakages of water tanks and pipes, damaged common spaces, roof leaking as well as the garbage house.

Risk Security Management

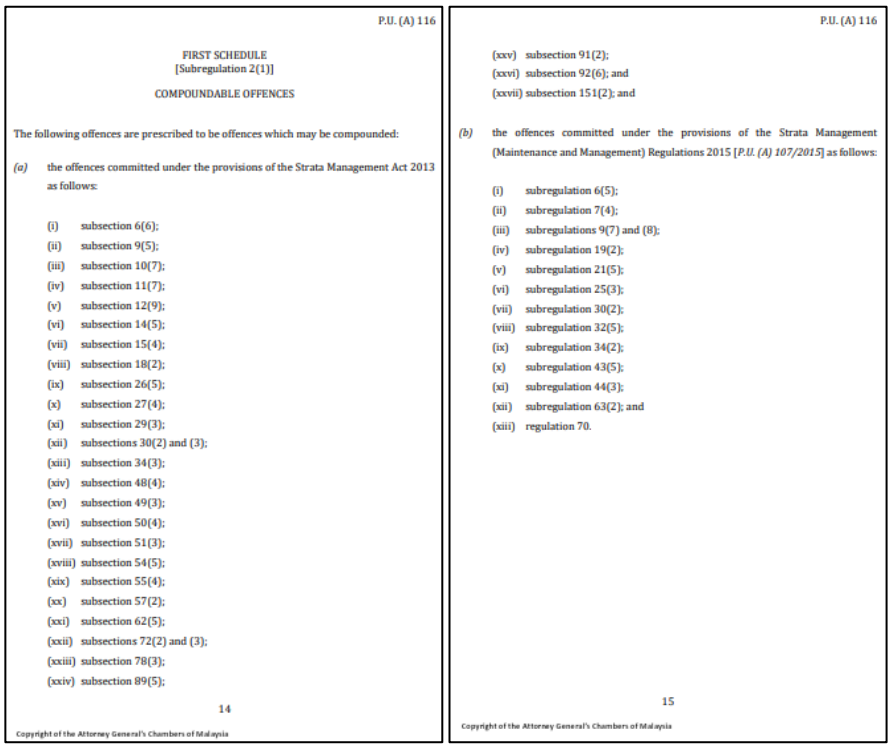
The practice of security risk management begins with a thorough and well-organized risk management. The main objective is to manage risks by harmonising the cost of protection measures with benefit (Peterson, 2010). Part of a strategic Facility Management function, it is important to establish clear objectives and statement in regard to the risk management and communicate with the organization in regards to the risk (Hashim et al., 2019).

Population Well-Being

The overall quality of living and well-being is greatly influenced by the surrounding neighbourhood, especially the neighbourhood's characteristics. The physical quality, as well as factors potentially relevant to health, this includes land use, density, street connectivity, infrastructure, access to nature and green space, public and open spaces, overall cleanliness and maintenance, air quality

and noise, including the general resources and access to public services, health care, schools, playgrounds, commercial functions (Berglund et al., 2017).

In reference to all five quality components that should be observed by management bodies, the COB has the right to take necessary actions against such failure to comply and offences. The COB's power to take action against offences committed by all parties involved in the strata management, the strata owners, management bodies as well as the developers. The 2019 Compound Regulations included 29 offences under the Act 757 and 19 offences under the Strata Management (Maintenance and Management) Regulations 2015 as listed in the First Schedule of the Regulation:



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FIRST SCHEDULE
[Subregulation 2(1)]

COMPOUNDABLE OFFENCES

The following offences are prescribed to be offences which may be compounded:

(a) the offences committed under the provisions of the Strata Management Act 2013 as follows:

(i) subsection 6(6);
(ii) subsection 9(5);
(iii) subsection 10(7);
(iv) subsection 11(7);
(v) subsection 12(9);
(vi) subsection 14(5);
(vii) subsection 15(4);
(viii) subsection 18(2);
(ix) subsection 26(5);
(x) subsection 27(4);
(xi) subsection 29(3);
(xii) subsections 30(2) and (3);
(xiii) subsection 34(3);
(xiv) subsection 48(4);
(xv) subsection 49(3);
(xvi) subsection 50(4);
(xvii) subsection 51(3);
(xviii) subsection 54(5);
(xix) subsection 55(4);
(xx) subsection 57(2);
(xxi) subsection 62(5);
(xxii) subsections 72(2) and (3);
(xxiii) subsection 78(3);
(xxiv) subsection 89(5);

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(xxv) subsection 91(2);
(xxvi) subsection 92(6); and
(xxvii) subsection 151(2); and

(b) the offences committed under the provisions of the Strata Management (Maintenance and Management) Regulations 2015 [*P.U. (A) 107/2015*] as follows:

(i) subregulation 6(5);
(ii) subregulation 7(4);
(iii) subregulations 9(7) and (8);
(iv) subregulation 19(2);
(v) subregulation 21(5);
(vi) subregulation 25(3);
(vii) subregulation 30(2);
(viii) subregulation 32(5);
(ix) subregulation 34(2);
(x) subregulation 43(5);
(xi) subregulation 44(3);
(xii) subregulation 63(2); and
(xiii) regulation 70.

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Figure 2: Strata Management (Compounding of Offences) Regulations 2019, First Schedule

RESEARCH METHODOLOGY

This study conducts qualitative research, a document analysis, driven by the objective formulated, an analysis over data recorded by the COB and the National Housing Department (Jabatan Perumahan Negara, JPN) between the year 2017 to 2020. This analysis aims to show whether the gazettement of the Act 757 has

the ability to improve the state of strata governance from the year it was gazetted and enforced in 2013. This data analysis discusses on the quality management with evidence provided within the available data set. The analysis is expected to show the most common and significant issues encountered through the enforcements taken by the COB according to the filed complaints and offences. The same data set will also be able to show the progressive state of management bodies throughout the years. The introduction of the Act 757 is expected to improve the overall quality, complementing its potential towards good governance.

For the data analysis, several methods including descriptive analysis by using frequency are presented in this paper. Comparison between number of enforcements should be able to reflect the current state of the strata governance. The data range taken from the post gazettement of the Act 757 (2017 to 2020), that should reflect the effectiveness as well as the flaws of the provisioned act. The result should reflect the offences made despite the gazettement and enforcement of the Act, according to the discussion drawn from the data used in the following calculation. Each analysis and discussion are based on data collected throughout the Peninsular of Malaysia including two Federal Territories (WP), the WP Kuala Lumpur and WP Labuan as reported and published by the KPKT.

ANALYSIS AND DISCUSSION

Table 2 shows the detailed offences under related sections, enforcement taken within the year 2020. From this table, it shows that the four highest number of enforcements taken, are related to the collected sums and matters of the account. Hence, the conclusion for the year 2020, matters in relation to the collection of fees and its accounts has the highest rate of non-compliance which leads to enforcements taken.

Table 2: Number of enforcements taken in the year 2020.

Section. No.	Quantity	Default by	Offence against (Section heading)
Sect. 13(3)	9	Any person	Prohibition on collection of moneys before accounts are opened
Sect. 123	284	Any person	Criminal penalty for failure to comply with (Tribunal) award
Sect. 6(6)	40	Developer	Schedule of parcels to be filed with the Commissioner before sale of any parcel
Sect. 9(5)	3	Developer	Duties and powers of developer during developer's management period
Sect. 10(7)	8	Any person / Developer	Developer to establish maintenance account
Sect. 11(7)	8	Any person / Developer	Developer to establish sinking fund account

Section. No.	Quantity	Default by	Offence against (Section heading)
Sect. 12(9)	1	Developer	Purchaser and developer to pay Charges and contribution to sinking fund
Sect. 14(5)	3	Developer	Duties of developer in relation to accounts
Sect. 15(4)	22	Developer	Handing over by developer to the joint management body
Sect. 18(2)	28	Developer	Duty of developer to convene first annual general meeting of joint management body
Sect. 25(5)(6)	500	Purchaser	Parcel Owners to pay charges and contribution to the sinking fund, to the joint MB
Sect. 26(5)	86	MB	Offence against "Duties of joint management body in relation to accounts"
Sect. 27(4)	5	JMB	Dissolution of joint management body
Sect. 29(3)	20	Developer	Duty of developer in respect of Charges for building or land intended for subdivision into parcels completed before commencement of this Act
Sect. 30(2) @ 30(3)	49	Developer / JMB	Register of parcel owners
Sect. 34(3)	1,308	Purchaser	Procedure on recovery of sums due
Sect. 48(4)	1	Developer	Duties and powers of developer to maintain and manage
Sect. 55(4)	4	Developer	Handing over of control to Management Corporation
Sect. 57(2)	23	MC	Duty of developer to convene first annual general meeting
Sect. 62(5)	131	MC	Duties of joint management body in relation to accounts
Sect. 72(2) @72(3)	10	Developer	Strata Roll
Sect. 78(3)	1,369	Purchaser	Procedure on recovery of sums due
Sect. 89(5)	6	Managing Agent	Powers and duties of managing agent
Sect. 91(2)	16	Managing Agent	Termination of Management Agreement
Sect. 92(6)	66	Developer	Developer to pay deposit to rectify defects on common property
Sect. 126(7)	1	Any Person	Search and seizure with warrant

Source: COB 2020 Data and Author's Calculation

To further analyse whether such account and collected sum matter are of a significant and re-occurring issue throughout the years, by comparison, the data set below shows the number of enforcements taken between the year 2017 until 2020 according to the local authorities' strata scheme categories, Category 1 (More than 50,000 parcels), Category 2 (10,000 parcels to 50,000 parcels, Category 3 (3,000 parcels to 10,000 parcels) and Category 4 (Less than 3,000 parcels).

Figure 3 shows the overall number of enforcements taken according to the years, 2019 with the highest number of enforcements, followed by 2017, 2018, and then 2020. Category 1 having the highest number of schemes shows the highest number of enforcements taken as well. Based on the overall number of enforcements taken, further analysis was done to determine, by ranking, the top five highest number of enforcements according to the studied years, from 2017 until 2020.

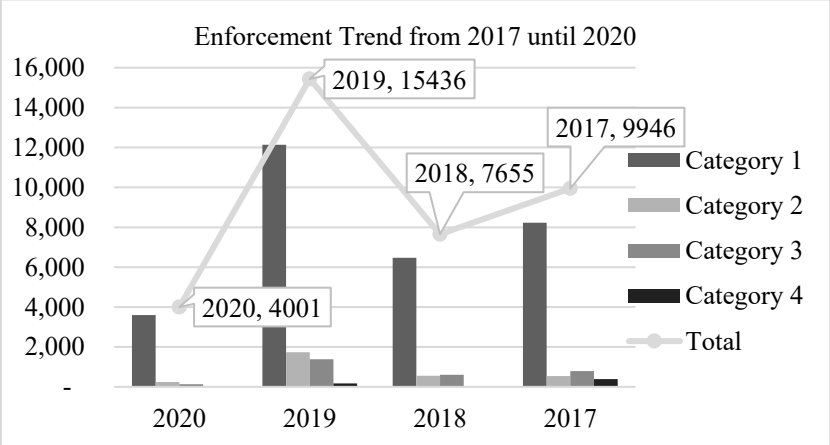

Figure 3: Enforcement Trend from 2017 until 2020
Source: KPKT (2017, 2018, 2019)*Commissioner of Buildings (2020) & Author's Calculation* (2021)

Based on the numbers reported and the Author's calculation, Table 3 shows the top five number of enforcements taken take up the higher percentage from the overall number of enforcements taken for each studied year. In 2020, 3,592 enforcements taken is equal to 90% from the overall recorded enforcement taken, 70% (10,869 enforcements) in 2019, 88% (6,747 enforcements) in 2018 and 91% (9,015 enforcements) in 2017.

Table 3: Highest Number of Enforcements for the year 2017 until 2020, in Ranking

Rank	2020	2019	2018	2017
1	Section 78(3) - 1,369 cases	Section 34(3) - 4,300 cases	Section 34(3) - 4,494 cases	Section 34(3) - 6,152 cases
2	Section 34(3) - 1,308 cases	Section 78(3) - 2,043 cases	Section 78(3) - 1,344 cases	Section 72(2)(3) - 1229 cases
3	Section 25(5)(6) – 500 cases	Regulation 32(5) - 1,862 cases	Section 123 - 368 cases	Section 78(3) - 639 cases
4	Section 123 - 284 cases	Regulation 21(5) - 1,817 cases	Regulation 34(2) - 366 cases	Section 9(7) - 545 cases

Rank	2020	2019	2018	2017
5	Section 62(5) – 131 cases	Regulation 34(2) - 847 cases	Section 18(2) - 175 cases	Section 48(4) - 472 cases
Total	**3,592**	**10,869**	**6,747**	**9,015**

Source: Author's Calculation

This study looks further into the description of the sections involved. Table 4 shows the calculated outcome of enforcements according to the sections under the Act 757. The result shown highlights that the three highest enforcements taken were in regards to the sum due (financial matters). that occurs during different stages in Strata Management.

Table 4: Total Number of Enforcements Taken throughout 2017 until 2020 According to the Act 757 provisions

Ranking	Section No.	Description / Offences	Number of Cases
1	Section 34(3)	Procedure on recovery of sums due – purchaser / owner fails to comply to notice	16,254 (53.7%)
2	Section 78(3)	Procedure on recovery of sums due – proprietor fails to comply to notice	5395 (17.8%)
3	Regulation 34(2)	Procedure on recovery of sums due –filed claims against purchaser / owner	1213 (4.0%)
4	Section 123	Criminal penalty for failure to comply with award	652 (2.2%)
5	Regulation 32(5)	Services of any person or agent to maintain and manage common property – Failure to comply	1,862 (6.2%)
6	Regulation 21(5)	Services of any person or agent to maintain and manage common property – Failure to comply	1,817 (6.0%)
7	Section 72(2) @72(3)	Strata Roll – Failure to comply	1,229 (4.1%)
8	Regulation 9(7)	Duties and powers of developer during developer's management period	545 (1.8%)
9	Section 25(5) @ 25(6)	Parcel owners to pay Charges and contribution to the sinking fund, to the joint management body	500 (1.7%)
10	Section 48(4)	Duties and powers of developer to maintain and manage	472 (1.6%)
11	Section 18(2)	Duty of developer to convene first annual general meeting of joint management body	175 (0.6%)
12	Section 62(5)	Duties of joint management body in relation to accounts	131 (0.4%)

Source: Author's Calculation

The top three highest number enforcements taken by the COB against offences relating to financial matters is parallel to another separate study that concluded,

the top two most challenging matter in strata management is to ensure all unit owners to pay their maintenance fee and to collect monthly maintenance fee form owners/residents (Darul Nafis Abas et al., 2021).

CONCLUSION

This study has been able to explore the roles of the strata management stakeholders, namely the Commissioner of Buildings (COB) and the management bodies under the Act 757. The quality of the current landscape of the strata management, was drawn to conclusion through the analysed data. The astounding number of offences made and failure to comply, as well as the enforcement actions taken by the COB was able to highlight and identify the most common issues occurs in Strata Management.

Thus far, the Author is able to conclude that despite the acceptance and employment of the Act 757 and its regulations, the adoption of the Act can further be amended towards a more enforceable standards, rules and rights in strata management for the improvement of the overall quality of strata management.

The analysis concludes that majority of the offences made by parties involved are provisions related to the contribution to the maintenance and management fees, strata roll as well as roles and responsibilities of the management bodies. Both the management and the strata owners have the right to report and make claims against the other party that fails to comply with the Act and its regulations. The COB, having the governance power to ensure the effectiveness of the Act including the power to enforce.

As the development of strata properties continues to increase all over the country, the COB is expected to play a stricter enforcement, ensuring compliance by all related parties regulated under the Act 757. Further study is required for future review and amendments of the Act to improve such authority, thus, to be more integrated, inclusive, and fair for all parties in line with the rapid strata development.

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INVESTIGATING THE CURRENT RISK MANAGEMENT PROCESS PRACTICE IN MALAYSIAN LANDSCAPE PLANNING PROJECTS

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Abstract

The Malaysian landscape planning projects are dynamic, subjective, and fast-tracked, causing multiple risks. Hence, risk management practice is needed to manage risks. However, the risk management process is not managed comprehensively despite the considerable capability of project practitioners to predict, analyse, and treat project risks, causing the project to underperform. This study has investigated the current risk management process in Malaysian landscape planning projects. Data were gathered through semi-structured interviews with twenty-four landscape architect practitioners from Klang Valley. The information from the interviews was analysed utilising the content and thematic analysis method. The six steps of the risk management process were not managed following the suggested methodology, whereby the procedure was carried out in an ad hoc, unstructured, and incomplete manner. This action has caused extensive risk impact which affected project performances. This finding will teach project practitioners to evaluate their current practice and recommend the adoption of formal risk management in landscape planning projects.

Keywords: risk management; risk management process; landscape planning project

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INTRODUCTION

The nature of landscape planning projects is dynamic, complex, and fast-tracked with a subjective outcome that exposed the projects to a high degree of risk (Godi and Sibelius 2012). Project risk could become a critical issue that hinders the project from achieving its objectives. As a result, risk management is useful to improve project performance regularity through accurate and systematic risk management during the project's inception (Keers and van Fenema 2018; Willumsen et al. 2019). It can also be incorporated into the project management process (ISO 31000:2018 2018; PMI 2017). Risk management is a well-known skill used worldwide with the majority of its standards and guides focusing on the concepts, process, strategy, and technique of practice.

However, risk management is not extensively used in the Malaysian construction business. Due to a lack of information and awareness of its benefits, project risks are managed on an ad hoc basis (Adnan and Rosman 2018; Fadzil, Noor, and Rahman 2017; Tung, Chia, and Yan-Yan 2021), causing apprehension about its adoption. Risk management is handled differently in Malaysian construction projects, depending on corporate regulations, resource allocation, and project nature (Fadzil et al. 2017). Moreover, Chong and Kamarudin (2018) mentioned the lack of coordination, imbalance of top-down commitment, and long-term planning in risk management. Instead of managing the project risk as a whole, most companies use easy, quick, reasonable, and economic approaches to identify it (Adnan and Rosman 2018).

Landscape planning and design, also known as design profession, is often grouped with the construction industry in the statutes on architecture, town planning, and engineering as a professional construction service (ASLA 2019). The scale of the project is considered in the landscape sector. Although a professional landscape architect possesses excellent design and technical expertise, a management system is needed to systematically warn them of potential risks, quantify consequences, and determine appropriate actions to control risks using the best available tools and techniques (S.Muthuveeran et al. 2021; Tung et al. 2021). Landscape architects face increased risks in today's industrial complexity as the liability grows (Godi and Sibelius 2012), especially when there are urban green areas and pedestrian safety (Hoon Leh et al. 2013). This liability risk is due to several factors. Specifically, landscape architects play a more prominent role in specific projects. The project scope is expanding, society is becoming more litigious, new contractual systems are being used, and client expectations are rising (Godi and Sibelius 2012). The most appropriate system for providing effective landscape planning project outcomes is the risk management application that includes the process of discovering, analysing, and responding to project risks (S.Muthuveeran et al. 2020).

Preliminary findings revealed that the risk management procedure was not comprehensive. Professional indemnity insurance and contract management

clauses help landscape architects in controlling risks. Those involved in a project often analyse and inform landscape architects on potential concerns. The impact of project risk is materialised and further compels project performances. Since the study is speculative, it assumes that the phenomenon is related to the risk of not following the recommended approach. As a result, the study's goal is to investigate the current risk management process in Malaysian landscape planning projects.

RISK MANAGEMENT PROCESS

The risk management process is divided into various parts, which vary in terms of standards or guidelines. The research discovered differences in risk process terminology and grouping pattern. Despite having different steps, the risk process is still identical. This research looked at the risk management process and produced eight criteria and guidelines (APM 2010; AS/NZS 4360:2004 2004; BS 6079-3:2000 2000; BS IEC 62198:2001 2001; CAN/CSA-Q850-97 2002; IEEE Std 1540-2001 2001; PMI 2017). According to the eight standards and guidelines, the risk management process is similar to the six key steps. The risk management process is divided into six steps as shown in Figure 1: 1) Establishing Risk Context, 2) Risk Identification, 3) Risk Analysis, 4) Risk Treatment, 5) Monitoring and Review, and 6) Communication and Consultation.

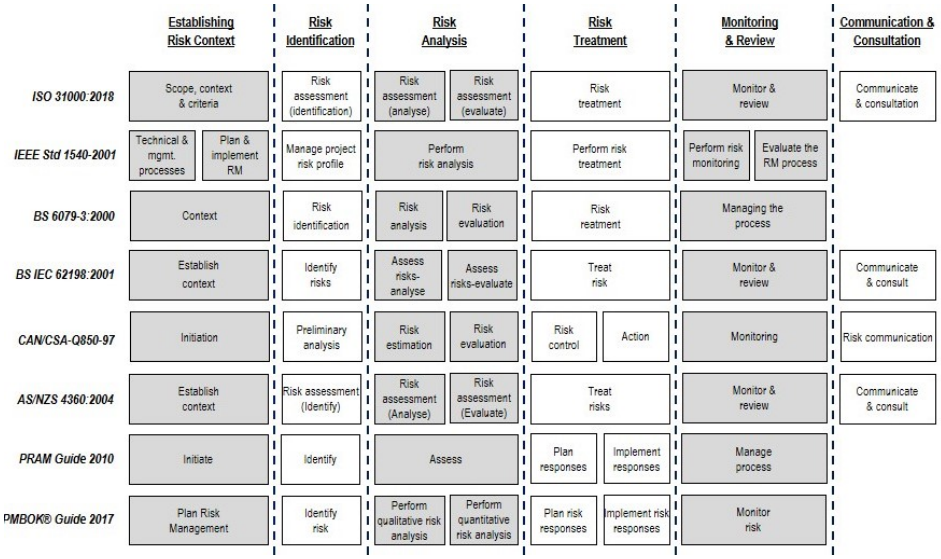

Figure 1: Summary of risk management processes

Establishing Risk Context is the initial step in defining a risk management project. The scope, objectives, project setting, level, kind, and

viability of risk management will be determined through this process (PMI 2017). This process also determines the risk treatment criterion, asset, and experts. There are formats and procedures for recording and organising risk management exercises throughout the project lifecycle (PD 6668:2000 2000). The outcomes are a brief description of task goals and progress criteria and a system for risk management and assigning risk owners (PMI 2017).

Risk Identification, which is a method for predicting future events, will impact the specified goals. Risk occurrences can cause problems. The Project Management Institute (2017) established that risk identification is about determining "what can go wrong?" The process helps determine what, how, and why things happened. It is a creative project that removes objective facts. As a result, all parties affected by the decisions should be consulted. Their abilities and knowledge should be used to determine the viability of risk management through identification (BS 6079-3:2000 2000).

Risk Analysis considers the probability and underlying drive of the risk that may occur to answer the question "how significant is the risk?" It determines the likelihood of a risk and the magnitude of an impact. After analysing and evaluating each risk, it prioritises risks based on their effects on the overall project's objectives (PMI 2017). The process adopts three approaches: qualitative, semi-quantitative, and quantitative risk analysis (BS IEC 62198:2001 2001; PMI 2017).

Risk Treatment can decide on a reasonable reaction to the risks that were identified and analysed before limiting their effects. This process establishes a system to reduce potential threats and expand potential opportunities (PMI 2017). Point-by-point action plans for each risk are produced where this stage's consideration is essential to avoid shocks for the risk. Various ways are relevant for risk response and treatment such as avoiding, reducing, transferring, or accepting the risk (PMI 2017).

The Monitoring and Review process is carried out to determine and manage risks. It promotes the significance of reviewing the risk status (Kang et al. 2015). According to PMI (2017), the technique is repeated to screen leftover risks and identify new risks. Processes for checking and investigating risks are linked to other management procedures. A typical project lifecycle in a management meeting displays key project phases and milestones. This process reinvestigates present risks and monitors residual risks and reactions.

Communication and Consultation is essential in risk management. It guarantees that the contractor's risk management approach is viable by involving appropriate individuals at a proper time and guaranteeing their comprehension. Early risk communication improves risk management applications and increases the institution's risk appetite. It ensures that all project partners know the potential risks and the lessons learnt may be used for future initiatives.

RESEARCH METHODOLOGY

The research methodology included exploratory case analysis. The research is divided into four stages: preliminary study, data collection, analysis, and interpretation. First, the researcher conducted a background study on the research's history, need, gap, and goals. Second, twenty-four professional landscape architects in the Klang Valley were interviewed via semi-structured interviews. In line with the exploratory study, open-ended questions using an aide-memoire to give them leeway and freedom for their responses (McNamara 2017). The researcher recorded audio recordings and project documentation, transcribed the text, and used ATLAS.ti 8, which is a documented and organised research software. Third, the content analysis identified and described the codes, categories, and topics (Mayring 2014). In addition, the thematic analysis was conducted to understand the data and create thematic maps linking various themes. The analysis explored the relationship between subject themes and determined the patterns (Maguire and Delahunt 2017). Finally, this study discovered the mapped and reported interpretations that analyse the current risk management approach in Malaysian landscape planning projects. The conclusion was based on the research objectives.

Twenty-four interviewees responded based on the predetermined sampling criteria in representing the landscape planning project. The following are the requirements of the interviewees: 1) individuals from landscape planning and design firms who are professional landscape architects; and 2) their current organisation held managerial and decision-making positions, indicating that they influence the policy and practice on the ground. All interviewers had more than ten years of experience in the sector. In a whole cycle of landscape projects in the urban region in Klang Valley, Malaysia, they have been involved in various project sizes, locations, and scopes. Each interviewee was assigned an alphanumerical code (L01 to L24) for easy identification and the information of the interviewees is shown in Table 1.

Table 1: Interviewees' information

Interviewees	Interviewees' Position	Interviewees' Background		Interviewees' Organisation Background		
		Education	[a] Years of Experience	[b] Years Established	[c] Headcount Size	[d] Total Ongoing Project
L01	Director	Abroad	Expert	Established	Small	Medium
L02	Proj. Director	Local	Intermediate	Established	Small	Medium
L03	Director	Abroad	Expert	Established	Small	High
L04	Director	Local	Expert	Established	Small	Medium
L05	Principal	Local	Intermediate	New	Small	Low
L06	Director	Local	Expert	Established	Small	Low
L07	Director	Local	Intermediate	New	Micro	Medium
L08	Director	Local	Intermediate	New	Micro	Low
L09	Director	Abroad	Expert	New	Small	Low
L10	Director	Abroad	Expert	Intermediate	Small	Medium

Interviewees	Interviewees' Position	Interviewees' Background		Interviewees' Organisation Background		
		Education	[a] Years of Experience	[b] Years Established	[c] Headcount Size	[d] Total Ongoing Project
L11	Associates	Local	Intermediate	Established	Small	Medium
L12	H. Contract	Local	Intermediate	New	Small	Medium
L13	Director	Abroad	Expert	Intermediate	Small	Low
L14	Director	Local	Intermediate	New	Small	Medium
L15	Director	Local	Expert	Established	Small	Medium
L16	Director	Local	Intermediate	Intermediate	Micro	Medium
L17	Principal	Local	Intermediate	Intermediate	Small	Medium
L18	Director	Local	Intermediate	New	Micro	Low
L19	P. Director	Abroad	Expert	Established	Small	Medium
L20	Director	Local	Intermediate	New	Small	Medium
L21	Director	Abroad	Expert	Established	Small	Medium
L22	M.D.	Local	Expert	Established	Small	Medium
L23	Director	Local	Intermediate	New	Micro	Low
L24	Director	Local	Intermediate	Intermediate	Small	Medium

Notes:
[a] Beginner (< 10 years) / Intermediate (10 < 20 years) / Expert (> 20 years)
[b] New (< 10 years) / Intermediate (10 < 20 years) / Established (> 20 years)
[c] Micro (< 5) / Small (5 < 30) / Medium (30 < 75): Malaysia's Small and Medium Enterprises (SME) classification
[d] Low (< 20) / Medium (20 < 40) / High (> 40)

RESULTS AND FINDING

In the semi-structured interviews, 24 landscape architects were asked about their risk management process. Establishing risk context, risk identification, risk analysis, risk treatment, monitoring and review, and communication and consultation are the six risk management steps discussed during the interview. The showcard method was used to elicit and improve responses on practical techniques to reduce risks in landscape projects.

Establishing Risk Context

The respondents were asked to describe how their organisation defined their objectives in project risk management based on internal and external circumstances. The outcomes show 15 coded feedback and seven groups as summarised in Figure 2.

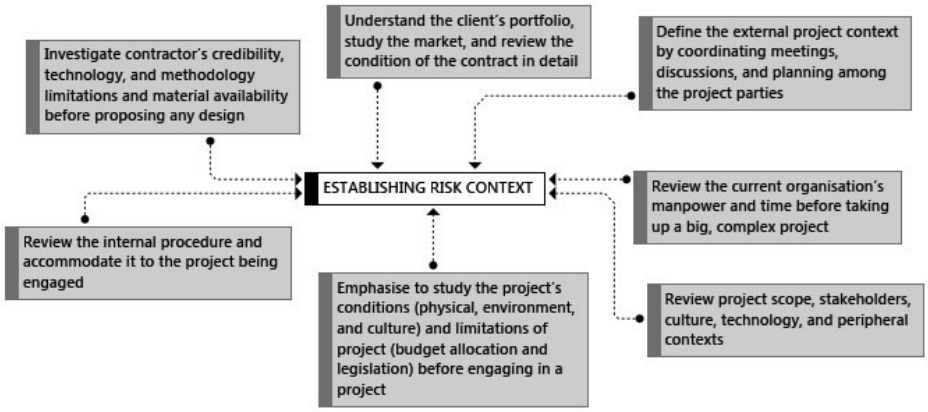

Figure 2: Establishing risk context - codes and categories
Source: ATLAS.Ti diagram, Author (2021)

According to the literature, there was no formal practice for establishing risk context. The risk context is managed as part of the project management context where the risk context is not fully acknowledged. First, the external context is established; then, the internal context is updated along with the project schedule. This scenario is understandable as landscape planning and design organisations rely on project delivery and stakeholders' satisfaction.

Risk Identification

This study has inquired how the interviewees identified project risks. Figure 3 shows 116 coded feedbacks divided into 25 categories and five topics.

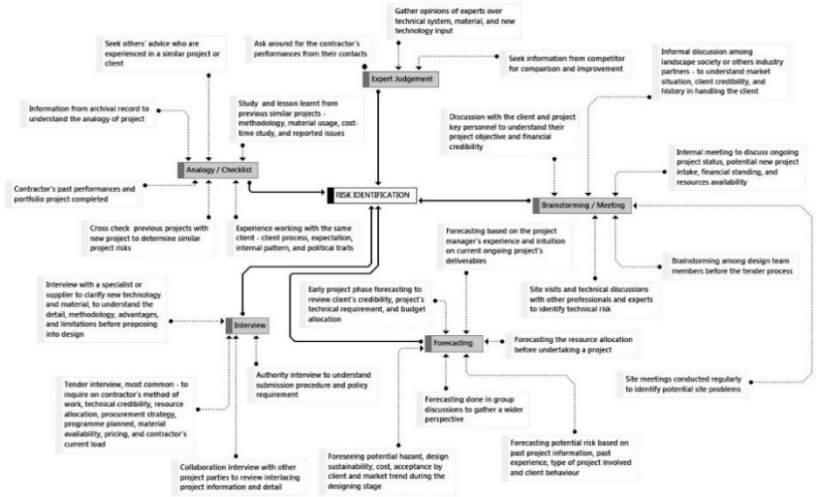

Figure 3: Risk identification - codes, categories, and themes
Source: ATLAS.Ti diagram, Author (2021)

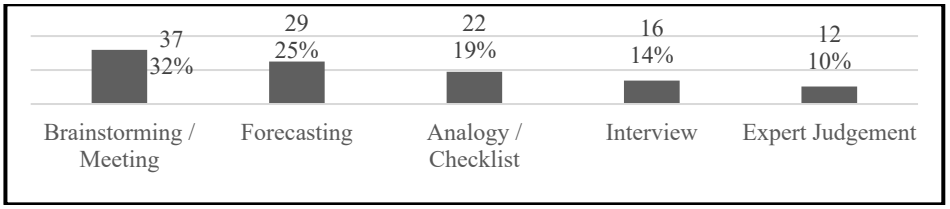

Figure 4: Summary of risk identification

As indicated in Figure 4, the most common method for identifying project risks is brainstorming/meeting. Some examples of site meetings are site visit, casual project party conversation, and internal operational talk. Forecasting is the second most popular method of predicting project hazards. Besides anticipating the client's behaviour and credibility, respondents frequently used their experience and knowledge to forecast project dangers based on historical project information, group conversations, or projections from current projects. By recycling facts and information from the scenario, the analogy/checklist technique is considered a critical thinking paradigm that handles new difficulties based on former or comparable experiences. The interview technique is normally used to address project challenges such as doubts and other technical aspects that are not covered by the project team. Finally, expert judgement is utilised to obtain experts' opinions on project matters. Advise or interviews are kept confidential to avoid problems or confrontations.

Risk Analysis

Based on the nominal scales of likelihood and consequence, scenario analysis is a common risk analysis technique in construction. The interviewees were asked to explain how they assessed risk implications and their likelihood. Figure 5 shows the results of coding 24 pieces of feedback into ten groups and three themes.

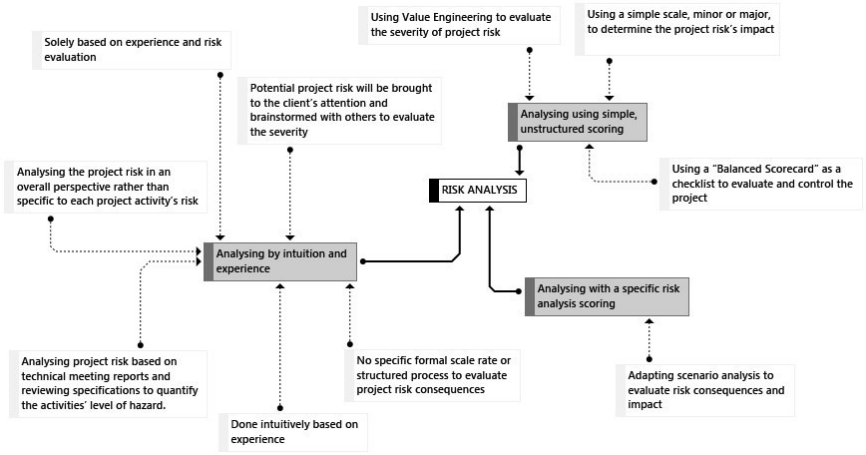

Figure 5: Risk analysis - codes, categories, and themes
Source: ATLAS.Ti diagram, Author (2021)

Figure 6 shows that the majority of interviewees (19 [79%]) used intuition and experience to justify the project risk impact. They also did not use a uniform scale rate or systematic process for assessing the project risk. Four interviewees (17%) used unstructured scoring for the project risk analysis. Only one (4%) interviewee used a specific risk scenario analysis to assess the risk impact.

In summary, the projects lacked precise risk rating instruments as proposed by the systematic risk analysis approach. The project managers' experience and intuition can also assess potential dangers, which is considered not a good risk analysis strategy. It is believed that project managers' arguments may be unclear and vulnerable to criticism, as well as establish biases and others may misconstrue their analytical technique.

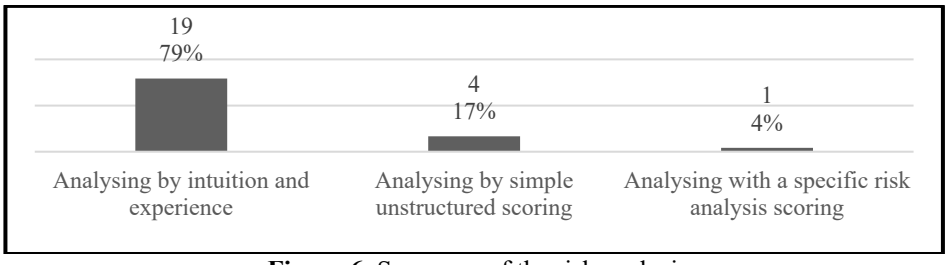

Figure 6: Summary of the risk analysis

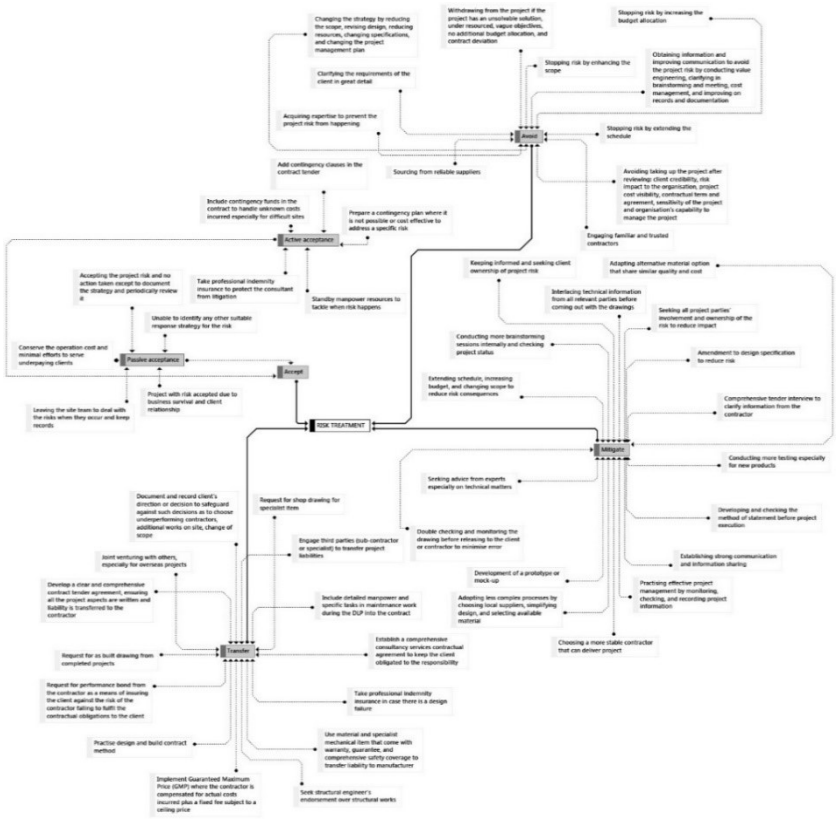

Figure 7: Risk treatment - codes, categories, and themes
Source: ATLAS.Ti diagram, Author (2021)

Risk Treatment

The interviewees were asked about the strategy used to manage project risks. Figure 7 shows 197 coded responses that were divided into 52 categories and four themes.

Figure 8 shows that interviewees preferred avoiding (35%) and minimising (31%) risk treatment options. Both procedures were used when they could detect and assess dangers earlier. They used these tactics as project managers to reduce risks. Transferring (20%) the risk was used when another person caused the risk and ownership was not possible. This technique was used when absorbing the risk is cheaper than transferring it to others. Finally, accepting (14%) the risk was done when there was no other option or when the risk had a modest influence on the project outcome.

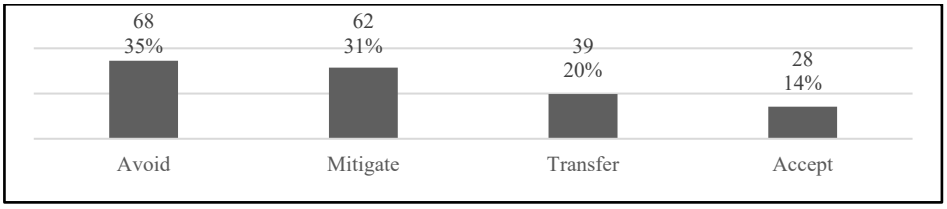

Figure 8: Summary of risk treatment

Monitoring and Review

The interview sessions questioned the interviewees on how they monitored and reviewed project risks. Figure 9 shows 81 coded feedback that are divided into 17 categories and three themes. Most interviewees stated that internal meetings were held periodically to explore and address potential project hazards. Most interviewees agreed that their organisation's principal, colleagues, and seniors were accountable for monitoring and reviewing project risks. The risk procedure was not explicitly recorded. Hence, the data are not traceable. Overall, the risk procedure was not appropriately monitored and assessed where it is only a part of the continuing project activity.

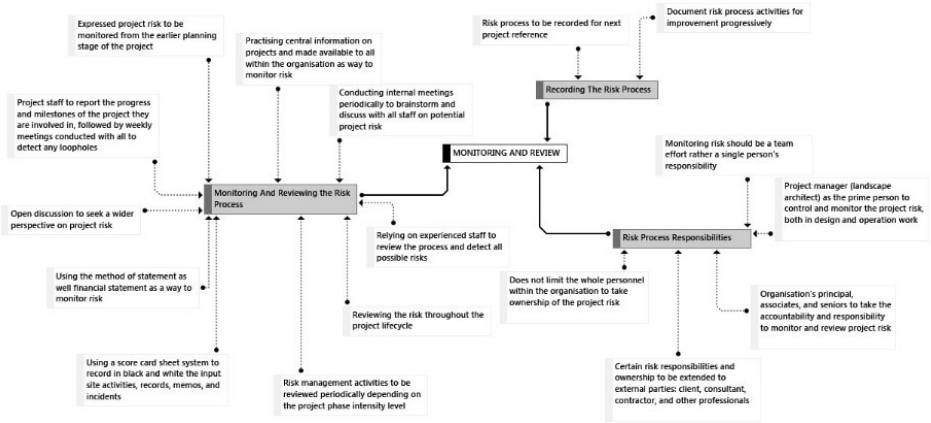

Figure 9: Monitoring and review - codes, categories, and themes
Source: ATLAS.Ti diagram, Author (2021)

Communication and Consultation

The interview questioned how the participants communicate and consult each other regarding project risks. Figure 10 shows the findings of 24 coded feedback divided into three categories.

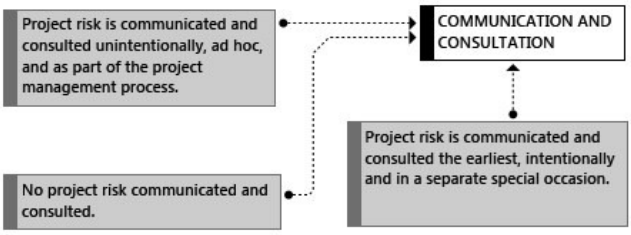

Figure 10: Communication and consultation- codes and categories
Source: ATLAS.Ti diagram, Author (2021)

The majority of 12 interviewees (50%) said that project risk was not communicated and was normally dealt with by the project team daily. Moreover, initial project dangers were not recorded and attended to by the team. Eleven (45.8%) participants expressed risk communication based on context and scenario. Rather than conducting a discrete session, the risk was often discussed as part of the project operation. Only 1 interviewee (4.2%), L12, said that their project risk has been communicated and consulted specifically.

DISCUSSION

Every risk process practice is summarised where there is no explicit risk context establishment and most of them are project management procedures. Risks are recognised impromptu via meeting, forecasting, analogy, interview, and expert opinion. Risks are assessed using experience and intuition rather than precise data analysis procedures. No risk was quantified. The project preferred proactive therapy by avoiding, minimising, transferring, and active acceptance. No specific methods or techniques were used to monitor or review risks. Finally, most risks were not communicated or consulted.

This study examined the completeness of the six steps of the risk management process. It classified the level of completion into three categories: complete, intermediate, and incomplete (Table 2). Figure 11 shows that 12 (50%) out of 24 interviewees were in the "Incomplete" category, revealing that they did not fully practise the three steps of the core risk identification-analysis-treatment processes. The "Intermediate" group consisted of five interviewees (21%) who used all three steps of the core risk identification-analysis-treatment processes. Only seven (29%) landscape planning and design firms interviewed had completed all six steps of the risk management process.

It is found that there is a lack of practice in the six steps of the risk management process. Most of the risk management process actions were ad hoc and not realised. Besides that, low-risk tools and approaches were used instead of the standard's broad approach. In practice, rudimentary tools and procedures with limited applications were used.

Table 2: Completeness of the overall risk management process practice

Interviewees	Establishing Risk Context	Risk Identification	Risk Analysis	Risk Treatment	Monitoring And Review	Communication And Consultation	Overall Risk Management Process Practice
L01		√		√	√		**Incomplete**
L02		√		√			**Incomplete**
L03		√	√	√	√	√	**Intermittent**
L04		√		√	√	√	**Incomplete**
L05	√	√		√			**Incomplete**
L06	√	√	√	√	√	√	**Complete**
L07		√		√			**Incomplete**
L08	√	√		√			**Incomplete**
L09		√	√	√		√	**Intermittent**
L10	√	√	√	√			**Intermittent**
L11	√	√	√	√	√	√	**Complete**
L12	√	√	√	√	√	√	**Complete**
L13		√	√	√		√	**Intermittent**
L14	√	√		√			**Incomplete**
L15	√	√	√	√	√	√	**Complete**
L16		√		√		√	**Incomplete**
L17		√		√	√		**Incomplete**
L18		√		√	√		**Incomplete**
L19		√	√	√	√		**Intermittent**
L20		√		√	√		**Incomplete**
L21	√	√	√	√	√	√	**Complete**
L22	√	√	√	√	√	√	**Complete**
L23		√		√	√		**Incomplete**
L24	√	√	√	√	√	√	**Complete**
Totals	**11**	**24**	**12**	**24**	**15**	**12**	

Note: *Complete: Practised all 6 steps of the risk management process*
Intermediate: Practised 3 steps of the core risk management process (Identify-Analyse-Treat)
Incomplete: Missed 1 or 2 steps of the core risk management process (Identify-Analyse-Treat)

The findings revealed huge discrepancies from the effective risk management process practice as suggested by APM (2010), ISO 31000:2018 (2018) and PMI (2017). Throughout the project lifecycle, risk communication and monitoring should be done continuously. The Malaysian construction industry uses similar methodologies to identify risks rather than managing risks as a whole process (Adnan and Rosman 2018). The Malaysian construction business has no defined risk management principles or regulations. Due to a lack of understanding of risk management implementation and awareness of its benefits, the industry did not use the recommended strategy (Abdul-Rahman, Wang, and Mohamad 2015; Kang et al. 2015).

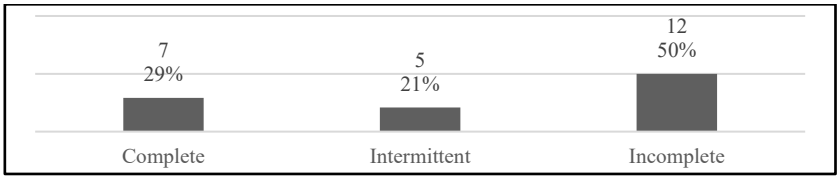

Figure 11: Summary of the completeness of the risk management process

CONCLUSION

Risk management is rarely used in landscape planning. Although formal risk management techniques are established, most of the processes are informal and unstructured. Risk management is frequently not well handled due to a lack of understanding in risk management implementation and awareness of its benefits. A systematic and organised approach for project risk management is required. This phenomenon explains why project risk impacts project performance. This study provides a recommendation to project practitioners on how to analyse their current practice and improve their risk management process application. It is advised that project practitioners needed proper risk management in handling landscape planning projects as it will boost project results.

This study is limited to case study interviews focusing on landscape architects. However, it does not disregard the value of other practitioners' perspectives. Second, this study used qualitative research methods due to the practitioners' limited risk management understanding.

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MONITORING MAJOR CITY URBAN EXPANSION IN KUALA LUMPUR AND PENANG CITY CENTRE

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Abstract

Malaysia is currently undergoing heterogeneous land-use allocation and conversion in the city centre, resulting in leapfrog urban expansion to the suburban areas. Identification of the growth pattern from land-use conversion and urban growth has defined the limits of development, which could be a feasible way to alleviate the severity of these challenges. The research aims at the expansion factor for the built-up pattern of Kuala Lumpur (KL) and Penang City Centres. The objective of this research is to create a model on the new knowledge of urban built-up patterns generated from Landsat image data and comparison with built-up area from the change in land use, limitation of plot ratio, and floor space. The assessment of land-use changes is crucial in deciding the outcome for future development while considering the completion of committed development. This mechanism will help in the analysis of the data gathered using a remote sensing approach, which involves identifying the built-up area in KL City Centre using satellite images and examining the impact of land use patterns and varied plot ratios. In detail, the focus is directed towards a factor that influences the change of built-up area and development force. This will provide knowledge of Landsat images for the built-up area in urban expansion and the built-up limitations allocated by the local authority.

***Keywords**:* Urban expansion, landsat image, city development, urban growth

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INTRODUCTION

In 1972, Kuala Lumpur was designated as a city, and in 1974, it was designated as a Federal Territory (Izuandi Yin, 2019). Meanwhile, Penang has undergone urban development since 1840 to this present day (Zhao, Wong, & Hanafi, 2019). It has had considerable infrastructure development between the Greater Kuala Lumpur and Penang conurbations; urban growth is taking place (Grunsven & Benson, 2020). In 2014, Kuala Lumpur's total land-use area was 243 square kilometres, whereas Penang's total land-use area was 1,049 square kilometres (Department of Statistics Malaysia, 2019). Many cities are experiencing rapid urban growth, which necessitates knowledge-based urban development to provide guidance for implementing strategic goals and policies. The application of machine learning for urban growth and development is becoming more prevalent in urban planning research (Ibrahim, Khattab, Khattab, & Abraham, 2021). Traditional urban planning concepts and measures for regulating urban development and service delivery are linked to the phenomenon of urban expansion (Hegazy, Helmi, Qurnfulah, Naji, & Ibrahim, 2021). Urban expansion is influenced by population and traffic circumstances, reflecting urban density around transit areas.

Urban areas were high with the density of built-up floor space in 50 kilometres radius from the city centre (Boori, Netzband, Vozenilek, & Choudhary, 2015) compared to the slowly outward growth to the suburban areas in 2014, while it climbed to 2,573.10 acres in 2015 (Noor et al., 2018). In 2015, many major categories such as residential, commercial, institutional, and public facilities were affected by land-use changes in the Strategic Planning Zone (SPZ) as a result of increased and decreased development. Because urbanisation is a worldwide phenomenon, population growth, the economy, and infrastructure all have the potential to contribute to its spread. A sprawl can arise as a result of an urban region's inability to anticipate growth through planning, law , and decision-making processes (Yasin, Yusof, & Noor, 2019). Urban sprawl is the urbanisation of space next to a city as a result of that city's development. Land development near cities, particularly agricultural land, infrastructure development, and a rise in the number of people who depend on public infrastructure and travel to work in the city are all problems under consideration (Cieslak, Bilozor, & Szuniewicz, 2020). A comparison of the current and traditional urban boundaries before Kuala Lumpur and Penang's upgrade as cities is reasonable to analyse the city's urban sprawl. Before any analytical operations can be done, a recently bought time series of remotely sensed data must be refined (Yasin, Yusof, & Noor, 2019). Although geographical factors are crucial in identifying land uses, total floor area is a second key element, as indicated by the synthesis of landed and high-rise buildings.

PROBLEM STATEMENT

The Landsat image comparison should be investigated as a separate factor influencing the built-up pattern. Understanding the factors that influence the built-up pattern and creating a built-up mapping will have an impact on how projects are developed efficiently and profitably. Understanding the factors that influence the built-up pattern and creating a built-up mapping will have an impact on how projects are developed efficiently and profitably. This includes identifying built-up and non-built-up areas, as well as built-up pattern characteristics such as land-use change, plot ratio, and floor space on various built-up area features. For determining land availability, each built-up area has its own classification system. This notion holds that if a well-constructed plan is in place, development will be easier, and land will be more readily available (Yin et al., 2020).

In the city centre, different plot ratios set by the local authority at the maximum cap resulted in saturation development and shrinkage of multi-storey development; in the suburbs, smaller plot ratios set by the local authority in the suburban area result in lower densities/price for some projects; and imbalance land-use allocation within a city result in transition urban sprawl to the suburbs (Razak & Yin, 2021). The sprawl of expansion to the suburbs cannot be effectively defined by development control measures given the high rate of development. As a result, measuring land-use trends can be done by looking at firm site selections in intra-city locations as well as home location selections. The land value and varying pricing for each area will be determined by this allocation. It also led to a shift in land usage from the city centre to the suburbs.

Rapid urban population growth has fuelled the development of peri-urban zones, which are the transitory boundaries between a city and its outskirts. Although urbanisation can improve an area's economy and infrastructure, uncontrolled development in peri-urban areas harms the economy and the people who live there. To ensure that the urban population in developing countries is sustainable, the boundary of city areas could limit urban expansion strategies, allowing for long-term planning (Samat, Mahamud, Tan, Tilaki, & Tiew, 2020). Because there is no obvious limit to Kuala Lumpur and Penang's urban expansion, a contrast between the existing and previous borders of Kuala Lumpur and Penang's upgrade as cities is reasonable. The building area is the most important factor for remote sensing data, guided by the building height (Samat, Mahamud, Rashid, Elhadary, & Noor, 2019). Furthermore, as indicated by the synthesis of landed and high-rise buildings, total floor area is a second essential component, although spatial features are vital in identifying land uses. Land use patterns are monitored to assist local governments and developers in strategising their constructed development to ensure that urban expansion is managed responsibly (Sharing Earth Observation Resources, 2021).

The development control of City Centre Commercial (CCC) has been assigned. As a result of District Centre Commercial's (DCC) growth, different priorities and growth for specific areas have been formed. The neighbourhood centre is more essential than the city centre's high density of expansion, which may be attributed to a misconception between the CCC's urban regeneration area and the district centre's secondary development area, particularly in the urban area of Kuala Lumpur (Yin & Abdullah, 2020). Although the (Kuala Lumpur City Plan, 2020) prioritises areas located in the city centre, other locations termed district centres appear to have high urbanisation and built-up areas that are practically equal to the city centre, based on current physical conditions. Three development control tools were utilised to detect the issue of urban expansion in Kuala Lumpur and Penang. Location and stress determine the economic traction force, which is more towards concentration and land value. It is founded on the demand for a high urban growth rate as well as commercial attraction, which leads developers to choose a location with a high land value to maximise profit (Marzukhi et al., 2021). To improve its role as a knowledge-based economy, Kuala Lumpur and Penang are also focused on the tertiary sector. While high-density development is important in metropolitan areas, low-rise suburban housing developments are particularly tempting to developers in Kuala Lumpur and Penang due to lower land prices and more demand (Smart City Handbook Malaysia, 2021).

Poorly balanced land use allocation within the Kuala Lumpur and Penang zones should be investigated in terms of economic organisation. As a result, measuring land-use trends can be done by looking at firm site selections in intra-city locations as well as home location selections. The land value and varying pricing for each area will also be determined by this allocation (Penang Economic and Development Report, 2019). It also resulted in a shift in land-use rules from the outskirts of the city centre. The project was dubbed a "mega-project" because of its size and complexity, as well as its placement in the city (Rahimzad, 2018). These initiatives are typically developed in the central region or city centre, adding to the city's economic gains and even allowing for the enlargement of the built-up area.

Based on the importance of directing expansion to the CCC region solely, the authority provides a varied plot percentage to each centre. It did, however, set a higher plot ratio for such centres, as well as some district centres that are not as significant as the city centre. It is founded on a high desire for economic development and a high land value. Urbanised areas agglomerate and develop as the population or economic activity centre within a larger metropolitan area.

RESEARCH QUESTIONS

Monitoring urban development between Kuala Lumpur and Penang City Centre:

i. What is the expansion trend for built-up development in Kuala Lumpur City Centre and Penang City Centre?
ii. How does the built-up development control the expansion of the urban area?
iii. How can the built-up area be defined through analysis of Landsat Image and zoning?

RESEARCH PURPOSE

Monitoring the city's expansion by considering the built-up development which directs the development force in the city centres of Kuala Lumpur and Penang (Georgetown) (Figure 1). The objectives of this study are as follows:

i. To determine the land use distribution and built-up expansion both in GIS and Landsat image for Kuala Lumpur City Centre and Penang City Centre.
ii. To understand the changes of space in urban areas from built-up, vegetation and non-built-up areas in the years 1987/1988 and 2021.
iii. To analyse the plot ratio, building height, and floor space from the land-use zoning which controls the intensity of development.
iv. To monitor the built-up expansion which influenced land-use conversion and allocation of plot ratios in defining the direction of development force.

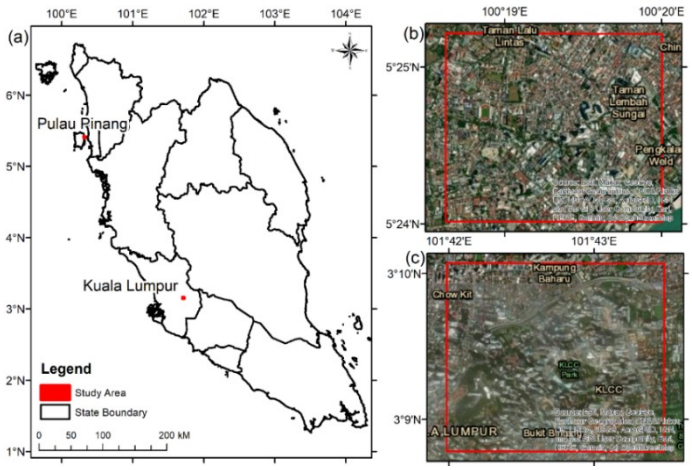

Figure 1: (a) Peninsular Malaysia and the location of study area in (b) Pulau Pinang and (c) Kuala Lumpur.

RESEARCH METHODS

In qualitative research, several observations were made by measuring development control variables allocated in the City Plan and Local Plan, and the Landsat image using remote sensing technique. On-site observation was used to determine the built-up area by calculating the actual floor space and designated plot ratio. The average floor space and built-up size of the building/plot were derived from site observations, which are used for intensity development. The built-up areas for KL City Centre and Penang City Centre were then added to find the average built-up area for each development. The other method of defining the built-up and non-built-up imaginary processes is by using remote sensing analysis where the Landsat image is generated from the satellite image. The value of its built-up area is used to calculate that component of urban expansion. The comparative analysis was made after both data from GIS and Landsat images were overlaid together to find the physical expansion of both cities. Secondary data was gathered from the local authorities, which are Dewan Bandaraya Kuala Lumpur (DBKL), PLANMalaysia Pulau Pinang, and Majlis Bandaraya Pulau Pinang (MBPP). Related data was collected to tabulate the distribution of land use, maximum plinth area, and plot ratio, which have been put by the local authorities to control the development in the city. The method of observation was carried out within a 1 km radius to identify the floor space, actual plinth area, and building height on the ground to get the total built-up area for each lot. The mapping from data analysed was then recorded in GIS plan to overlay (Figure 2) each variable to get the finding on the existing built-up area in both cities.

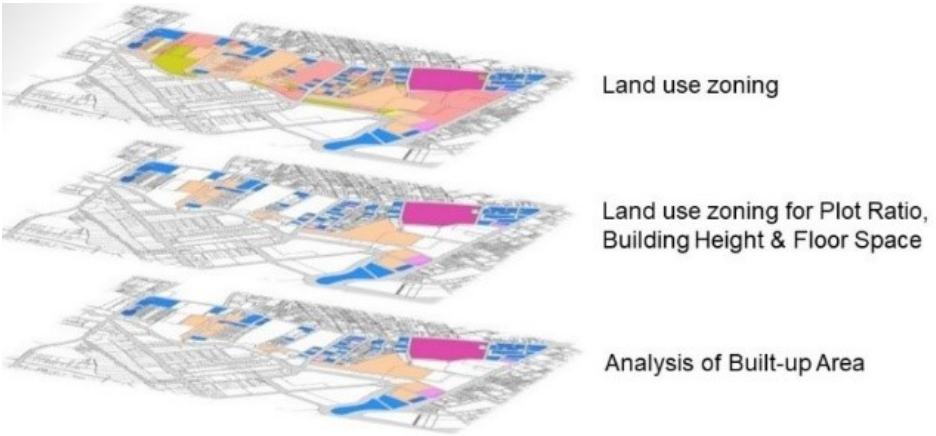

Figure 2: Built-up Area Overlay Technique

The second method used in this study was by generating the Landsat image (Figure 3). This data must be used to retrieve massive built-up areas from one

region to the next within a defined radius. This investigation employs four primary steps of Landsat image processing by using the USGS Earth Explorer to get various sensor categories of Landsat data. Step one retrieves the Landsat image from the USGS Earth Explorer. Step two involves pre-processing of the image, including subsetting and extracting the research region from satellite images, as well as calibration of radiometric instruments and atmospheric image restoration. Step three chooses a region of interest and produces the image of the ground truth in random samples of 50 from Google Earth for picture categorisation and precision testing. The maximum likelihood approach was used to classify the images. Step four uses image differencing to determine the extended urban area. It entails analysing Landsat images from a satellite image to determine the pattern of built-up in the previous years (1987 & 1988) and recent year (2021). It requires a precise image to be able to retrieve better shape. This procedure was carried out in this study to determine the extended urban area between 1987 and 2021 for KL City Centre while Penang City Centre between the years 1988 and 2021. The combination from both years shows the result of image classification of urban expansion for Kuala Lumpur City Centre and Penang City Centre.

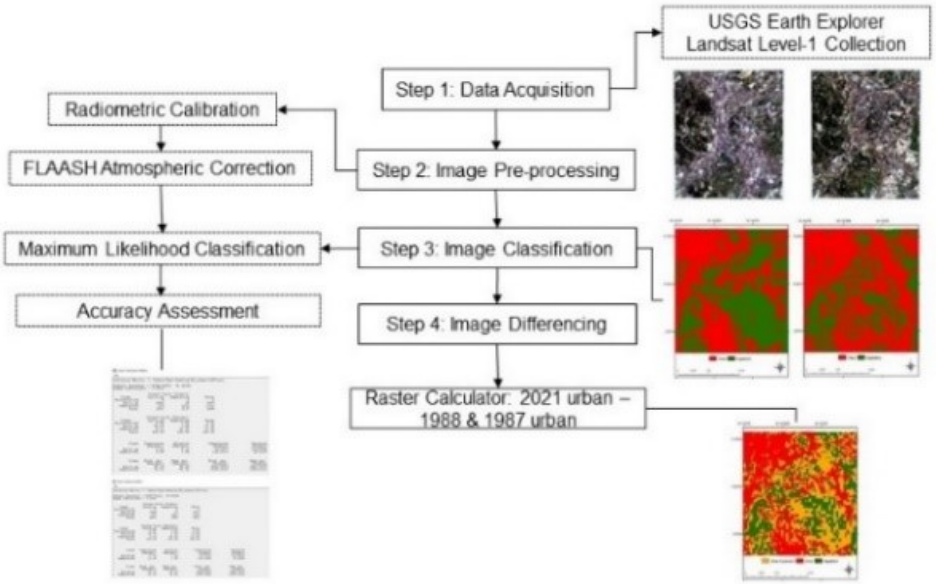

Figure 3: Image processing of Landsat image on urban expansion

FINDINGS

Analysis was done through the correlation of tools of development control used by local authorities, which led to the usage of built-up plot area on the ground and the expansion of built-up area based on the priorities plot ratio.

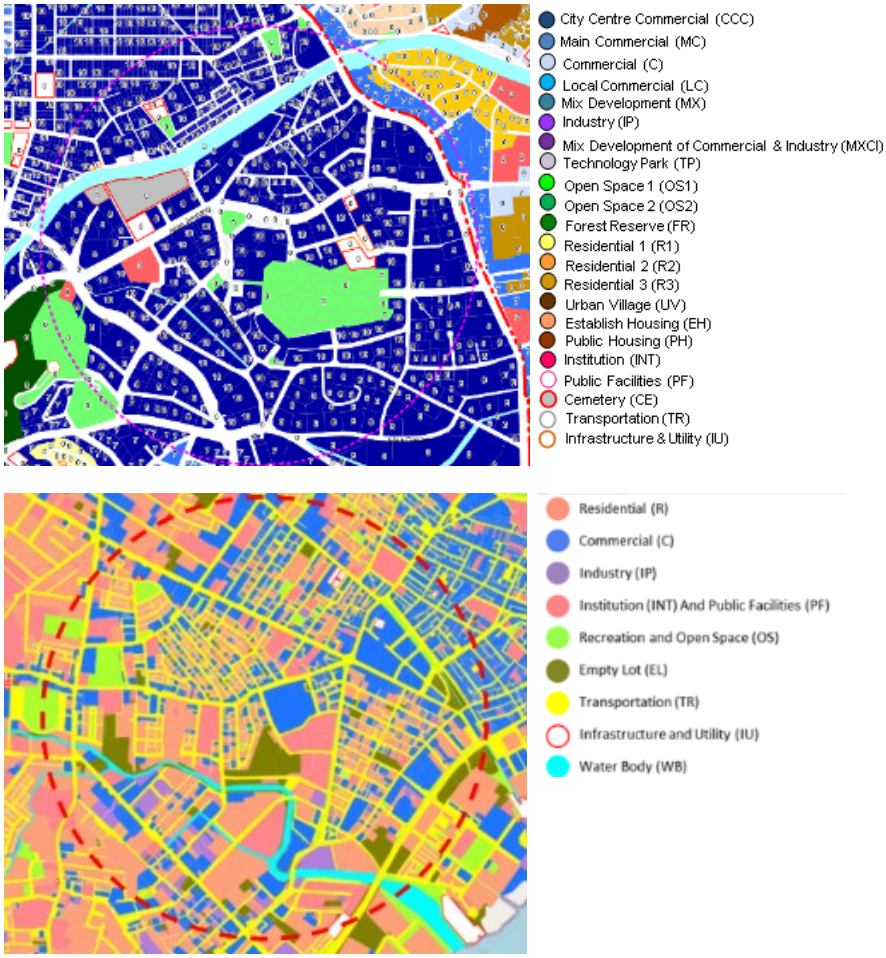

Figure 4: Land use area for Kuala Lumpur City Centre and Penang City Centre

Table 1: Urban Expansion on Built-up Area in 1km radius

Urban Centre	1km Radius of Land Use			Average Plinth Area	Average Building Floor	Total Built Up Area (Sqm)	Average Plot Ratio	Gross Floor Area (Sqm)	Non-Built-up Area (sqm)
	Area (Acre)	Lowest Built-up	Highest Built-up						

KL City Centre	247.1	Industry (0.03%)	Commercial (35.4%)	40%	18	175,467	1: 8	17,668,700	824,511
Penang City Centre	247.0	Industry (0.74%)	Residential (13.14%)	60%	14	225,410	1:5	11,869,060	774,164

Figure 4 shows the land use (1 km radius) for both cities and shows Kuala Lumpur's area controlling the land use with commercial as the major development activities compared to Penang's area with scattered commercial activities but focusing on residential land uses as most of the areas were located as heritage and buffer zones for UNESCO heritage building area. The highest land built-up area for Kuala Lumpur City Centre is commercial while in Penang City Centre, the highest land use built-up area is residential and the lowest is industry activities for both cities. Based on the GIS analysis in Table 1.0, both areas show that plinth area influenced the size of the built-up area where Kuala Lumpur has an average plinth area of 40%, which led to only 17.5% built-up area that can be developed as structure/ building area while Penang has 22.6% the actual size of building area by using 60% of the average allowable plinth area. Non-built-up area for both cities show a large number of the area consisting of recreation area, open space, transportation, water bodies, infrastructure and utilities, vacant land, cemetery, and forest reserve, which categorises as a non-structure building at 77.5% in Penang City Centre and 82.5% in Kuala Lumpur City Centre.

The gross floor area has been influenced by the plot ratio allocated by the local authorities, where DBKL put the highest plot ratio in Kuala Lumpur City Centre at 1:10 (average plot ratio 1:8), which led to 17 million of floor area compared to Penang City Centre allocated by MBPP, with an average plot ratio of 1:5, which translates to a gross floor area of 11 million constructed in the city area. The development and growth concentrated at the middle of Penang City Centre and the expansion from the Southern to Northern region is due to the limitation of development caused by the development control for heritage building areas and coastal areas. Urban areas continue to expand to the Eastern region of Kuala Lumpur City Centre due to the additional densities allowed by the local authority in this area.

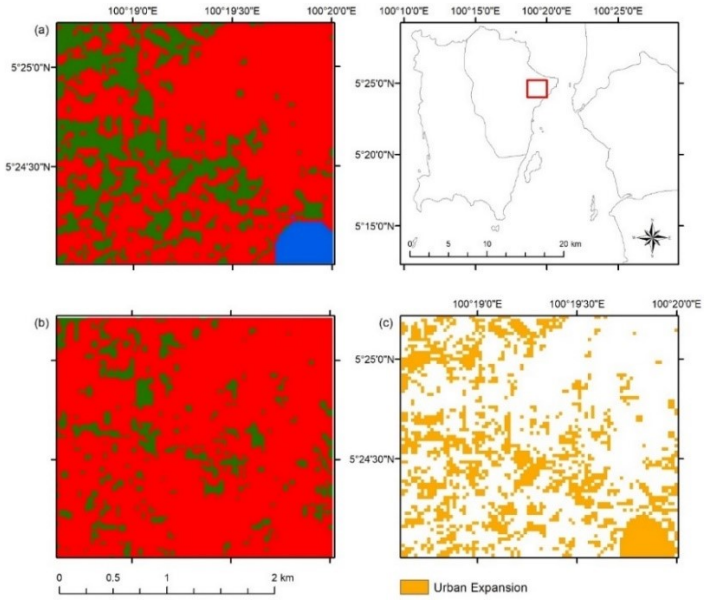

Figure 5: Image Classification for Built Up Area in Kuala Lumpur City Centre for the year of 1987 and 2021

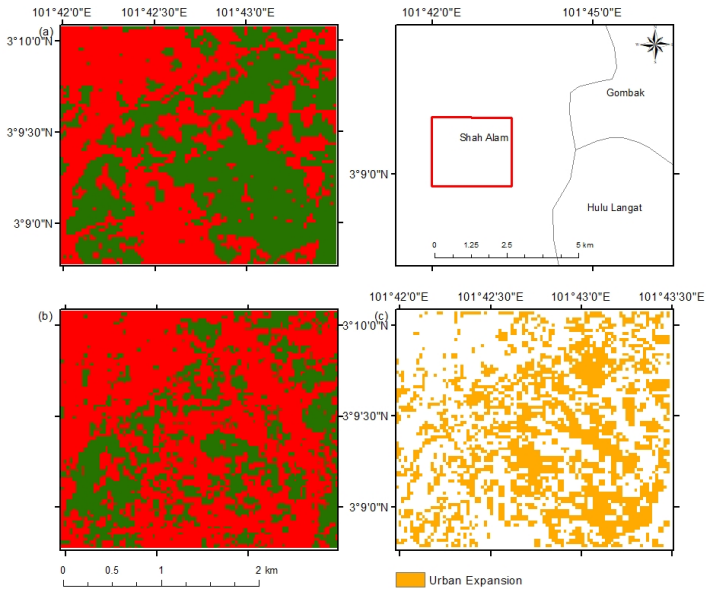

Figure 6: Image Classification for Built Up Area in Penang City Centre for the year of 1988 and 2021

Landsat image data shows that the available non-built-up area (vegetation) and built-up area (urban) for the past three decades since 1987 for Kuala Lumpur City Centre (Figure 5) and since 1988 for Penang City Centre (Figure 6) with the comparison of both using the same year of 2021.

Table 2: Urban Expansion Comparison using Landsat Image

Urban Area	Kuala Lumpur City Centre		Different	Penang City Centre		Different
Year	1987	2021		1988	2021	
Built-up	51.21%	67.41%	+16.21%	69.29%	87.19%	+17.9%
Vegetation	48.79%	32.59%	-16.2%	27.41%	12.11%	-15.3%
Water	-	-		3.30%	0.70%	-2.6%

The change in built-up area shows a movement of development activities (from 1987) in the North and South-Eastern regions of Kuala Lumpur in Figure 5 with the additional +16.2% of built-up taken from the existing vegetation, which decreases to 32.59% in 2021. Meanwhile, in Penang, the built-up area expands (Figure 6) (from 1988) to the West and Southern regions (additional of +17.9%) with the reclamation of the coastal area (decrease water area -2.6%) on the South-Eastern region; and vegetation has decreased -15.3% in 2021. The expansion shows concentrated expansion in the middle of Kuala Lumpur City Centre except for the North-West region. Meanwhile, in Penang City Centre, the expansion focusses towards the central and West regions, while the activities of land reclamation happened at North-East region.

CONCLUSION

The built-up area is expanding every year due to the conversion of non-built-up area to building development which has taken and expanded more than 5% every decade. The expansion is also influenced by the existing plinth area developed in the city centre, which can only be changed by adding up the density of the plot area. The redevelopment of existing vacant land also contributes to the new built-up where the vegetation is decreasing but has been allocated the non-plinth area as their plot open space. Reclamation of water bodies and changing of the utility area into built-up plot area has rapidly expanded, which decreases the water area in the city centre.

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The authors would like to thank our main sponsor, Ministry of Higher Education through Fundamental Research Grant Scheme (FRGS) (FRGS/1/2020/SSI02/USM/03/2) to avail this study. The credit also goes to all authors who contributed to this research and School of Housing, Building and Planning, Universiti Sains Malaysia with full support to carry out the work.

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CELLULAR AUTOMATA FOR CIREBON CITY LAND COVER AND DEVELOPMENT PREDICTION

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Abstract

Land changes in urban areas are a common thing. Along with the increase in economic activity, the population also increased and resulted in changes in land use. This results in uncomfortable, unsafe and inefficient urban conditions. This problem can be anticipated by predicting changes in land cover, from the result of prediction of landcover, the direction of urban growth will be known. The purpose of this research is to analyse and modelling land use changes and to predict the urban growth. One methodology for modelling land cover is to use the Cellular Automata model. Using land cover data from Landsat Satellite Imagery in 1999 and 2009, it can predict that land cover in 2019 until 2031, after calculating the validity value using a kappa accuracy test of 0.79. Results of the model are that development of the city of Cirebon leads to the southern part of the District of Harjamukti. It happens because, in the area of Harjamukti District, there is a lot of lands that can convert into developed land.

***Keywords**:* cellular automata, Cirebon, city development, landcover, prediction

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INTRODUCTION

The development of urban areas is a natural thing with many factors influence it which one of the factors driving regional development in developing countries is urbanization. With urbanization, urban areas will increase in number and size which will result in land changes in the area (Mosammam et al., 2017). Land change is the partial conversion of land use by humans, from one land function to another (Schielein et al., 2021). Changes in land use in urban areas that occur will form a pattern and direction of urban development (Samat et al., 2019). These changes can also be seen from the increase in socio-economic activities and the movement of urban population mobility flows which ultimately demand the need for space for settlements, because in an urban environment, residential housing occupies the largest percentage of land use compared to other uses, so that settlements are the main component in the formation of settlements city structure (Xu et al., 2021).

RESEARCH BACKGROUND

Cirebon City is determined as the study location because Cirebon City is an attraction for residents outside Cirebon City to enter Cirebon City, especially after the connection of Cirebon city to the Cikampek - Palimanan (Cipali) Toll Road, economic activity in Cirebon City has increased along with the increase number of visits (Ortega et al., 2021). As a result, the number of residents and population density increases, while the availability of land in urban areas does not experience expansion, which implies that land changes are increasing, especially the addition of built-up land, this makes the city less livable, less safe, inefficient and this has become a classic urban problem everywhere (Cao et al., 2021).

There are many methods that can be used to conduct land change studies, one of which is the Cellular Automata (CA) model. The CA model can describe a complex city situation with a fairly simple rule (Fardani, 2020). Another study uses the Multi Criteria Evaluation (MCE) method, this method makes a transition suitability map with MCE which produces good enough results to predict land cover changes (Pérez-Hoyos et al., 2020). Changes in land cover can be investigated using the Hybrid Urban Expesion model, namely by combining Remote Sensing data and Geographic Information Systems (GIS) which simulate the process of urban change that provides information about environmental influences on future urbanization (Wu et al., 2010).

One of the land cover modeling application is to see urban development which is very important for sustainable urban planning (Bose & Chowdhury, 2020). The factor that influences the pattern of urban development is the urbanization process, using the Geographically Weighted Regression (GWR) technique which has been proven to be effective in showing the relationship between non-stationary spatial data from the influence of urbanization and the

condition of urban patterns (Huilei et al., 2017). There are studies that argue that urbanization in poor areas of the country does not lead to urban growth (Koroso et al., 2021). The condition of the area of Cirebon City which is currently developing, becomes very interesting to study whether population development affects the development of the city. Many previous studies have examined urban development using urbanization as a driving factor, but for the existing population density factor compared to the existing residential area (net population density) have not done yet.

Changes in land in the city of Cirebon are always increasing (Nirwansyah & Braun, 2021), then the population factor continues to increase and there are no studies to predict land cover combined with population density factors in the city of Cirebon. The purpose of this research is to analyze and model land change and to see the direction of the development of the city of Cirebon by considering the net population density factor. With this land change study, the local government can anticipate which locations will change drastically and arrange it so that the location does not become slum making this research very useful for the Cirebon City government.

RESEARCH METHOD

Satellite Image Data

In the study using image data for 1999 (Landsat TM 5), 2009 (Landsat TM 5) and 2019 (Landsat 8) which is shown in Figure 1. This satellite image data will later be used to create a land cover map in Cirebon City.

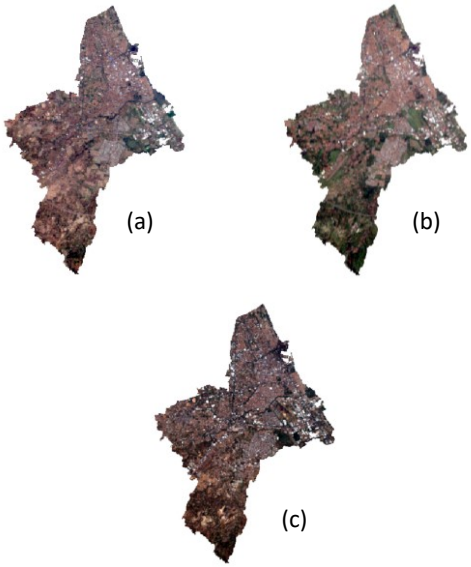

Figure 1: Landsat Satellite Image Data (a) 1999 (b) 2009 (c) 2019

Demographic Data

One of the factors that drive the change of a region is the population factor, especially in the case of land conversion (Zainudin et al., 2021). With the increase in population, the need for land will increase, which causes changes in the function of a land. The data used in this study is population density data as can be seen in Table 1.

Table 1: Cirebon City Population Density in 2018

No.	District	Population	Area (Ha)		Density (Person/Ha)	
			Total	**Built-up**	**Bruto**	**Netto**
1	Harjamukti	109.005	1773.83	306.60	61	356
2	Lemahwungkuk	56.353	637.58	206.16	88	273
3	Pekalipan	30.880	158.68	95.00	195	325
4	Kesambi	74.894	851.79	276.52	88	271
5	Kejaksan	45.145	424.03	140.12	106	322
Total		**316.277**	**3845.91**	1024.40	364	1254

Seen in Table 1, the highest net density is in Harjamukti District with a population density of 356 people/ha, while the lowest net population density is in Kesambi District, which is 271 people/ha.

Cellular Automata

The concept of Cellular Automata (CA) was first developed by Johann Louis Von Neuman in the late 1940s and early 1950s. The idea was the development of information from stem cells to other cells in a cellular automaton, which was thought to be able to explain the structure of space-time. and the limitations of the speed of light (Beuchat & Haenni, 2000). CA is a form of model that is very dynamic and combines the dimensions of space and time (Cavalcante et al., 2021). In this model, space is the land cover of an urban area, then time is in the form of time series data from the land cover of an urban area. In the CA concept, predictions for the future of data from a cell depend on the surrounding cells or what is known as Cell Neighborhood. Neighborhood Cells are used in modeling "Von Neumann Neighborhoods", i.e. a cell has 4 cells that are directly neighbors, namely to the north (N) of the cell, to the east (E) of the cell, to the south (S) of the cell and to the west. (W) the cell. An example of a Von Neumann neighboring cell can be seen in Figure 2 below. The surrounding cells, which will affect changes in the cells in the middle (C).

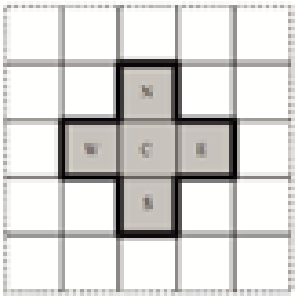

Figure 2. Illustration of the definition of neighboring CA on the Bon Neumann concept.

RESULT AND DISCUSSION

Land Cover

From the existing Landsat satellite imagery data, land cover classification was carried out using the Supervised classification method. Supervised Classification is a method for classifying satellite images with the help of samples from the Digital Number (DN) for each land cover class. Supervised classification is very easy to use and produces reliable classification results. The results of land cover classification can be converted into different land cover areas each year as can be seen in Table 2.

From the results of the classification of satellite images, there are 5 land covers, namely: Mangrove Forest, Built Land, Vacant Land, Waters and Mixed Gardens. In 1999 it was seen that the dominant land cover was Mixed Gardens, while in 2009 and 2019, the dominant land cover was Built-up Land. This data shows that there is a rapid development in the city of Cirebon which is marked by an increase in the percentage of its land cover almost reaching 30% in the period 1999 to 2009.

Table 2: Land Cover Area in 1999 and 2009

No	Land Cover Types	Area		Percentage	
		1999	**2009**	**1999**	**2009**
1	Mangrove Forest	34.92	9.32	0.89	0.24
2	Built-up Area	1163.63	1994.63	29.63	50.78
3	Empty Land	397.95	388.83	10.13	9.90
4	Water	99.54	247.49	2.53	6.30
5	Field	2231.71	1287.49	56.82	32.78
	Total	3927.76	3927.76	100.00	100.00

Land Cover Prediction Results (2019)

The first step in doing CA modeling is to make a land cover model whose condition is known by using 2 datasets of land cover data in the previous period. In this model, 1999 and 2009 land cover are used to predict 2019 land cover. The results of the 2019 land cover prediction will be compared with the existing 2019 land cover. The map in Figure 6 is a comparison between the 2019 (existing) land cover map and the 2019 land cover prediction map, it can be seen that the land cover classes are not much different when viewed for the distribution in the city of Cirebon, meanwhile for the difference in area between land cover the existing 2019 land cover with the predicted 2019 land cover can be seen in Table 3.

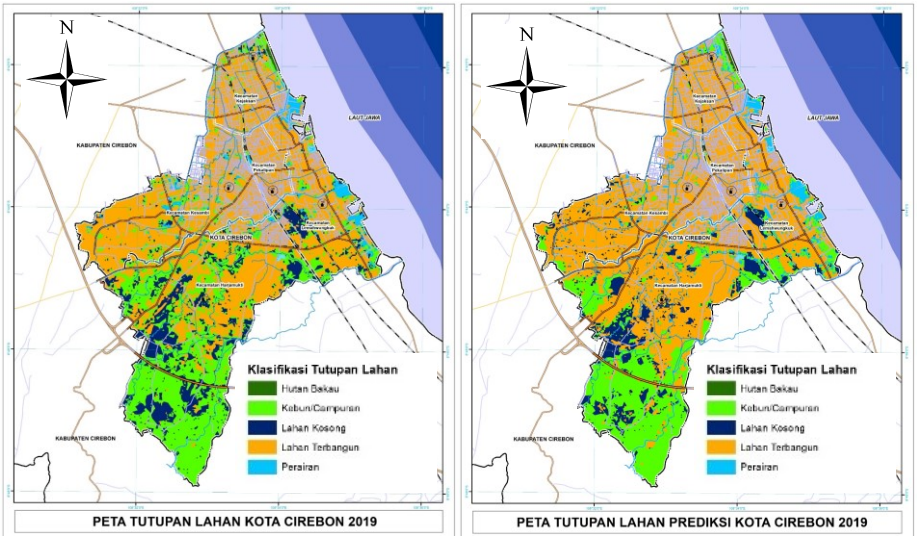

Figure 3: Land Cover Map 2019 and Predicted Land Cover Map

Table 3: Comparison of Existing Land Cover Area and Prediction Results for 2019

No	Land Cover Type	Land Cover Area 2019 (Ha)		Land Cover Perc. 2019 (%)	
		Existing	Prediction	Existing	Prediction
1	Mangrove Forest	11.26	9.22	0.29	0.23
2	Built-up Area	2224.37	2564.17	56.63	65.28
3	Empty Land	443.43	296.44	11.29	7.55
4	Water	131.01	232.33	3.34	5.91
5	Field	1117.69	825.61	28.46	21.02
	Total	**3927.76**	**3927.76**	**100.00**	**100.00**

Accuracy Test

In a modeling, accuracy test is mandatory. The accuracy test shows the difference between the actual condition and the expected condition (the result of the model). In this model, an accuracy test using the Kappa method is applied.

Classification agreement/disagreement
According to ability to specify accurately quantity and allocation

	Information of Quantity		
Information of Allocation	No[n]	Medium[m]	Perfect[p]
Perfect[P(x)]	P(n) = 0.5183	P(m) = 0.9500	P(p) = 1.0000
PerfectStratum[K(x)]	K(n) = 0.5183	K(m) = 0.9500	K(p) = 1.0000
MediumGrid[M(x)]	M(n) = 0.4420	M(m) = 0.8747	M(p) = 0.8714
MediumStratum[H(x)]	H(n) = 0.1667	H(m) = 0.4146	H(p) = 0.4109
No[N(x)]	N(n) = 0.1667	N(m) = 0.4146	N(p) = 0.4109

```
  AgreementChance =  0.1667
 AgreementQuantity =  0.2480
   AgreementStrata =  0.0000
 AgreementGridcell =  0.4601
  DisagreeGridcell =  0.0753
    DisagreeStrata =  0.0000
  DisagreeQuantity =  0.0500

               Kno =  0.8497
         Klocation =  0.8593
   KlocationStrata =  0.8593
         Kstandard =  0.7860
//Ending of run:          1
```

Figure 4: Kappa Test Results Classification of Land Cover Prediction 2019

The accuracy test results show an accuracy value of 0.7860 which is shown in Figure 4. The accuracy value shows that the 2019 land cover predicted using the CA model with the existing 2019 land cover corresponds in terms of area and spatial distribution. This shows that the validation of the CA prediction data according to the kappa index has a kappa accuracy value included in the good category so it can be concluded that the 2031 land cover prediction results can be said to be good and acceptable.

Land Cover and City Development Prediction Result

In this model, land cover predictions are carried out until 2031. Based on the model results, it can be seen that in each class there is an increasing and decreasing trend in area which can be seen in Figure 8. For vacant land there is an upward trend in 2009-2019 but between 2019 and 2031 there is a downward trend in area, this can be seen in the land cover map that in 2009 to 2019 there has been a conversion from garden/mixture to vacant land resulting in an increase

in land area. empty, while in 2019 to 2031 there was a fairly large conversion from empty land to build up land.

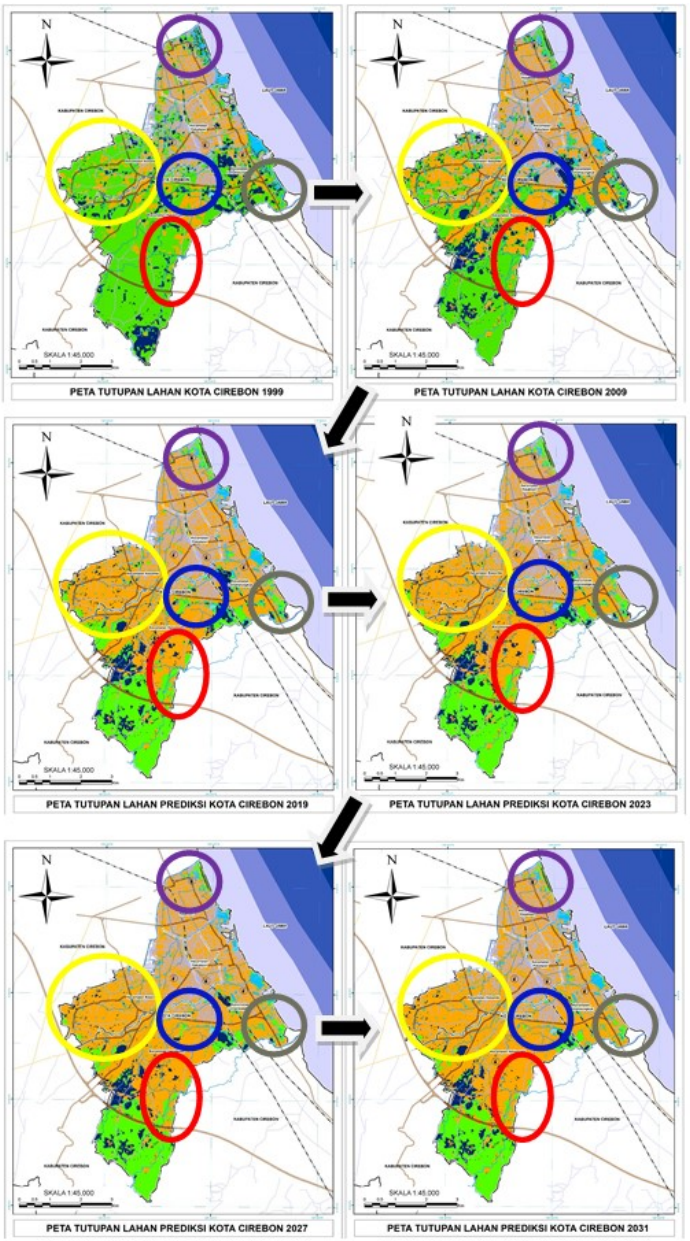

Figure 5. Locations of Land Cover Changes in Cirebon City

Figure 5 shows the development of the existing land cover of Cirebon City from 1999 to 2009 and the prediction of land cover from 2019 to 2031. Seen in the purple circle, namely in the northern area of Cirebon City, namely the District Attorney's Office, the mangrove forest land cover appears to decrease from 1999 to 2031. For the western part, namely Kesambi District, which is indicated by a yellow circle, there is a conversion from mixed plantation land to residential land cover classes, this is possible seen from the driving factor, namely the number of road networks in the area and the slope factor which is quite gentle which allows mixed gardens. converted into built-up land. For the southern area, namely Harjamukti District, which is indicated by the red circle, there was a fairly massive land cover change from mixed garden land cover to built-up land, but the spread to the south stopped in 2023, because the area further south than Harjamukti District has a height and the slope is quite high, which causes the built-up land to not continue to expand to the south. For the eastern area, namely Lemahwungkuk District, the expansion of built-up land is not too much, because the land in the sub-district is already the majority of built-up land. Just like the area east of the city of Cirebon, the area in the middle of Cirebon is not much converted, there are only a few mixed gardens that are converted into residential land. For the northern region, there is not much land conversion, but there is one important thing to note, that it is indicated that there will be conversion of mangrove forests into built-up land.

From the model results, it is shown that the development of Cirebon City leads to two parts, namely the western and southern parts. If it is associated with population density, the southern area of Cirebon city, namely Harjamukti District, has the highest net population density and has the largest area in the city of Cirebon, this means it is very suitable for the direction of urban development in the future and in line with Previous research has shown that population has a close relationship with urban development (Elsawahli et al., 2016). When viewed from the side of the topography and slope, which is one of the factors controlling urban development, the southern region is limited because it has a fairly high slope and steep topography, making it unsuitable to be developed for residential areas. In the western area, which can be an alternative for urban development, this is considering that the area is close to toll access which will facilitate settlements or industries in and out of the city of Cirebon.

CONCLUSION

From the results of the study, it can be seen that the CA model can describe the prediction of the development of the city of Cirebon in the future. By adding the net population density factor, a better model is produced, which can be seen from the fairly high kappa accuracy test value. The development of the area that Cirebon City will mostly lead to the south is the Harjamukti sub-district. The

driving factors of this model are elevation, slope, distance from the road, distance from urban areas and population density.

From the model results, it can be seen that the built-up land class has a positive trend, namely its area increases every year, while the mixed garden class has a negative trend, which is it decreases every year. This can be used as input for the Cirebon City government to oversee the development of Cirebon City. The Cirebon City Government can anticipate the development of the city to the south and west, namely by optimal settlement planning and supporting facilities in the two areas.

By doing land cover modeling, it will be easier to do spatial planning. Spatial planning in regional planning is generally carried out by considering physical, economic, social and cultural analysis. With the results of land cover predictions, and knowing the direction of urban development, it can be used by planners as an additional analytical tool for regional planning. With this, spatial planners will be able to better have a basis in determining the direction of inner urban development, namely in determining spatial patterns and spatial structures

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TOURIST PREFERENCES AND EXPECTATIONS OF URBAN PARK: A CASE STUDY IN KITAKYUSHU, JAPAN

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Abstract

The quality of an urban park can be evaluated by understanding the tourist's reasons, preferences, and expectations. This study analyzes several variables based on answers to field survey questionnaires using 425 respondents. Furthermore, Green Park, located in Kitakyushu, Japan, serves as the case study. The result found six essential variables: 1) "Playing with children" is the most popular reason for visiting this park; 2) Tourists living closer to the area frequently visit; 3) The existence is necessary; 4) The relationship between the importance and the origins of the tourists is related to a sense of place; 5) Tourist preferences are affected by seasonality; 6) The most favorite expectation is the availability of water facilities. This further can contribute to tourism development in urban parks with similar climatic and environmental characteristics.

Keywords: Tourism; tourist preferences; tourist expectation; outdoor activities; urban park; sense of place

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INTRODUCTION

There are many benefits of urban park, including social and environmental services (Rouhi, Monfared, & Forsat, 2017). For example, it can mitigate the heat island effect and improve the outdoor thermal environment quality (Yan, Wu, & Dong, 2018), and also increase residents' satisfaction and enjoyment as well as avoid stresses produced by activities (Razak, Othman, & Nazir, 2016). It also has social, economic, and ecological roles in improving the quality of life and community development (Chiesura, 2004; Othman, Mohamed, Ariffin, & Razak, 2015; Riki, Rezazade, & Miri, 2016; Ward, Parker, & Shackleton, 2010).

This study aims to understand tourists' reasons, preferences, and expectations in Green Park, Kitakyushu, Japan. The six crucial questions to be considered are: 1) What is the reason for visiting this park?; 2) What is the relationship between the frequency and the source of the visits?; 3) How significant is this park to visitors?; 4) What is the relationship between the significance of visiting and their origins?; 5) Are tourists more inclined to visit during specific seasons?; and 6) What are the expectations on this park facilities?. This could also be useful for tourism development, specifically for urban parks with similar climatic and environmental characteristics.

The criteria considered for the eligibility of the case study are a large-scale park (Aram, Solgi, García, Mosavi, & Várkonyi-Kóczy, 2019) with a legal classification (MLIT, 2006). According to the Ministry of Land, Infrastructure, and Transport of Japan (MLIT, 2006), there are two legal classifications of Japanese parks: natural and urban parks. Urban parks are specific areas of land opened for public use and created by central government or local bodies. In the Kitakyushu City area, 23 parks fall within the territorial area, according to their official tourism information website (KCTIC, 2021). Green Park Kitakyushu was the most eligible to serve as a case study based on these criteria.

LITERATURE REVIEW

Visiting urban parks is a fun activity for many people, and the experience can reduce mental stress (Ulrich, 1981), increase meditation, and provide peace of mind (Kaplan, 1985). There is a significant relationship between park use and perceived health conditions. Frequent users of local parks are more likely to have good health (Godbey & Mowen, 2010) since they visit for functional needs such as exercise, relaxation, and outings with children (H. Liu, Li, Xu, & Han, 2017). Parks and urban green spaces can provide opportunities for recreation, sport, leisure, and residents' physical and mental health (Riki et al., 2016). Urban nature fulfills many citizens' social functions and psychological needs, making it a valuable municipal resource and an essential ingredient for city sustainability (Chiesura, 2004). According to a study conducted in Malaysia (Razak et al., 2016) and (Othman et al., 2015), the primary reason for visiting an urban park is for recreational purposes. It shows that the feelings and the emotions evoked in this park are perceived by people as significant

contributions to their well-being, such as regeneration of psychophysical equilibrium, relaxation, break from the daily routine, and the stimulation of a spiritual connection with the natural world (Chiesura, 2004). Furthermore, (Riki et al., 2016) (Jones, 2006) stated that the reasons for visiting a park are: exercise or fitness, picnics with family, playing with children, educational/study purposes, taking part in certain activities or events, and relaxing or having pleasant diversion. Chiesura (2004) stated that visitors conduct several activities with different motives. Children are always eager to explore water because it is fascinating and intriguing (McMillan, 2014). Water play can also help them acquire problem-solving and thinking skills (Hoisington, Chalufour, Winokur, & Clark-Chiarelli, 2014; Olowe, Ojoko, & Onuegbu, 2020). These findings show that tourists' behavior and activities are related to age, reason/purpose to visit, and the urban park's environment. The design and management also play an essential role in increasing tourists' feelings and emotions.

The tourist's satisfaction and expectation of environmental conditions can affect their perception of comfort in outdoor space, and the park quality is significantly correlated to physical activity (Rosli, Leh, Adzmi, & Marzukhi, 2020). Nature and human interactions need elements of open spaces such as green environments, water elements, and physical attributes to enhance the interactions between human-human and human-nature (Ibrahim, Omar, & Nik Mohamad, 2017). According to Klanicka (2006), expectations for developing urban park facilities can indicate a sense of belonging to the local community. This is strongly associated with memories of childhood and youth (Klanicka, Buchecker, Hunziker, & Böker, 2006).

One of the most significant challenges an urban park faces as a tourist destination is seasonality. It affects the optimal use of investment and infrastructure and can create a negative experience of crowding at destinations (Sætórsdóttir, Hall, & Stefánsson, 2019). Visits are also affected by seasonality variation (Corluka, 2019; Zainol & Au-Yong, 2016; Corluka, Mikinac, & Milenkovska, 2017; Geng, Innes, Wu, Wang, & Wang, 2021; Sætórsdóttir et al., 2019) and tourist preferences.

STUDY METHODS

1. Study case

This park is located at 1006 Takenami, Wakamatsu-ku, Kitakyushu City, Fukuoka Prefecture, Japan. It has various types of attractions (Hibikinada Green Park, 2020), such as a lawn square or large green open space (Figure 1), kid's playgrounds, e.g., slider house, the world's longest swing, adventure forest, cycling terminal, an open stage for public performance, animal square (pony horse square, goat square, and kangaroo square), plant garden, e.g., three tropical eco-parks in greenhouses, rose garden, and seasonal plantation.

Figure 1: Green Park Kitakyushu facilities: Lawn square and Bumpy open space
Source: Authors (2021)

This park has seasonal attractions, for example, there is a swimming pool and giant air slider in summer, while there are skating and night illumination in winter. There are also some natural sceneries, such as forests and reservoirs. Several new tourist attractions have been inaugurated in 2020 - 2021, including Bumpy open space (Figure 1), Dino Park, Nyoki-nyoki forest, and fossil valley. A water house that is a supporting facility as a relaxing room for families containing a nursing room for babies, a toilet, and a water curtain was also provided. The urban greenery center provides information on greening and flowers, consultancy activities, exhibitions, and seminars.

2. Study subject

The study subject is the tourist of Green Park Kitakyushu, which are participated by a random and voluntary approach. Except for children under 10 years, there are no special provisions to avoid bias/misunderstanding. The number of respondents is 425 people, consisting of 187 males, 236 females, and 2 undecided genders. The study location is focused on the large grass open space, as the most frequently visited, based on the observation results of the pre-study.

3. Data collection method

The data collection method was conducted by distributing field survey questionnaires to tourists. Respondents were limited to volunteers who had been screened by entering this park on purpose (Statistic-Canada, 2017). This study was conducted in 4 different seasons within one year. Each season consists of 3-4 days of data collection, and each day consists of 2-3 location spots (Table 1).

Table 1: Seasons, number of days, and period of data collection

Seasons	Number of days	Period
Summer	4	19 July - 16 August 2020
Autumn	3	14 - 18 October 2020
Winter	4	17 January - 14 February 2021
Spring	4	10 April - 8 May 2021
Total	11	

4. Data analysis method

Data analysis was carried out using quantitative approaches and statistical techniques using computer software. The distribution analysis technique determined the reasons, frequency, and importance of tourists to the existence of Green Park Kitakyushu. In addition, it obtained the most favorite season, area, and tourists' expectations of urban park facilities. The correspondence analysis technique was used to determine the closeness between factors, importance, and frequency of visiting the Green. Meanwhile, the analysis data were processed in Microsoft Excel and illustrated by graphs. The JMP statistical software is utilized to gain a correspondence analysis.

RESULTS AND FINDINGS

1. Reason to visit urban parks

This study determined tourists' reasons, preferences, and expectations at Green Park, Kitakyushu. The trends on the bar graph indicate an urban park that is friendly to families with children. The most popular reason is playing with children, which is popular for spring's respondents. "Having a picnic or gathering with friends" accounts for the second reason, as shown in Figure 2.

The heatmap graph (Figure 3) presents the correlation between reason and age groups. The result shows that adults between 30 and 40 years mostly have a motive to play with children. Meanwhile, most teenagers are motivated to have a picnic or gather with friends. The elderly above 70 years visit this park for pleasure or pleasant diversion.

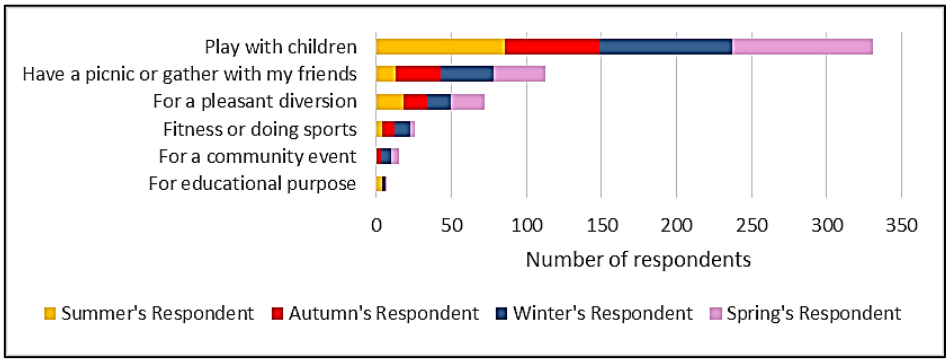

Figure 2: The reason for visiting Green Park Kitakyushu
Source: Authors (2021)

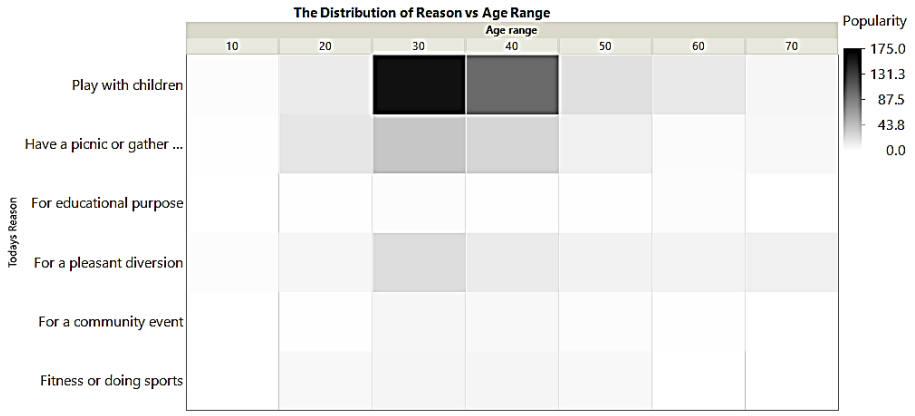

Figure 3: The correlation between current reason and the age-group
Source: Authors (2021)

2. The frequency of visiting

Tourists were asked how often they visit Green Park Kitakyushu. Based on the survey results, 61%, 26%, and 11% answered (4) "once or twice a year", (3) "monthly or more often", and (5) "this is my first time", respectively. Compared to the results obtained, this pattern occurs in all seasons. This finding shows that most respondents "rarely" visit this park. It also shows that the tourists living outside the city, i.e., Fukuoka or other cities in Japan, are primarily associated with the first-timer tourist to this park (Figure 4).

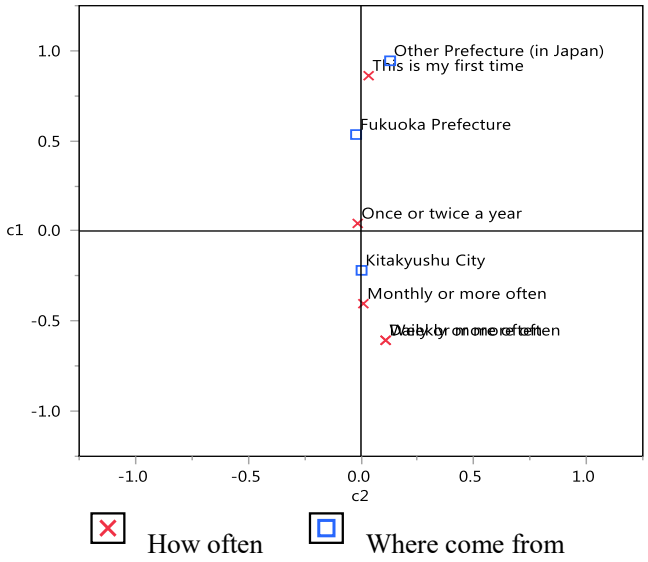

Figure 4: Correspondence analysis between "Where come from" by "How often"
Source: Authors (2021)

Tourists in Kitakyushu City are classified according to their frequency of visits. Based on this correspondence analysis, it is founded that tourists living closer to this park frequently visit.

3. The importance of visiting urban parks

The frequency analysis (Figure 5) shows that 33%, 29%, 21%, and 16% answered (+1) slightly important, (+2) important, (+3) very important, and (0) neutral, respectively. Almost no respondents (0%) answered negatively, and each season has a different pattern. From these findings, tourists feel that the existence of Green Park Kitakyushu is important to their lives.

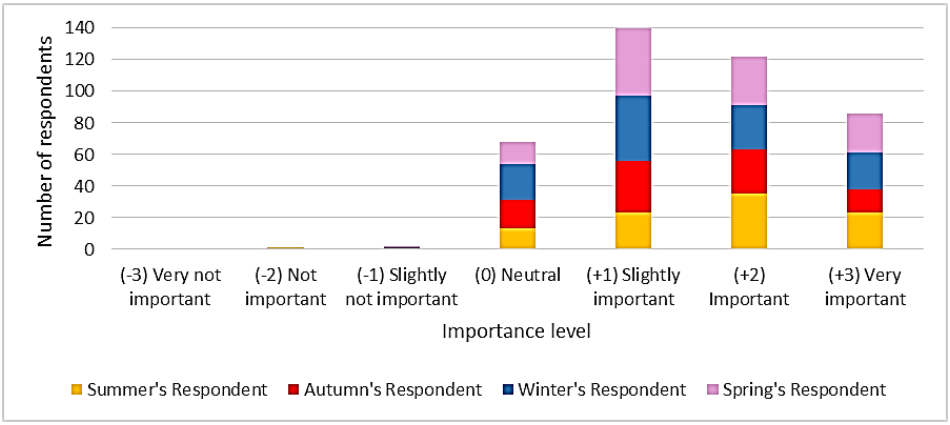

Figure 5: The importance of visiting Green Park Kitakyushu
Source: Authors (2021)

4. The relationship between the significance and the origin of location

Based on the correspondence analysis (Figure 6), the correlation between the two variables tends to be positive. Respondents who answered that visiting this park is essential are from Kitakyushu (local tourists), while the majority from outside answered neutrally.

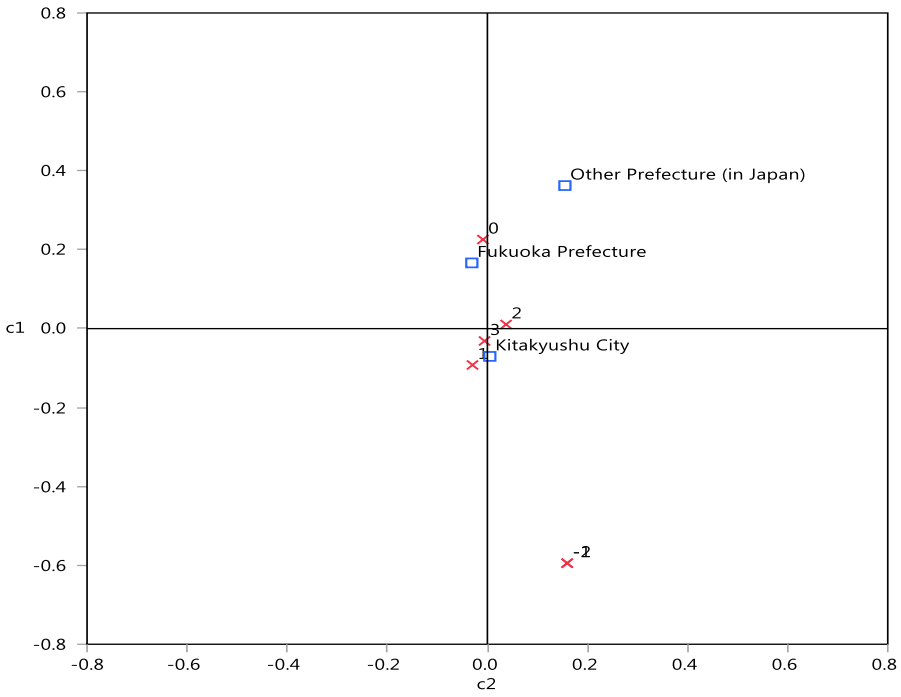

Figure 6: Correspondence analysis between the importance of visiting this park and the origin living area of respondent
Source: Authors (2021)

5. The most favorite season and area of urban park

The result confirms that seasonality affects tourist preferences to visit an urban park. Most tourists select the spring season as their favorite, followed by autumn and summer (Figure 7). Almost all respondents selected "spring" as their favorite season, except autumn. Meanwhile, the summer respondent has two favorite seasons, spring and autumn. Based on the survey results shown in Figure 7), the favorite area in Green Park Kitakyushu is the lawn square, followed by the playground for kids, then the natural, indoor, and outdoor areas. The lawn square is used as a picnic area, setting up a tent or storing personal belongings based on field observations. This result is correlated to the tourists' answers regarding the reason for visiting this park.

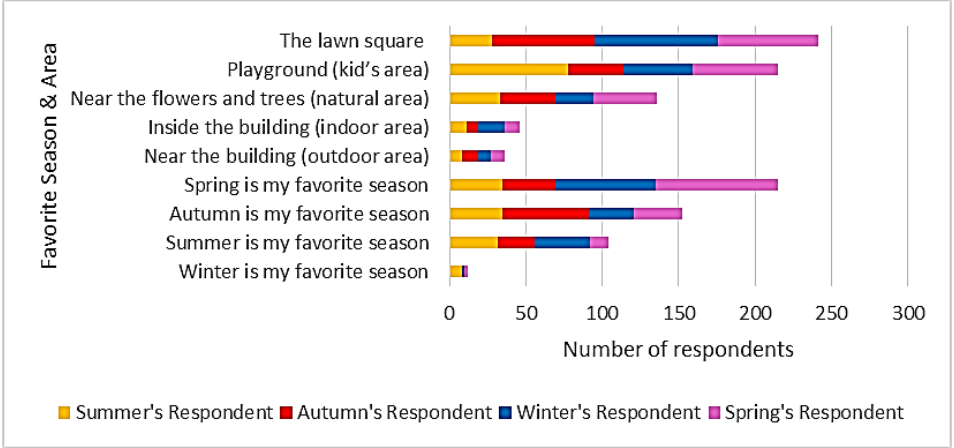

Figure 7: The most favorite season and area of Green Park Kitakyushu
Source: Authors (2021)

6. The tourist expectations for urban parks

The survey result shows that most respondents selected the expectation of the availability of permanent water play facilities as the most popular one (Figure 8). This is followed by camping space facilities, the answer of "I am satisfied with the current condition," pets play facilities, can stay all night, more animal varieties, athletic ground or sports space, and skate park.

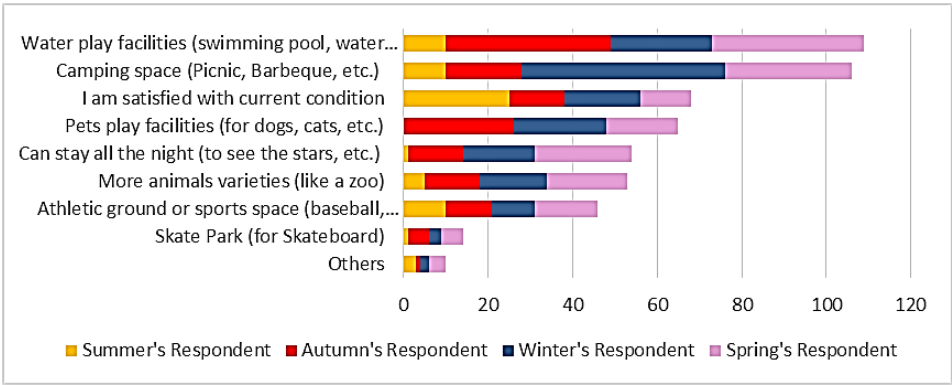

Figure 8: The tourist expectation of park facilities in Green Park Kitakyushu
Source: Authors (2021)

This result shows that even though the temporary water play facilities are provided only in winter, it is still the best for all seasons. This may be due to children's great interest in water-related play facilities.

CONCLUSIONS

This study showed six crucial things, first, most of respondents visited to play with children. These findings indicate that Green Park Kitakyushu is friendly to families and children. The adult and older age groups mostly visited because of children, while teenagers visited for picnics. The motive of the elderly groups above 70 years is to seek pleasure.

Second, most respondents rarely visit this park, and the tourists living closer to the area visit frequently. This result strengthens the finding that distance tends to affect the frequency of visits.

Third, the existence of this park is critical for tourists, and there is a positive correlation between its importance and origin. Fourth, respondents who stated that visiting this park is necessary are from Kitakyushu, while the majority from outside gave a neural answer concerning the sense of place felt by tourists.

Fifth, tourists mostly select spring season as their favorite, followed by autumn and summer. This finding confirms that seasonality affects tourist preferences to visit. The most favorite area in this park is the lawn square, followed by the playground for kids, as well as natural, indoor, and outdoor areas. These results may be correlated to the tourists' answers regarding the reason for visiting this park.

Sixth, even though the temporary water play facilities are provided in winter, most respondents expect that permanent facilities will be provided in different seasons. This may be due to children's great interest and parents' wisdom in water-related play facilities.

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A PARADOXICAL PROPOSITION OF CONNECTEDNESS TO NATURE, RECYCLING BEHAVIOUR AND PSYCHOLOGICAL RESTORATION RELATIONSHIP IN URBAN PARK CONTEXT: A PATH ANALYSIS EVIDENCE

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Abstract

About 29.2% of Malaysians have been diagnosed with psychological distress, especially young adults. The B40 low-income group is most afflicted due to financial restrictions and limiting access to medication. Therefore, urban parks' connectedness and pro-environmental behaviour towards psychological restoration are inexpensive ways to alleviate distress. This study examines the relationship between Connectedness to Nature (CN), Pro-Environmental Behaviour (PEB), and Psychological Restoration (PR). Three hypotheses were used to create a structural model to guide the cross-sectional methodology used for the study. A total of 161 students responded to the Google Form questionnaire. SPSS v21 and Smart-PLS 3.2.7 were used to examine the model relationship. The results showed that all hypotheses were supported by substantial statistical evidence. This study provides an important direction to motivate people to utilize urban parks for obtaining psychological restoration benefits cost-effectively. Green behaviour is also beneficial for humans and the environment in promoting healthy living.

Keywords: Connectedness to nature, pro-environmental behaviour, psychological restoration, urban park

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INTRODUCTION

Psychological Restoration (PR) is an appropriate initial preventive measure to alleviate psychological distress. Previous studies have proved that the natural environment can alleviate psychological distress in many ways (Schebella et al., 2020; Gao et al., 2019; Wang et al., 2020). Nevertheless, the relationship between urban parks and psychological benefits is still uncertain (Deng et al., 2020) especially in contemplative urban parks in Malaysia (Othman et al., 2020) related to natural connectedness. Connectedness to Nature (CN) is a mental state of an individual comprising emotional and cognitive bonding with the natural environment like the urban park. It starts when people interact with urban parks incidentally, intentionally, or non-directionally (Martin et al., 2020). However, the CN-PR association is seldom identified; moreover, it produces inconsistent results (Kryazh, 2019). Also, individuals with frequent urban park experiences have emotions concerning environmental belongingness and preservation (Martin et al., 2020) via Pro-Environmental Behaviour (PEB). PEB is a conception of protecting and preserving the natural environment like recycling. Recycling had a significant positive effect on improving psychological health (Hsiao et al., 2020; Joy, Ramachandran, & George, 2021; Sun & Trudel, 2017) and life satisfaction (Donnelly et al., 2017; Giovanis, 2014). This study argues that PEB has a similar impact on psychological restoration directly or indirectly. It is a seemingly paradoxical proposition that must be justified using scientific evidence. Hence, this study evaluates the relationship between CN, PEB, and PR using the path analysis approach.

CONCEPTUAL STRUCTURAL MODEL

Path analysis requires developing a structural equation model. This study formulated a conceptual structural model using three major domains, namely, Connectedness to Nature (CN), Pro-Environmental Behaviour (PEB), and Psychological Restoration (PR) as per Figure 1. This study also intends to contribute toward expanding the literature on the relationship of the highlighted domains. Most studies have employed more than one PEB type, whereas the present study uses recycling as a single measure. Also, to date, the role of PEB to enact PR remains fuzzy. Hence, three hypotheses have been proposed: H1-Connectedness to Nature (CN) has a significant positive relationship with Psychological Restoration (PR) (Schebella et al., 2019; Gao, Song, Zhu, & Qiu, 2019); H2-Connectedness to Nature (CN) has a significant positive relationship with Pro-Environmental Behaviour (PEB) (Barrera-Hernández et al., 2020; Sulphey & Faisal, 2021; Martin et al., 2020; Whitburn, Linklater, & Milfont, 2019); and H3-Pro-Environmental Behaviour (PEB) has a significant positive relationship with Psychological Restoration (PR) (Hsiao et al., 2020; Joy, Ramachandran, & George, 2021; Sun & Trudel, 2017; Donnelly et al., 2017).

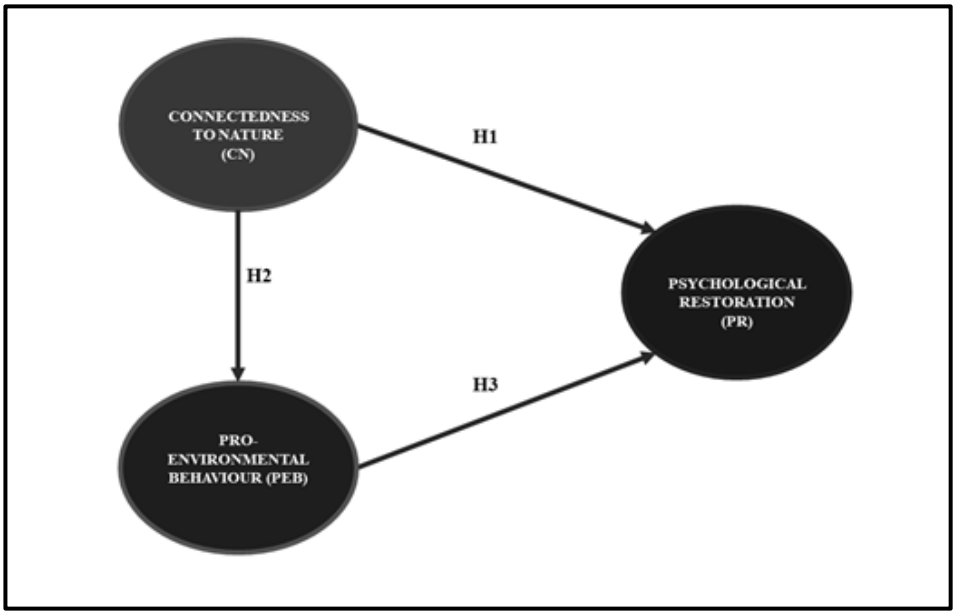

Figure 1: Conceptual Structural Model

METHOD

This study uses a deductive approach by testing the formulated hypotheses using a cross-sectional study conducted at Universiti Technology MARA (UiTM) Shah Alam, Selangor. UiTM is a public university for Bumiputera (Local citizens) to help low-income families (B40) pursue studies. Convenience sampling was used for sample selection. The urban park selected for this study is Taman Tasik Shah Alam, Selangor. The area integrates soft and hard landscapes to facilitate human-nature interaction (Malek & Nashar, 2020; Illia Ibrahim, Omar, & Hanita Nik Mohamad, 2018). However, studies on psychological impact in this context are infrequent. Hence, this study should assess the underestimated perceived restorative potential of the area. The measurement instrument comprises six items of Connectedness to Nature (five-point Likert scale), three items of Pro-Environmental Behaviour (five-point Likert scale), five items of Psychological Restoration (five-point Likert scale), and four items of Demographic Profile. The instrument was loaded onto digital platforms to use online surveys (Google Form) for data collection. Data analysis concerning this study involved descriptive analysis performed using IBM SPSS version 23 and inferential analysis performed using Smart-PLS 3.2.9 (Two stages: measurement model analysis and structural model analysis)

RESULT

Demographic Profile

This study comprised 161 respondents; 68.9% were female, while 31.1% were males. The majority comprised Malays (95.0%); the remaining 5.0% were Bumiputera. Most students belong to semesters five and six, comprising 51.6% of respondents. Other participation includes semester 7-8 (22.4%), 3-4 (19.2%), 1-2 (5.6%), and above semester 9 (1.2%). These individuals are from the B40 groups having four monthly income categories. There were 40.4% of respondents each from family income ranges: of less than RM2,500 and RM3,970-RM4,849. The remaining income distribution was RM2,501-RM3,169 (13.0%) and RM3,170-RM3,969 (6.2%).

Measurement Model Analysis

The normality test assessed the data distribution to help identify an appropriate data analysis technique. Study data were not normally distributed because cut-off values concerning Mardia's multivariate skewness (±3) and kurtosis (±20) test were exceeded (Hair et al., 2017). The WebPower application indicated that the study had a skewness of $\beta = 75.693$, $p < 0.01$ and a kurtosis value of $\beta = 324.170$, $p < 0.01$. Thus, non-parametric analysis using Smart-PLS was confirmed for this study. The first stage comprises measurement model analysis (Confirmatory Factor Analysis) consisting of reliability and validity tests. Table 1 indicates that all items representing every construct were reliable. These items were also in the threshold range specified. This study confirmed that the representative items were consistent with other studies concerning different contexts and samples.

Table 1: Measurement Model Analysis

Construct	Items	Loading	Mean	Composite Reliability	Average Variance Extracted
Connectedness to Nature	A3NC1	0.739	4.69	0.924	0.670
	A3NC2	0.775	4.60		
	A3NC3	0.881	4.67		
	A3NC4	0.766	4.40		
	A3NC5	0.863	4.65		
	A3NC6	0.877	4.40		
Pro-Environmental Behaviour (Recycling)	PEBt1	0.785	3.24	0.829	0.619
	PEBt2	0.835	3.42		
	PEBt3	0.738	3.47		
Psychological Restoration	PR1	0.806	4.22	0.918	0.692
	PR2	0.868	4.10		
	PR3	0.797	4.03		
	PR4	0.842	4.12		
	PR5	0.843	4.10		

Source: Author

Tables 2 and 3 show that all items were valid in representing the three primary constructs in this study. In Table 3, all construct values are higher than the construct's highest squared correlation values (Chin, 1998; Fornell & Larcker, 1981). The HTMT ratio in Table 4 also meets the threshold value of less than 0.85 or 0.95 (Darlington & Hayes, 2017). Thus, the measurement model analysis was fulfilled with substantive evidence for the next stage, i.e., structural model analysis.

Table 2: Fornell-Larcker Criterion

	1	**2**	**3**
1. CN	0.819		
2. PEB	0.300	0.787	
3. PR	0.551	0.306	0.832

Source: Author

Table 3: Heterotrait-Monotrait Ratio (HTMT)

	1	**2**	**3**
1. CN			
2. PEB	0.375		5666
3. PR	0.602	0.374	

Source: Author

Structural Model Analysis

The second stage comprises structural model analysis using a bootstrapping procedure with a subsample of 5000 to generate a model relationship (Hair et al., 2017). Before this process, the Goodness of Fit (GoF) should be determined to ascertain model fitness criteria. In this study, the value of GoF was 0.457 (Large) and considered an acceptable fit (Wetzels et al. 2009). According to Hair et al. (2017), path coefficient (t-value), coefficient of determination (R^2), effect size, and predictive relevance criteria must be tested. Figure 2 and Table 4 below specify all the criteria. The results showed that all proposed hypotheses were supported, for instance, CN and PR ($\beta = 0.505$, $p < 0.01$), CN and PEB ($\beta = 0.300$, $p < 0.01$), and PEB and PR ($\beta = 0.155$, $p < 0.05$). Furthermore, the R^2 values for PEB were 0.090 (weak) and 0.326 (substantial) (Cohen, 1989). The effect size values (f^2) of this study were 0.344 (moderate), 0.090 (weak), and 0.032 (weak) (Cohen, 1989). This study also recognized predictive relevance (Q^2) using the blindfolding technique. Blindfolding is a sample reuse strategy in which data points are systematically deleted, and their original values are predicted (Stone,

1974; Geisser, 1974). This study has acceptable Q^2 values: 0.049 (PEB) and 0.213 (PR); both values exceed zero, as required (Hair et al., 2017).

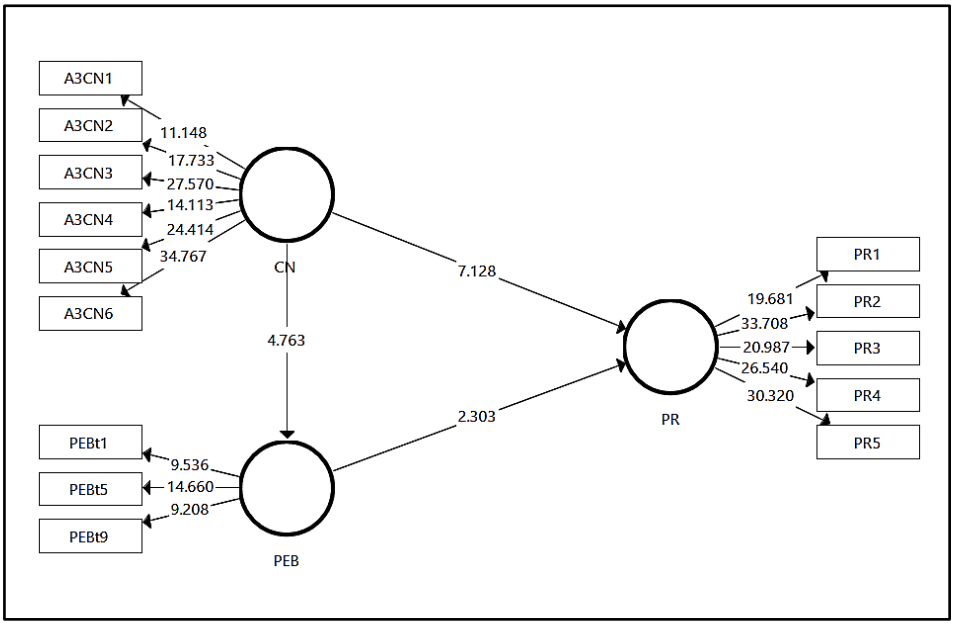

Figure 2: Structural Model Relationship
Source: Author

Table 4: Hypothesis Testing Results

	Std. Beta	Std Error	p-value	t-value	Decision	5.0%	95.0%	R^2	Q^2	f^2
CN > PR	0.505	0.071	0.000	7.128**	Supported	0.386	0.619	-	-	0.344
CN > PEB	0.300	0.063	0.000	4.763**	Supported	0.209	0.414	0.090	0.049	0.099
PEB > PR	0.155	0.067	0.011	2.303*	Supported	0.055	0.275	0.326	0.213	0.032

Source: Author

DISCUSSION

Connectedness to Nature (CN) has a significant positive relationship with Psychological Restoration (PR)-H1

This study found that H1 was supported. It indicates that an individual bonding with nature experiences restorative emotions. The context and type of natural existence differ and arouse feelings of well-being (Schebella et al., 2019); however, natural settings like urban parks are still emotionally restoring resources. Previous studies focus only on natural environment settings like forests than urban parks; hence, the role is still unclear (Deng et al., 2020; Wang et al., 2016). Therefore, this study helps justify the argument based on the biodiversity attributes of urban parks. For instance, biodiversity attributes like vegetation richness substantially impact individual psychological restoration and stress reduction (Schebella et al., 2019; Gao, Song, Zhu, & Qiu, 2019). Besides, water body attributes provide a tranquil gaze for emotional serenity (Gao, Song, Zhu, & Qiu, 2019). Hence, the assertion that individuals remain close to nature for well-being is significant because of the mentioned advantages. Scale representations for both domains were verified. This study's short versions of the Nature Relatedness Scale (NRS-6) and Perceived Restorative Scale (PRS-5) were reliable and valid in this context. This study found that the composite reliability of CN (0.924) paralleled with a previous study (0.920) (Martin et al., 2020). For PR, reliability, and validity values of 0.918 and 0.700 are higher than the previous study (Panno et al., 2020). In this regard, the concept of model parsimony was highlighted in the study. Furthermore, this study found that the perceptive evaluation of CN towards PR was substantiated.

Connectedness to Nature (CN) has a significant positive relationship with Pro-Environmental Behaviour (PEB)-H2

This study argues that individuals better connected with nature tend to undertake PEB. The H2 association in this study was significant (Barrera-Hernández et al., 2020; Sulphey & Faisal, 2021; Martin et al., 2020; Whitburn, Linklater, & Milfont, 2019). However, this study used only a single PEB (recycling), rarely applied in previous works. Advantages can help identify CN-influenced PEB types. Connection to nature plays an essential role in explaining environmental concerns, including recycling behaviour. It is a nature-conserving behaviour used commonly as a primary PEB in previous studies (Barrera-Hernández et al., 2020; Sulphey & Faisal, 2021; Martin et al., 2020; Whitburn, Linklater and Milfont, 2019). The present study has superior reliability and validity values than previous studies. For instance, previous studies recorded 0.780 reliability (Barrera-Hernández et al., 2020; Ibáñez-Rueda et al., 2020), compared to 0.829 for the present study. Besides, this study has distinctive loading values of 0.738-0.835 compared to 0.60 (Martin et al., 2020). In conclusion, individuals who care about

the environment through subjective connectedness are expected to preserve the environment using simple actions like recycling.

Pro-Environmental Behaviour (PEB) has a significant positive relationship with Psychological Restoration (PR)-H3

In general, the relationship between recycling behaviour and life satisfaction is widely stated (Hsiao et al., 2020; Joy, Ramachandran, & George, 2021; Sun & Trudel, 2017; Donnelly et al., 2017) compared to psychological restoration itself. This study justified the paradoxical proposition of the direct and bidirectional relationship between PEB and PR (Whitburn et al., 2019). However, this study used recycling as the PEB type than tree-planting behaviour. The PR relationship remains direct and bidirectional. It shows that actions (like recycling) towards conserving the natural environment are profitable for humans and nature; the benefits manifest as high happiness levels, reduced negative emotions, and less waste deposited in landfills (Hsiao et al., 2020). Psychological restoration depends on the quality of the restorative environment. For instance, one of the leading PR attributes is the fascination elicited by artistically attractive settings (Rita & Giuseppe, 2017). Littering rampant in urban parks will affect the restorative environment. Steps can be taken to transform recyclable waste into aesthetic sculptures to improve the scenery. In other words, recycling is also part of nature-conserving behaviour. It helps preserve the aesthetic quality of the environment and serves restorative experiences. Consequently, such steps can reduce waste disposal, reduce natural resource use, and reduce environmental challenges.

CONCLUSION

It is possible to alleviate psychological distress using a connection with nature. This study postulates a new proposition for promoting mental health by integrating Pro-Environmental Behaviour (PEB). Remarkably, the results revealed that a single PEB item has significant direct and indirect effects on Psychological Restoration (PR). The PEB-PR proposition having a bidirectional relationship is paradoxical. It suggests that humans protect and preserve urban natural aspects to benefit from perceived restorativeness. The correlations between CN, PEB, and PR were provided concerning relationships than establishing causality. Due to a new proposition in the literature, this study attempted first to identify significant compatibility between model constructs. However, there is room for enriching future studies by incorporating exposure and experience levels concerning CN, internal and external stimuli concerning PEB, and inserting stimulant images about PR when administering the survey. Besides, a cross-sectional study can be transformed into a longitudinal study to assess causality. In conclusion, rapid transformation for preserving urban nature

needs to be intensified to benefit urban communities, including low-income groups (B40). The authorities and agencies can be provided with a progressive plan to promote restorative environments in urban areas and encourage direct preservation by citizens. This study provides an essential direction for people to connect with the urban natural environment to gain psychological restoration benefits. Subsequently, they should maintain urban settings to help with the benefits of restorative experiences. In essence, both movements can create a harmonious atmosphere to preserve the natural environment and increase the well-being of urban communities.

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THE IMPACT OF MONETARY POLICY ON HOUSING AFFORDABILITY IN MALAYSIA

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Abstract

Housing affordability is a global concern, especially among researchers and policymakers around the world in both developed and developing countries. In Malaysia, it has been a decade since the median multiple house price reaching more than a tripled median household income threshold in term of housing affordability. This indicates that housing in Malaysia is seriously unaffordable. In general, this study was conducted to examine the impact of monetary policy on housing affordability in Malaysia. This study focuses on investigating both short and long-run relationships between money supply and interest rate on housing affordability. To achieve this goal, Autoregressive Distributed Lag (ARDL) estimation techniques were employed on a quarterly data from the first quarter of 2008 until the first quarter of 2021. The findings showed the existence of long-run cointegration between all indicators except for the interest rate. In addition, money supply, interest rate, and employment were found to be significant in the short run. In the matter of policy implication, it is best for policymakers to focus on regulating money supply rather than controlling interest rate in promoting housing affordability.

***Keywords**:* housing affordability, monetary policy, money supply, interest rate

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INTRODUCTION

Monetary policy is a mechanism or instrument used to control the money supply and interest rates in an economy (Zakaria, Sarmidi, Mohd Salleh & Othman, 2013). This policy is adopted by the monetary regulator of a country with the ultimate goals of maintaining price stability, and supporting the sustainable growth of the country (Bank Negara Malaysia, 2020). Interest rate, reserve requirements, credit policy, and open market operations serve as the main instruments of governmental intervention to economic activities through the monetary policy to achieve the goals (Xu & Chen, 2012).

Expansionary monetary policy is employed by the regulator to upsurge the money supply in the market by reducing the interest rate, decreasing reserve requirements, and purchasing government security. In contrast, contractionary monetary policy is the one that tends to restrict the supply of money through the selling of government securities, increasing the interest rate, and raising reserve requirements (Naylor, 1967). Nevertheless, the uses of the instrument differ among countries depending on the development level of the money and capital markets of the country (Karim, Harif & Adziz, 2006). In Malaysia, the Central Bank of Malaysia or Bank Negara Malaysia (BNM) has control over the monetary policy, so long as they comply with the Central Bank of Malaysia Act 2009 (Bank Negara Malaysia, 2020).

Recently, the housing market and the monetary policy have shown their links between each other, leading to the reception of an enormous amount of attention from investors, academicians, and policymakers around the world – regarding such connection (Reed & Ume, 2013; Ume, 2018). This is due to the vital role of monetary policy that plays its part as the engine of a country's economic growth (Yu & Zhang, 2019). In addition, monetary policy is an essential instrument which bridges the government's interventions towards economic activities in Malaysia.

Nevertheless, most previous studies explored the issues of monetary policy on macroeconomic determinants, market dynamics (Wilhelmsson, 2008), housing prices, monetary policy transmission, and credit channels in the housing market (Yu & Zhang, 2019), but studies on the empirical relationship between monetary policy and housing affordability are still scarce. This motivates and justifies the need for this study to empirically unveil their relationships (monetary policy and housing affordability) especially in the Malaysian context that has not been empirically tested to date. The understanding of their relationship is crucial to ensure the formulation of effective policies in addressing the problem of housing affordability (Squires & Webber, 2019).

Money supply and interest rates play a significant role in influencing the level of housing affordability. The definition of money supply is the complete money value that runs around an economy at a point of time, entailing the currency, printed notes and deposit accounts' money, along with those of liquid

assets. A rise in the money supply will lead to an increase in consumer spending, as there is more capital available in the economic system and sequentially leading to a higher price (Liu, 2013; Taghizadeh-Hesary, Yoshino & Chiu, 2019) which therefore, worsen the housing affordability. Figure 1 shows the rising trend of money supply in Malaysia from 2010 to 2020. The value of the money supply in 2017 increased to RM1736440 from RM1655220 million in 2016. The amount of money supply continued to increase for another two consecutive years by 8.3 per cent (RM1894520 million) in 2018, and 3.5 percent (RM1961550 million) in 2019. In 2020, the amount of money supply continued to increase by 4 per cent to RM2040993 million.

In Malaysia, the Overnight Policy Rate (OPR) that is benchmarked for the interest rate is determined by the Central Bank. A higher OPR will increase the bank's lending rate along with the cost of borrowing – which ultimately worsens the housing affordability level. Figure 1 shows an irregular rising and falling of OPR in Malaysia. In 2009, the OPR was set at 2.00 and it increased tremendously to 2.75 in 2010. The OPR continued to rise to 3.00 in 2011 and 3.25 in 2014. However, the OPR decreased slightly in 2016 by 0.25, but it remained above 3.00 and rose again to 3.25 in 2018. In 2019, the OPR was marginally reduced to 3.00 before plummeting to 1.75 in 2020. This trend may affect the housing affordability as households will face hardship in securing a loan to purchase their house.

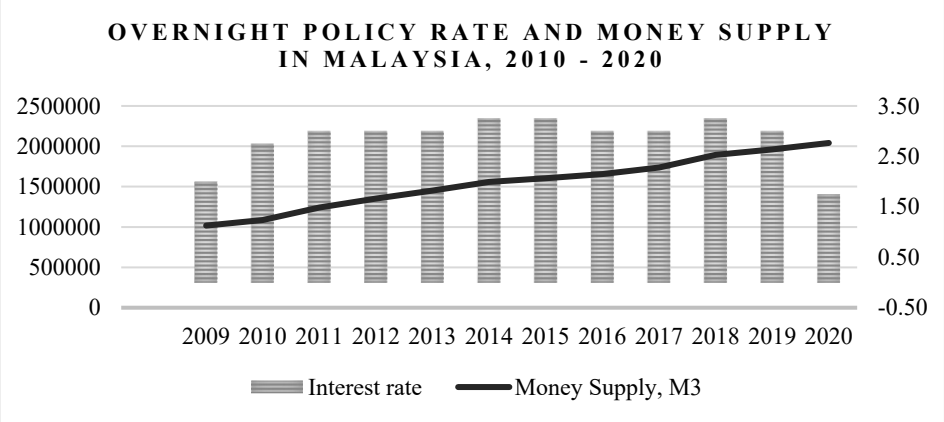

Figure 1: Overnight Policy Rate and Money Supply, M3 in Malaysia, 2010 – 2020
Source: Bank Negara Malaysia, 2021

Against this background, the effects carried by monetary policy on housing affordability were examined, hoping that the results carry a substantial weight to the comprehension of the effects carried by monetary policy on housing affordability. Such understanding allows policymakers to either review existing

policies or develop new strategies that are more applicable in improving housing affordability in Malaysia.

LITERATURE REVIEW

Monetary policy may affect housing affordability through various channels such as the interest rate, money supply, and the bank's credit policy (Xu & Chen, 2012). Firstly, when the central bank modifies the long-term benchmark bank loan rate, the interest rate and demands for loans will also experience shifts, which impact the real estate's condition. Hui & Yue (2006) argued that monetary policy through the rise of interest rates would cause a decrease in housing demand that eventually leads to the depreciation of house price and vice versa. Other markets of financial assets could be substituted by the housing markets in which the investors will transfer their portfolio from housing to other financial assets if the return available is higher due to the rise of interest rates. This will cause a decline in housing prices and an increase in the ability of buyers to purchase houses, until the balance of returns from holding distinct classes of assets is achieved (Elbourne, 2008). This is further explained by Zhu, Betzinger, & Sebastian (2017) in their study where the higher mortgage interest rate builds a reduction in the real estate market and consequently carries an impact on housing affordability level. Secondly, the level of interest rate may be increased or decreased due to money supply change; hence, will affect the ability of making loans from commercial banks. In addition, changes in interest rate will lead to the change in spending and saving patterns; thus, will affect the decision on purchasing houses (Damen, Vastmans, & Buyst, 2016). Interest payment constitutes a significant portion of the cost of property purchase, a high number of interest rates can cause a fall in the demand of housing which results in house price depreciation and vice versa (Elbourne, 2008). Thirdly, through mortgage down payment requirements, the central bank can encourage or discourage the supply of mortgage credit in the housing market. The ability to purchase houses declines if the mortgage down payment requirement is high.

Studies by Liu & Liu (2010), Liu & Liu (2012), Xu & Chen (2012) and Yu & Zhang (2019) found a significant relationship between monetary policy and housing affordability. Nevertheless, they conflict with the results of studies conducted by Squires & Webber (2019), and Wadud, Bashar, & Ahmed (2012). Liu & Liu (2010) empirically studied the consequences of monetary policies on housing affordability in eight capital cities of Australia, and they discovered huge effects on housing affordability when the monetary policy changes, as the adjustments of money supply and interest rate happen. Specifically, this study that uses the Structural Vector Autoregression Model (SVAR) on the data from 1998 to 2009 found positive effects carried by the money supply on the housing affordability in Australia, while interest rate brings a negative influence on it. The justification of the conventional macroeconomic theory fits this finding.

Furthermore, Liu & Liu (2012) found that expansionary monetary policy played a role in influencing housing affordability in Australia when interbank rate is decreased, while the money supply is increased. It significantly caused a reaction on the pricing of houses in eight major cities. This is because expansionary monetary policy allows residents of Australia to have easier access to apply for housing loans which therefore, expand the demand for housing and increase the price of houses. Affordability and house price volatility are inseparable (Maclennan, 2008), in which an increase in housing price may mean a decline in affordability across the regions and vice versa (Gan and Hill, 2009; Hui & Yue, 2006).

Xu & Chen (2012) verified the vital role played by monetary policy on housing affordability issues in China. The empirical evidence of this study suggests that monetary policy actions through the instrument, including long-term benchmark bank, loan rate, money supply growth, and mortgage credit policy are the main reasons why house prices are experiencing changes, and this phenomenon is growing across China. Thus, when a decision is made about the process of monetary policy, it is vital to be concerned with housing development.

As monetary policy receives adjustments, some major political issues could build up and affect housing affordability. This is consistent with the latest study by Yu & Zhang (2019) in China who employed the ARDL bounds testing approach and error correction model. The result showed that bank lending growth rate, money supply and inflation growth positively influence housing price growth, while reserve requirement ratio and benchmark lending rate carry negative impact on housing price growth in the long run. Nonetheless, the bank's lending offers, money supply and inflation will affect the price of housing positively, but it reacts negatively to reserve requirement ratio in the short run.

In contrast, a study by Squires & Webber (2019) revealed that there was no statistically significant relationship between monetary policy through its instrument mortgage rate and housing affordability. The research that uses the trajectory regression technique concluded that the regional house affordability trajectories were irresponsive to mortgage rate changes. They also questioned the adequacy of monetary policy through mortgage rate to deflate house affordability bubbles in New Zealand and believes that housing affordability could now be more in tune with conspicuous consumption activities that housing wealth affords. Wadud, Bashar & Ahmed (2012) found that contractionary monetary policy significantly limits activity in the housing market but does not exert any significant adverse effect on the real house price in Australia.

The discrepancy in these research findings is consistent with Reed & Ume's (2019) view that the consequences of monetary policy are not symmetrical across varied segments in the economy because of the differences in regional economic background, the use of various indicators as well as the application of mixed analytical methods between these studies. The degree of responsiveness

for the housing sector towards monetary policy can be varied from time to time and across nations (Berger-Thomson & Ellis, 2004). The past research have shown that both money supply and interest rate are the two critical instrumental variables of the monetary policy.

RESEARCH METHODOLOGY

This study uses secondary data extracted from numerous credible sources such as National Property Information Centre (NAPIC) for housing price in Malaysia, Department of Statistic Malaysia (DOSM) for Gross Domestic Product per capita (GDPP), and employment rate and Bank Negara Malaysia (BNM) for interest rate, money supply, and inflation rate. The time series data used is on a quarterly data which involved 61 observations starting from the first quarter of 2006 until the first quarter of 2021. Data of money supply is expressed as the natural logarithm to normalise the data and reduce possible heteroscedasticity. Other variables such as housing affordability, interest rate, employment rate, and inflation rate are expressed without logs due to their percentage/index/ratio forms. Table 1 summarizes the measurement of all variables used in this study.

Table 1: Measurement of Variables

Variables	Classification	Data Measurement	Unit	Sources
Housing Affordability (HA)	Dependent Variable	Overall House Price Over GDPP	Ratio	NAPIC & DOSM
Interest Rate (IR)	Independent Variable	Overnight Policy Rate	Percent	BNM
Money Supply (MS)	Independent Variable	Money Supply, M3	RM million	BNM
Employment (EMP)	Control Variable	Percentage of Employment	Percent	DOSM
Inflation (INF)	Control Variable	Consumer Price Index	Percent	BNM

This study employed the Autoregressive Distributed-Lag (ARDL) bound testing approach proposed by Pesaran et al. (2001) to measure the impact of monetary policy that is proxied by interest rate and money supply on housing affordability. The ARDL technique is said to be more flexible, attractive, and versatile than other alternative techniques (Menegaki, 2019). The key advantage of ARDL technique is the provision of more reliable results for a small sample size data, while other alternative cointegration methods like Johansen test necessitates a larger sample size for a robust estimation (Ghatak & Siddiki, 2001). It is suitable for this study which uses a small sample size of quarterly data

covering the years of 2006 until 2021. This technique also requires zero pre-testing of variables and can be applied whether the variables are stationary at levels, first differences or the mixture of both (Pesaran et al. 2001). However, ARDL cannot be applied if any variable in the study is stationary at second difference. In addition, the ARDL technique allows different variables to have different optimal number of lag terms (Laurenceson & Chai, 2003) and this technique provides Unrestricted Error Correction Model (UECM) which integrates both short run and long run equilibrium without losing any information about the long run.

For data analysis, several procedures had to be followed. It started with the test of stationarities of the data by using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root test. For ADF test, the optimal lag length was selected automatically using the Schwarz Info Criteria (SIC) while for PP unit root test the bandwidth was selected by using the Newey–West method. Based on ADF and PP tests, the variables in this study were determined based on whether it was stationary purely at level I (0), stationary purely at first difference I (1) or mixture of level and first difference. This information is imperative because it is the foundation for the selection of the best statistical models that is used for analysis purposes. If the t-statistic is more than the critical value, or the probability value is lesser than selected significant level, the hypothesis $\beta = 0$ (the data are non-stationary) can be rejected; hence, indicates the series is stationary.

Next, cointegration test was used to establish a possible long-run relationship between several time series. To foresee the presence of this relationship, the ARDL bound F-test was applied based on the constructed Unrestricted Error Correction Model (UECM). Should the computed F-statistics being larger than the upper bound critical value, the null hypothesis of no cointegration will be rejected. This indicates the presence of cointegration and long run relationship between time series. If cointegration exists between all the variables tested, the next step is to estimate the ARDL model in the long run.

Finally, to ensure the reliability of the study's results, diagnostic tests were run using Lagrange Multiplier Serial Correlation (LMSC) tests to detect the presence of autocorrelation. To check the existence of heteroscedasticity problem, the White's heteroskedasticity test was carried out. If the test statistic has a probability value (p-value) lesser than selected significant level (for instance at 0.01, 0.05 or 0.1) then the null hypothesis is rejected; thus, indicating the autocorrelation and heteroscedasticity.

In addition, Ramsey Regression Equation Specification Error Test, or abbreviated as Ramsey RESET test was used to examine the possibilities of functional misspecification. The null hypothesis is rejected if the value of F-test statistics is higher than the value of F critical, indicating some sort of specification error in the equation.

Lastly, two tests proposed by Brown, Durbin and Evans (1975) namely Cumulative Sum (CUSUM) and Cumulative Sum of Square (CUSUMSQ) tests were used to examine the stability of the model's parameters, across the different data subsamples. Both tests generated recursive residual charts for analysis purposes, and to test the null hypothesis of parameter constancy over the sample. The movement of the cumulative sum and cumulative sum of squares within the critical line suggests that the residual variance is stable.

RESEARCH FINDINGS AND ANALYSIS

Unit Root test results based on ARDL models

Table 2 unveils the results of the ADF and PP unit root tests for all variables in this research.

Table 2: ADF and PP Unit Root Test

Level I (0)	ADF Unit Root				PP Unit Root			
	Intercept		Intercept and Trend		Intercept		Intercept and Trend	
HA	-2.602	*	-3.899	**	-2.351		-3.839	**
LNMS	-2.503		-0.891		-2.316		-0.983	
OPR	-2.186		-1.156		-1.777		-1.759	
INF	-2.725	*	-3.140		-2.949	**	-3.416	*
EMP	-0.924		-2.604		-1.116		-2.604	
Level I (1)	**ADF Unit Root**				**PP Unit Root**			
	Intercept		**Intercept and Trend**		**Intercept**		**Intercept and Trend**	
HA	-6.902	***	-7083	***	-11.61	***	-19.37	***
LNMS	-5.652	***	-6.158	***	-5.698	***	-6.134	***
OPR	-5.213	***	-5.179	***	-5.222	***	-5189	***
INF	-6.268	***	-6.169	***	-6.557	***	-6.389	***
EMP	-6.682	***	-6.921	***	-6.682	***	-6.917	***

Note: ***, ** and * are 1%, 5% and 10% of significant levels, respectively.

Based on the ADF test, most of the variables are found as non-stationary at level at 5 percent significant level except for HA (at intercept and trend). However, all variables are detected as stationary at first difference at 5 percent significant level. The PP unit root test confirms that most of the variables are non-stationary at level except for HA (at intercept and trend) and INF (at intercept) but all variables become stationary purely at first difference. There is no single variable integrated at order two in which the ARDL models will not be an accurate estimator if the variable is integrated at order greater than one (Dogan,

2015). Accordingly, the cointegration test is allowed to be conducted by using ARDL estimation.

Co-integration Test Result

The ARDL cointegration test result is reported in Table 3. The value of F-statistics is 9.481, that is, higher than the upper value of critical bound that is 4.01 at 5 percent significance level. The null hypothesis of no cointegration can be rejected; thus, indicating the presence of long run association between dependent variables of housing affordability, and all independent variables including interest rate, money supply, employment rate and inflation rate in Malaysia. As the cointegration exists between all the tested variables, the estimation using ARDL model in both long and short runs should follow suit.

Table 3: Bound Test for The Existence of Co-integration

Model	Max Lag	Lag order	F statistics
HA = F(LNMS, OPR, EMP, INF)	1,1	1,1,0,1,1	9.481***
Critical Values for F stat		**Lower I(0)**	**Upper (1)**
10%		2.45	3.52
5%		2.86	4.01
1%		3.74	5.06

Note: ***, ** and * are 1%, 5% and 10% of significant levels, respectively.

Estimated Short-run and Long-run Analysis Results

Table 4 displays the findings of the long-run and short-run analysis. The money supply is found to be a positive and significant influence on housing affordability at 5 percent significance level in the long run. In particular, a 1 percent increase in money supply will increase the housing affordability index by 4.917 percent. This is consistent with the findings by Liu (2013) and Taghizadeh-Hesary, Yoshino, & Chiu (2019) who explained that when money supply goes up, the consumer spending rises too, as there is more capital available in the economic system and consequently, leading to a higher price and worsening the housing affordability. In the short run, money supply displays a coefficient value of 2.423 and significantly affects the housing affordability index.

Next, the estimated coefficient for interest rate is revealed as negative but it is found to be statistically insignificant in determining housing affordability in the long run. It is based on the p-value that is relatively high at 0.069 as compared to the most common significance level of 0.05. However, the interest rate postulates a negative and significant relationship with housing affordability in the short run. Technically, increasing the interest rate by 1 percent will decrease the housing affordability index by 1.299 in the short run. The negative sign implies that housing affordability improves when interest rates are increased, and housing affordability deteriorates when interest rates are decreased. Higher

interest rates will raise the cost of borrowing, particularly in the housing sector, where interest payment constitutes a significant portion of the cost of homeownership. As a result, people are discouraged from borrowing and spending, reducing housing demand, lowering housing price and therefore, improving housing affordability in the short run.

Table 4: Short-run and Long-run Analysis

Variables	Coefficient	t-stat	Prob	
Long-run Analysis				
Money Supply	4.917	6.668	0.001	***
OPR	-0.636	-1.864	0.069	*
EMP	0.850	2.951	0.005	***
INF	0.261	2.267	0.028	**
C	-142.054	-3.943	0.001	***
Short-run Analysis				
Money Supply	2.423	4.770	0.001	***
OPR	-1.299	-4.732	0.001	***
EMP	-0.54	-3.058	0.003	***
INF	0.002	0.053	0.957	
ECT	-0.492	-4.989	0.001	***

Note: ***, ** and * are 1%, 5% and 10% of significant levels, respectively

Employment is found to be positively and statistically significant in determining the housing affordability index in the long run. The p-value recorded a reasonably low at 0.005 as compared to the significance level of 5 per cent. A 1 per cent rise in the employment rate would result in a 0.85 percent increase in the housing affordability index, indicating a deterioration of the housing affordability level in Malaysia. Furthermore, the result of this study shows that employment is significant at a 5 percent significant level and is negatively associated with housing affordability in the short run. The rise of employment rates signifies that there are more people who have a stable income; therefore, improving the ability of people to purchase a house. However, it will increase the total housing demand and housing prices in the long run; hence, reducing consumers' ability to own a home.

The study's findings indicate that there is a positive relationship between inflation rate and housing affordability at 5 percent level of significance in the long run. It demonstrates that a 1 percent rise in inflation increases the Malaysian housing affordability index by 0.261 percent. This is in line with a study conducted by Kiong & Aralas (2019) using the ARDL method, which concluded that an increase in the inflation rate will eventually result in an increase in housing prices in Malaysia. Haibin (2004) clarified that inflation would increase the price of raw materials used for the construction sector and hence,

increase the construction cost of housing projects. In response, the housing developers will increase the housing price to cover the increase in expenses. The increase in house prices will eventually decrease the ability of consumers to buy a house. This is further reinforced by Kleshcheva (2021), who concluded that inflation directly impacts the housing affordability index in Russia. He noted that the rise in the inflation rate is an indicator that housing becomes less affordable.

The estimated ECT for the model used in this study has a negative sign and is statistically significant at 5 percent significance level. More specifically, the ECT has a coefficient of -0.492 indicating that about 49.2 per cent of the disequilibrium is corrected to reach its long run equilibrium within one-year time. In summary, the model used in this study is desirable since the ECT coefficient has a negative sign, statistically significant and its value is in the range of 0 to -1 (Dhungel, 2014).

Diagnostic Test Results

The revealed diagnostic test results in Table 5 confirm that the model estimated in this research is valid and acceptable. First, the p-value of Lagrange Multiplier Serial Correlation (LMSC) tests is 0.478, leading to the non-rejection of the null hypothesis of no autocorrelation in the original equation. Second, the White heteroscedasticity test has a p-value of 0.147 that is higher than the significant level of 0.05 that indicates the nonappearance of heteroscedasticity in the error term. Third, the Ramsey RESET test specifies that the functional form of the model is correctly specified as the p-value (0.113) is greater than the significant level (0.05). In addition, the movement of CUSUM and CUSUMQ test statistics is within the 5 percent significant level suggesting that all parameters in the model are stable across various subsamples of the data.

Table 5: Diagnostic Tests

Model	Autocorrelation [p-value]	Functional Form [p-value]	Heteroscedasticity [p-value]
HA = F(LNMS, OPR,EMP,INF)	1.474 [0.478]	2.613 [0.113]	1.685 [0.147]

CONCLUSION

The existence of long-run cointegration between money supply and housing affordability in conjunction with its significant short-run relationship has highlighted the imperative role played by money supply in influencing housing affordability. Undoubtedly, money supply, as a monetary policy instrument, can effectively influence housing affordability. Evidently, interest rate mechanism is only effective in the short run and is inoperative in the long run for Malaysian housing market. Therefore, for urban planning and development, the intervention of BNM in monitoring interest rates as a cost of borrowing to promote

homeownership is deemed to be crucial. In the long run; however, more fiscal side policies such as increasing the government expenditure for developmental expenses and taxes in promoting homeownership, particularly if targeted to urban areas, could be seen as an alternative and thus, requires to be explored further in Malaysian context.

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THE DEVELOPMENT OF SMART CITIES AND ENVIRONMENT-RELATED DOMAIN: A CASE STUDY IN INDONESIA AND FRANCE

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Abstract

In Indonesia, and so is France, there is a growing concern about smart city development. However, empirical evidence is still lacking in Indonesia and so is the comparison between cities in Indonesia and France. Therefore, this paper is to elucidate the smart city development in Indonesia and France in terms of the environment-related domain. This current study is qualitative in nature, focusing on two cities, Lyon in France and Bandar Lampung in Indonesia. The data collection was carried out using two types of instruments. First, we collected data to measure indicators of the environment-related domain of smart cities through interviews with government officials who were in charge of city development. Second, the data collection also involved a five-point Likert scale survey. The findings indicate that the smart city development in Lyon in terms of the environment-related domain is more developed compared to Bandar Lampung. Lyon has enlisted additional private sector support for the concept of smart city development, while everything necessary for the development of a smart city is now being prepared in Bandar Lampung. The recommendations from the findings and suggestions for further research are also discussed.

Keywords: Smart city, socio-engineering, Indonesia, France

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INTRODUCTION

There has been wide interest in smart city development, with several disciplines contributing to the literature on smart cities recently (Wahyuddin, 2019). Smart cities assure to add economic, social, and environmental benefit by connecting infrastructure and urban services with technological innovations (Hollands, 2008; Viitanen & Kingston, 2014) and promise a perfect society (utopia) in this so-called twenty-first century (Datta, 2015). Today, therefore, there is an increasing interest to comprehend how to make smart city discourse affect and change ordinary cities and societies (Evans et al., 2019; Luque-Ayala & Marvin, 2016; Wiig & Wyly, 2016).

There is now much evidence in the literature to support the discourse that smart cities development is making a huge and positive impact on societies. Smart city programs help cities in the United States, among others, directly and indirectly promote their economic growth (Musa, 2017). However, it is also reported that it has negative impacts on relations among people (Dhere & Bendale, 2019). In Indonesia, there is now a growing concern towards smart city development (see, for example, (Hasibuan & Sulaiman, 2019; Lee, 2019; McKinsey & Company, 2018; Salamah & Yananda, 2019; Sanjaya et al., 2018; Suartika & Cuthbert, 2020; Susanti et al., 2016) and so is in France (see, for example, (Jeannot, 2019). However, empirical evidence that has appeared in the literature on smart city development is still lacking in Indonesia (Sanjaya et al., 2018) and so is the comparison between cities in Indonesia and France. Therefore, this aim of this paper is to elucidate the smart city development in Indonesia and France in terms of environment-related domain in particular.

LITERATURE REVIEW

Smart City Definitions

There are several definitions of smart cities that can be found in the literature (Albino et al., 2015; Sánchez-Corcuera et al., 2019). There is no one-size-fits-all concept of this concept, nor is there a single template for framing one (O'Grady & O'Hare, 2012). A smart city is described as a city with high and sophisticated technology that uses modern technology to connect people, information, and city elements. It creates sustainable, environmentally friendly cities, competitive and creative commerce, and improves the quality of life (Bakıcı et al., 2013). It puts an emphasis on three main areas including the use of technology as a key driver of smart cities, services everywhere, and a wide range of urban functions (Kim et al., 2021). Moreover, the ideas about potential urban planning are inextricably linked with debates about the profound effects that information and communication technologies will continue to have on our lives in the twenty-first century, and nothing is clearer than the concept of a smart city (Hollands, 2015). The aim of this future urban projects is sustainability (Adnan et al., 2016).

Application Domains of Smart Cities

Scholars have proposed a plethora of smart city application domains, subdomains, and attributes (see, among others, (Albino et al., 2015; Gharaibeh et al., 2017; Giffinger & Gudrun, 2010; Harrison & Donnelly, 2011; Liu & Peng, 2014; Lombardi et al., 2012; Neirotti et al., 2014). However, in this current study we adopted the smart city application domains proposed by (Yin et al., 2015), which are divided into four major domain including domains relating to business, citizens, government, and environment, with a focused look at the environment-related domain with its subdomains (Zurinah & Jalaluddin, 2016). The environment-related domain is divided into the following subdomains including public space, building, housing, pollution control, renewable energy, smart grid, water management, and waste management (Yin et al., 2015).

In terms of public space, green zones should be developed in cities since they help both citizens and the environment (Sánchez-Corcuera et al., 2019). Vitoria-Gasteiz, the capital of the Basque Country in northern Spain, received the award for its green areas for its friendlier environment. The city is surrounded by a park system known as the Green Belt which connects the city centre and significantly reduces environmental impact (Cömertler, 2017). In addition, for developing urban development and design of smart cities, (Rathore et al., 2016) propose an Internet of things and Big Data based architecture through the utilization of a network of linked devices for data collection from the city that can be beneficial to future urban planning decision-making. A smart house, for example, is a house utilizing applications of pervasive technology/computing in a home context (Alam et al., 2012).

In terms of pollution control, a video analytics-based architecture sensor for measuring traffic emissions (Mehta et al., 2016) and sensors for air and humidity (Dutta et al., 2017; Peng et al., 2017) are of importance to adopt in smart cities. As widely accepted, energy generation is quickly expanding, with renewable energy now accounting for 29% of all power produced in the European Union. Since cities consume 75% of all energy produced, it is necessary to incorporate renewable energy into the components that build cities to make them sustainable (Kammen & Sunter, 2016).

The need for improving more economical grids has emerged as cities grow in size (Sánchez-Corcuera et al., 2019). As a result, the advancement of the smart grids will provide numerous advantages to smart cities (Farhangi, 2010). Smart grids can be adopted to integrate the current existing services into modern platforms to create new services for citizens and energy consumers (Fadel et al., 2015). In addition, water has indeed one of the most valuable resources for cities, which is why so many have built up alongside streams or coastlines (Sánchez-Corcuera et al., 2019). In order to make maintain the quality and sustainability of water, several efforts should be made, for example, developing a sensor to control the aquifer salinization (Parra et al., 2015), to monitor heavy metals in fresh water

(Lin et al., 2017), and to regulate water distribution so that polluted drinking water can be minimized (Zhao et al., 2016). Finally, issues on waste management should be also taken into account in smart cities (Anagnostopoulos et al., 2017), for example, creating smart containers with the ability of recognizing when they are filling up and alerting garbage collectors when they are almost filled (Aazam et al., 2016), use of genetic algorithms, establishing more effective waste collection routes as well (Król et al., 2016).

Smart Cities in France and Indonesia

(Jeannot, 2019) investigated whether smart cities founded in France were able to reflect consistency or break with the current national socio-technical regime of French cities. This indicates a continuation of the break with the urban socio-technical regime that has been developed by the smart city project. Moreover, (Azlal et al., 2020) suggested it should address three areas including smart community and services, smart infrastructure, and smart buildings. The collaboration of various stakeholders, i.e., governments, corporate sectors, civil society, academicians, technological experts, and citizens, to support smart city projects in Indonesia play a significant role (Hasibuan & Sulaiman, 2019; Mayangsari & Novani, 2015). All parties, including government with their relevant regulations, should work hand in hand to develop a well-organised smart city (Hasibuan & Sulaiman, 2019). In other words, both technology and social factor should be balanced to enable people's participation (Salamah & Yananda, 2019). Finally, there is a growing need for research, either interdisciplinary or multidisciplinary, on smart city to make continued improvements and gain more holistic overview on the smart city development in the Indonesian context.

THE STUDY

This current study is qualitative in nature, focusing on two cities, Lyon in France and Bandar Lampung in Indonesia, that are key drivers of the area's socioeconomic development, aiming to have a closer look at how each smart city domain, particularly environment-related domain with its subdomains, has evolved in each city. It is publicly accepted that smart cities' role is to connect cities, industry, and inhabitants in attempt to optimise urban living through leveraging innovative potential and more sustainable effective services (Alibegović et al., 2018).

INSTRUMENTS AND DATA COLLECTION

The data collection in the current study was carried out using two types of instruments. First, we collected data to measure indicators of the environment-related domain of smart cities including public space, building, housing, pollution control, renewable energy, smart grid, water management, and waste management (Yin et al., 2015) through interviews with government officials who

were in charge of city development. Second, the data collection activity also involved distributing a five-point Likert scale survey for each city administration and the public to obtain additional information for measuring the indicators of the environment-related domain. To see if the questionnaire's design was appropriate for achieving the study's objective, it was pilot tested (McQuirk & O'Neill, 2016) to ensure that the instructions and questions of the questionnaire were clearly expressed in a comprehensible manner and were of a fair length (Schleef, 2014). Finally, we confirmed the data obtained by triangulating and reporting back to the key informants to ensure the authenticity and accuracy of the information. Triangulation is a strategy for validating findings that is almost mandatory (Miles et al., 2014). In addition, we also made use of secondary data, e.g., official websites, documents, and other related information for data collection.

DATA ANALYSIS

The data collected from interviews were descriptively analysed through coding categorization and pattern classification (Hsieh & Shannon, 2005) based on the indicators or subdomains of the environment-related domain of smart cities (Yin et al., 2015), with the goal of providing comprehensive explanatory a social phenomenon interpretations (Tesch 1991 as cited in (Dey, 2005). The data obtained from the questionnaire were quantitatively analysed using SPSS 23 for Windows through a descriptive statistics procedure. This analysis was undertaken to look at the participants' views of smart cities, especially the environment-related domain.

RESULTS

Numerous cities have attempted to transition from traditional metropolitan areas to smart cities over the last decade. However, in many cases, despite significant private and public investment, those efforts have been fruitless (Sánchez-Corcuera et al., 2019). As a result, we intend to shed light on the development of smart cities in Indonesia and France, particularly in Bandar Lampung and Lyon cities in terms of the environment. Regarding participants' perception of an environment-related domain, we focused on eight constructs as follows. The first construct is the building-related aspect in Table 1 below.

Building

Table 1: Participants' perception of smart city development in terms of environment-related aspect of building in Bandar Lampung City, Indonesia

Statement	Response				
	SD	**D**	**N**	**A**	**SA**
Building					
Existing buildings are constructed in accordance with sustainable development principles.	0 (0%)	7 (3.7%)	56 (29.6%)	84 (44.4%)	42 (22.2%)
Existing structures have incorporated the concept of zero-energy buildings.	0 (0%)	21 (11.1%)	77 (40.7%)	63 (33.3%)	28 (14.8%)
Each building is capable of meeting its own energy requirements.	0 (0%)	14 (7.4%)	70 (37%)	56 (29.6%)	49 (25.9%)
The existing building network takes sustainability into account.	0 (0%)	7 (3.7%)	63 (33.3%)	77 (40.7%)	42 (22.2%)
The building's network is well-organized and distributed.	0 (0%)	7 (3.7%)	63 (33.3%)	77 (40.7%)	42 (22.2%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 1 illustrates participants' perceptions of smart city development in terms of environmental-related building aspects in Bandar Lampung City, Indonesia. It is clear that more than half agreed and strongly agreed that the existing buildings were built according to the principles of sustainable development, taking into account sustainability with a well-organized and distributed network of buildings. They also see that each building is capable of meeting its own energy needs. However, only less than half of them believe that existing buildings have incorporated the concept of a zero-energy building.

Housing

Table 2. Participants' perception of smart city development in terms of environment-related aspect of housing in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Housing					
The concept of smart home has been implemented.	0 (0%)	21 (11.1%)	70 (37%)	63 (33.3%)	35 (18.5%)
Renewable energy is used to power the household furniture.	0 (0%)	7 (3.7%)	35 (18.5%)	112 (59.3%)	35 (18.5%)
Existing community houses have incorporated disability-accessible features.	0 (0%)	49 (25.9%)	49 (25.9%)	56 (29.6%)	35 (18.5%)
The use of green plants as an entertainment medium.	0 (0%)	7 (3.7%)	28 (14.8%)	77 (40.7%)	77 (40.7%)
The creation of a home environment that creates a favourable impression.	0 (0%)	7 (3.7%)	35 (18.5%)	70 (37%)	77 (40.7%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 2 informs about participants' smart city development perception in terms of environment-related aspect of housing in Bandar Lampung City, Indonesia. It is apparent that nearly 100% of them said agree that housing has used green plants as an entertainment medium, followed by the creation of a home environment that creates a favourable impression. The majority of them also believe that renewable energy has been used to power household furniture. However, less than half of them agree and strongly agree that the concept of smart home has been well implemented. In addition, they also show similar disagreement that existing houses have not incorporated disability-accessible features.

Pollution Control

Table 3. Participants' perception of smart city development in terms of environment-related aspect of pollution control in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Pollution control					
Pollution control is governed by rules and regulations.	7 (3.7%)	0 (0%)	42 (22.2%)	77 (40.7%)	63 (33.3%)
Numerous attempts to monitor and manage pollution have been made.	7 (3.7%)	0 (0%)	70 (37%)	77 (40.7%)	35 (18.5%)
The technology is used to determine whether there is excessive pollution in the environment.	14 (7.4%)	14 (7.4%)	56 (29.6%)	70 (37%)	35 (18.5%)
The community utilises and manages the technology used to evaluate and collect data on air quality.	7 (3.7%)	14 (7.4%)	63 (33.3%)	70 (37%)	35 (18.5%)
Environmental management is well-implemented through an integrated system.	0 (0%)	21 (11.1%)	42 (22.2%)	70 (37%)	56 (29.6%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 3 informs about participants' smart city development perception in terms of environment-related aspect of pollution control in Bandar Lampung City, Indonesia. It is clear that the participants believe that pollution control is governed by rules and regulations, with numerous attempts being made to monitor and manage pollution. More than half of them also agree and strongly agree that environmental management is well-implemented through an integrated system. In addition, more than half of them also view that technology is used to determine whether there is excessive pollution in their environment, with

community utilizing and managing technology to evaluate and collect data on air quality.

Public Space

Table 4. Participants' perception of smart city development in terms of environment-related aspect of public space in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Public space					
In a public area, there is a green space.	0 (0%)	14 (7.4%)	21 (11.1%)	49 (25.9%)	105 (55.6%)
In certain areas, there are awards for reforestation efforts and environmental stewardship.	0 (0%)	14 (7.4%)	28 (14.1%)	56 (29.6%)	91 (48.1%)
Areas that are not currently being used for green open spaces are repurposed.	0 (0%)	14 (7.4%)	35 (18.5%)	49 (25.9%)	84 (44.4%)
Control and supervision of public spaces are accomplished through the use of technology.	0 (0%)	21 (11.1%)	28 (14.8%)	63 (33.3%)	77 (40.7%)
The development of public spaces is transparent to the general public.	0 (0%)	7 (3.7%)	35 (18.5%)	63 (33.3%)	84 (44.4%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 4 above informs about participants' smart city development perception in terms of environment-related aspect of public space in Bandar Lampung City, Indonesia. It is evident that more than 75% of them agree and strongly agree that the city has a green space in public areas. The majority of them (more than 70%) also show their agreement that there are awards for reforestation efforts and environmental stewardship, areas not currently being used for green open spaces are repurposed, supervision of public spaces are accomplished through the use of technology, and the development of public spaces is transparent to the general public.

Renewable Energy

Table 5. Participants' perception of smart city development in terms of environment-related aspect of renewable energy in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Renewable energy					
There has been a noticeable increase in the use of renewable energy.	0 (0%)	7 (3.7%)	21 (11.1%)	84 (44.4%)	77 (40.7%)

The use of potentially harmful nuclear energy is significantly reduced.	0 (0%)	14 (7.4%)	21 (11.1%)	70 (37%)	84 (44.4%)
Renewable energy is used in every aspect of life.	0 (0%)	7 (3.7%)	42 (22.2%)	84 (44.4%)	56 (29.6%)
There are efforts being made to reduce our reliance on fossil fuels.	7 (3.7%)	7 (3.7%)	35 (18.5%)	84 (44.4%)	56 (29.6%)
Regulations govern the use of sustainable energy sources.	0 (0%)	14 (7.4%)	35 (18.5%)	63 (33.3%)	77 (40.7%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 5 above informs about participants' smart city development perception in terms of environment-related aspect of renewable energy in Bandar Lampung City, Indonesia. It is apparent that nearly 100% of the participants believe that there has been a noticeable increase in the renewable energy use in the city. Moreover, more than 70% of them also show agreement that use of harmful energy has been significantly reduced, renewable energy is used in every aspect of life, efforts are made to reduce reliance on fossil fuels, and sustainable energy sources are governed by regulations.

Smart Grid

Table 6. Participants' perception of smart city development in terms of environment-related aspect of smart grid in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Smart grid					
There is a commendable effort being made to develop the infrastructure network.	0 (0%)	28 (14.8%)	70 (37%)	84 (44.4%)	84 (44.4%)
There are parties and regulations that govern the infrastructure's layout.	0 (0%)	0 (0%)	35 (18.5%)	63 (33.3%)	91 (48.1%)
There is a commitment to implementing an energy-efficient infrastructure layout.	0 (0%)	7 (3.7%)	28 (14.8%)	49 (25.9%)	105 (55.6%)
The use of renewable energy is becoming more integrated into society.	0 (0%)	21 (11.1%)	14 (7.4%)	84 (44.4%)	70 (37%)
Advanced models for infrastructure management are being used to reduce energy consumption.	0 (0%)	14 (7.4%)	49 (25.9%)	56 (29.6%)	70 (37%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 6 above informs about participants' smart city development perception in terms of environment-related aspect of smart grid in Bandar Lampung City, Indonesia. Nearly 100% of the participants believe that a commendable effort is being made to develop the infrastructure network, with

parties and regulations governing the infrastructure's layout and commitment to implementing an energy-efficient infrastructure layout. In addition, nearly all of them also view that the use of renewable energy is becoming more integrated into society, with advanced models for infrastructure management are being used to reduce energy consumption.

Waste Management

Table 7. Participants' perception of smart city development in terms of environment-related aspect of waste management in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Waste management					
Special regulations and rules govern the responsibility to manage waste.	0 (0%)	7 (3.7%)	42 (22.2%)	49 (25.9%)	91 (48.1%)
There is an environmentally hazardous waste management facility.	7 (3.7%)	21 (11.1%)	42 (22.2%)	56 (29.6%)	63 (33.3%)
Waste management is accomplished through the implementation of a technological system.	0 (0%)	7 (3.7%)	42 (22.2%)	70 (37%)	70 (37%)
The procedure for managing large amounts of household waste is streamlined.	0 (0%)	14 (7.4%)	49 (25.9%)	56 (29.6%)	70 (37%)
There is socialisation regarding waste management.	0 (0%)	14 (7.4%)	35 (18.5%)	42 (22.2%)	98 (51.9%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 7 above informs about participants' smart city development perception in terms of environment-related aspect of waste management in Bandar Lampung City, Indonesia. The majority of the participants agree that the city has special regulations and rules governing the responsibility to manage waste, with the existence of environmentally hazardous waste management facility. They also show agreement that waste management is accomplished through the implementation of a technological system, with procedure for managing large amounts of household waste being streamlined. They also agree that there is socialisation regarding waste management.

Water Management

Table 8. Participants' perception of smart city development in terms of environment-related aspect of water management in Bandar Lampung City, Indonesia

Statement	Response				
	SD	D	N	A	SA
Water management					
There are natural springs nearby.	0 (0%)	7 (3.7%)	21 (11.1%)	91 (48.1%)	70 (37%)

The regulator exerts control over the use of naturally clean water.	7 (3.7%)	14 (7.4%)	28 (14.8%)	56 (29.6%)	84 (44.4%)
There is the application of technology in determining the feasibility of utilising water.	7 (3.7%)	14 (7.4%)	28 (14.8%)	49 (25.9%)	91 (48.1%)
Efforts are being made to prevent and detect water pollution.	14 (7.4%)	7 (3.7%)	28 (14.8%)	42 (22.2%)	98 (51.9%)
Industrial waste disposed of in water sources is governed by rules and regulations.	7 (3.7%)	0 (0%)	35 (18.5%)	63 (33.3%)	84 (44.4%)

SD: Strongly disagree; D: Disagree; N: Neutral; A: Agree; SA: Strongly agree

Table 8 above informs about participants' smart city development perception in terms of environment-related aspect of water management in Bandar Lampung City, Indonesia. More than 70% of the participants agree that the city has natural springs, with regulator exerting control over the use of clean water. They also believe that technology is utilized to determine the feasibility of water for use, with efforts being made to prevent and detect water pollution. Finally, the majority of the participants also show agreement that industrial waste disposed of in water sources is governed by rules and regulations.

In addition to the results of the questionnaire as presented above, we also collected data through interviews with key actors in Bandar Lampung and Lyon cities. Here are the excerpts of the interviews.

> Bandar Lampung's Department of Communication and Information continues to support the realisation of the smart city programme, which was launched in mid-2019. Later, everything will be integrated (Key Actor 1, Bandar Lampung).

> Additionally, the Smart City concept promotes a more sustainable environment through the use of advanced waste and water management concepts (Key Actor 2, Bandar Lampung).

> We are currently expanding the network of internet infrastructure in 20 sub-districts and 126 urban villages. Additionally, we will develop an infrastructure network at the Bandar Lampung City Secretariat, consisting of approximately 1,000 metres of fibre optic cable, in order to establish a command centre and data centre (Key Actor 3, Bandar Lampung).

> In order to be more integrated, we've tightened housing developer regulations (Key Actor 3, Bandar Lampung).

> Our green open space is more than adequate and contributes to a sustainable environment (Key Actor 3, Bandar Lampung).

> We recognise that there are still gaps in renewable energy, waste management, and pollution control, but this is not an impediment, but rather our challenges to create a smart environment (Key Actor 1, Bandar Lampung).

> Lyon Smart City project began ten years ago. The first step on the path to a smart city was partnering with large companies. The implementation of self-service bicycles laid the groundwork for this city's smart city journey. Vélo'v. Since then, we have developed a lot of innovations (Key Actor 1, Lyon).

> The following are some examples of Lyon's smart city projects: The Optimod project aims to transform an individual's relationship with urban travel by incorporating a variety of modes of transportation, including the Navya Project, which features a driverless bus, and the Sunmoov Project, which features a solar-powered car sharing service (Key Actor 2, Lyon).

> In terms of smart environment, we have taken several actions to address environmental concerns, including pollution control, energy consumption, and solar/renewable energy use (Key Actor 3, Lyon).

DISCUSSION

Findings above illustrate that the participants perceive Bandar Lampung to be a city with a smart environment concept, showing agreement that buildings have been constructed according to sustainable development principles although they also believe that the existing buildings have not fully incorporated a concept of zero-energy buildings. Housing in Bandar Lampung has implemented green plants as entertainment medium, creating a favourable impression. However, the so-called smart home concept has not been fully implemented. In terms of pollution control, Bandar Lampung administration has controlled it with a number of attempts being made to monitor and manage pollution. The city also has green public areas, with technology being used to monitor them. Cities should develop green zones because they benefit both citizens and the environment. (Sánchez-Corcuera et al., 2019), Vitoria-Gasteiz, the capital of northern Spain's Basque Country, for example, received an award for its green spaces as a result of its friendlier environment (Cömertler, 2017). In addition, it is also believed that there has been a noticeable increase in the use of renewable energy in the city. It is also found that a commendable effort is being made to develop the infrastructure network of the city, involving parties and regulations governing the infrastructure's layout and commitment to implementing an energy-efficient infrastructure layout. Likewise, this is true for waste management. Bandar Lampung has an environmentally hazardous waste management facility where waste is managed using a technological system that streamlines the process of managing large amounts of household waste. In terms of water management, the city has natural springs, and technology is being used to determine the feasibility of using the water, as well as efforts to prevent and detect water pollution.

However, the findings of the interviews indicate that the municipality of Bandar Lampung has not completely implemented the so-called smart environment related domain for smart city, but their green open space. To create a complete smart environment, the municipality is facing challenges in terms of renewable energy, waste management, and pollution control. Moreover, they are at the present expanding the Internet infrastructure for a command and data center. This indicates that the municipality is not yet well-prepared for a smart city development, especially smart environment related domain.

Lyon Metropolis, on the contrary, seems to be smarter compared to Bandar Lampung. Lyon pursued a policy of facilitation in order to attract private innovation under the banner of smart cities to their territory, making it the first city to implement smart grid infrastructures. As stated in the literature, a smart city development has always been linked to IBM, Cisco, and Microsoft announced in the early 2000 (Portmann, 2015). Thus, to enable city actors to implement smart city solutions, the project could be completed in collaboration with the IT industry (Glasmeier & Christopherson, 2015). Since the launch of the Smart Metropolis strategy in 2012, approximately twenty operations within the programme have generated investment flows totalling approximately 350 million euros from both public and private actors (consolidated data between 2012 and 2017) (Wahyuddin, 2019). Lyon is a pioneer in the field of smart cities (Belot, 2017). In France, smart cities represent a continuation rather than a urban socio-technical regime rupture with smart city projects have developed (Jeannot, 2019). Additionally, a smart city should focus on three areas: intelligent communities and services, intelligent infrastructure, and intelligent buildings (Azlal et al., 2020; Lim et al., 2019). Therefore, Lyon is a more developed smart city than Bandar Lampung, having enlisted the support of numerous private sectors for their smart city initiatives.

CONCLUSION

Based on our findings, the smart city development in Lyon, France in terms of environment-related domain is more developed compared to Bandar Lampung, Indonesia. Lyon has enlisted additional private sector supporting for the development concept, while everything necessary for smart city development is now being prepared in Bandar Lampung. Therefore, the findings of the current study have implications. To support smart city projects, collaboration among various stakeholders is required. All stakeholders, including the government and its relevant regulations, should collaborate to create a well-organized smart city (Boon et al., 2020). In other words, both technology and social factors must be balanced in order to allow for citizen participation. Additionally, a socio-political dimension should be considered when developing a smart city. There is an increasing need for interdisciplinary or multidisciplinary research in order to

make continuous improvements and gain a more holistic perspective on the development of smart cities in the Indonesian context.

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TORNADO FINANCIAL DEVELOPMENT COST ANALYSIS FOR GREEN PROJECT IN MALAYSIA

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Abstract

In Malaysia, green building has currently become significant as sustainable development. Most of the established developers have incorporated sustainable development in green building projects. Due to the passive evolutionary effects of real estate on the environment and human health, the development and promotion of green buildings for a sustainable environment have become a market trend to attract buyers in this country. Thereby, the qualitative approach methodology is adopted in this study, where a case study has been selected to observe the significant risk impact on the development cost. An in-depth analysis was carried out using a feasibility study, and a discounted cash flow was performed. The simulation runs using tornado analysis to detect the most significant risk affected by development cost. The results indicate that the building cost, mechanical and electrical works, and piling works are the highest risk in developing a green building. Therefore, the client should take extra precautions in green development to monitor the affected cost to minimise project delay and achieve the project objectives. A tornado analysis makes decision-making more explicit by the client. It enables the decision-maker to analyse the risk contributing to the development cost and make more effective decisions.

***Keywords**:* Green Development, Development Cost, Qualitative Method and Tornado Analysis

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INTRODUCTION

Green building has currently gained significance in development projects in Malaysia. The design and construction of the proposed development for green buildings are required to follow the guideline set up in the Green Building Index (GBI) that has been developed by the Malaysian Institute of Architects (PAM) and the Association of Consulting Engineers Malaysia (ACEM). The proposed project must accomplish the rating criteria for building environmental design and performance in green building development. The six (6) critical criteria include energy efficiency, water efficiency, indoor environment quality, sustainable site planning and management, material and resources, and innovations (PAM) and (ACEM) (April 2009). As confirmed by Li, Yang, He, and Zhao (2014), green buildings have various definitions and rating systems, such as saving energy, material, land, and water resources, indoor environmental quality, and reducing pollution are widely accepted as the general definitive principle. For a development to be recognised as sustainable, the developer should consider the project based on a balanced approach that addresses the environmental, social, and cost issues. According to Finkbener, Schau, Lehmann, and Traverso (2010), green development is capable of covering today's needs for an intact environment, social justice, and economic prosperity without limiting the ability of future generations to meet their needs. The preservation of the natural environment is a prerequisite for a well-functioning economy and social justice. The cost to construct the project embedded with green elements differs from the conventional method. Therefore, the research aims to analyse the element of risk for the financial development costs by using tornado analysis. The tornado analysis is crucial for the clients in decision-making and to analyse the financial development risk in the green building projects.

Green Development

Green development is a real estate concept that reflects social and environmental impacts. The developer should consider the elements of nature, minimise the damage to the ecosystem and resource efficiency in order to conserve energy and the environment. The building they construct, design, and operate should reflect knowledge of sustainability needs (J, Wilkinson, and Sayce (2015). The related whole life cost for green development is crucial. The quantity surveyor should integrate knowledge in the costing method for feasibility appraisal for green development Halil, Ismail, Hasim, and Hashim (2020). To estimate the cost of this type of construction requires skills in terms of design factor, material, the topography of the site area, and the form of the construction that is used. Getting the minimum whole life cost and environmental impact is complex. Figure 1 shows the technique, materials

choices and technologies significantly related to the costs of the construction (Cartlidge, 2009).

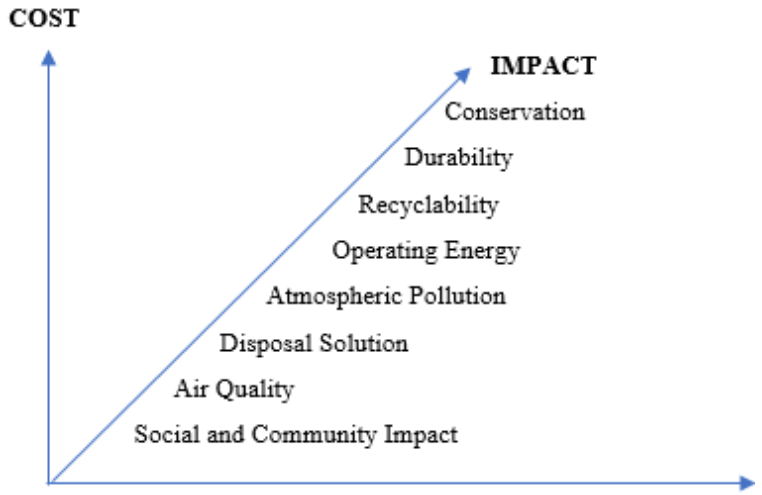

Figure 1: Shows the technique, materials choices and technologies

Figure 1 shows the elements that contribute to the cost of the projects for sustainability development. The whole life cost contributes to the higher cost of the development that is proposed by the developer. The cost of the development comprises the activities conducted. The expenses include estimation of demand for new buildings types, the design of sites, the design of facilities, the arrangement of short and long term finance for site acquisition, construction, and lastly, the management of the completed buildings (Chau, Leung, & Ng.W.Y, 2015).

The Characteristics of Green Development

The characteristic of Green Development, as revealed by J et al. (2015), are as follows;

1) Land use, Urban Form and Urban Quality
2) Environmental Protection and Enhancement
3) Location and Transport
4) Resource Use
5) Business and Community Characteristics

Land use, Urban Form and Urban Quality

Urban design for creating space inspires individuals as well as encourages and facilitates safe pedestrians. The plan for the proposed development must

promote longevity and sustainability (Kamaruddin, Mohd Rosmi, Muhamad Halil, Misni, & Marzukhi, 2020). Sites should be designed to meet the needs of the end-users. The concept of building and infrastructure must promote sustainable townships to balance liable neighbourhood and community. An appropriate density for the population is crucial for the developer to consider. Minimising transportation use is vital to preserving the environment from global CO2 gas emissions. Sustainable sites bring economic advantages by reducing resource use and encouraging social and environmental responsibility, improving human health and social wellbeing (Huo, Yu, Wu, & Jayanthn, 2020).

Environmental Protection and Enhancement

The project's construction in development will create pollution for humans and the environment. The client must take into consideration and care that the development minimises and avoids polluting emissions. At least 33 per cent of greenhouse gas emissions are related to construction activities (Chau et al., 2015).

Location and Transport

Location is a crucial part of successful green development, and access via the various modes of transportation is increasingly important to provide flexibility of use in the future (Nasrudin et al., 2020). The new transportation development is expected to complement the existing transportation systems, and reduce overall traffic density (Narayanaswami, 2017). The researcher added a good example from a case study of Dubai Metro. Dubai Metro proposed transport integration in a green development area, and the system of integration with other city transport is aligned with bus routes.

Resource Use

Energy-Efficient Design for green development is fundamental to improving the resource use for the sustainability of a building. Efficient energy use is a crucial measure to reduce carbon dioxide emissions. (Lu, Tam, & Du, 2020) revealed that low carbon designs can be very effective in lowering building carbon emissions through the reduction of energy consumption or by applying a new material system.

Business and Community Characteristics

The green development design must fulfil all aspects of the business chain and suit every part of community characteristics such as equality and diversity, health and wellbeing, safety and security, and accessibility and diversity (Luederitz, Long, & Von Wehrden, 2013). In designing a sustainable community, it is necessary to consider the social, ecological, and economic

factors. The most important is that green development is offered within a reasonable project budget. The goal is to provide an enjoyable living environment for the residents while reducing pressure on the natural environment as much as possible. Therefore, the above characteristic is crucial for the developer in planning green development for a future project.

Tornado Analysis

The tornado analysis is a powerful simulation tool that captures the static impacts of each variable on the outcome of the model (Mun, 2015). Tornado techniques are used to depict the sensitivity of a result to changes in selected variables in the construction cost. The result is then displayed as a special type of bar graph.

Advantages

1) The tornado diagram is relatively easy to create.
2) Sensitivity of risk occur can be identified at the early stage in the construction project.

Disadvantages

1) This software is costly to purchase.
2) Technical knowledge is required to run this software.

Assessment of Risk for Development Cost in the Process of Decision Making

The appraisal preparation for the development cost in the green project is crucial for the developer or clients. Therefore, during this stage, assessing risk on the development cost is fundamental. The incurred cost on the construction, finance, site, and all fees for the professional team and contingency must be evaluated deeply by the developer. The client and team should determine the risk of overestimating or underestimating at the appraisal stage (B., 2014). Estimating the final cost of projects is extremely difficult due to factors such as type of project, material costs, design, duration, size of the project and tendering method (Ahiaga Dagbui & Smith, 2014). Therefore, assessment of risk for the cost in the development project is fundamental. The impact on the construction delay is if the quantity surveyor calculates an insufficient budget. Sayce (2015) explained that the methods that are most frequently used to assist decision-making during the preparation of investment appraisal are as follows:

1) Comparability
2) Residual Valuation
3) Discounted Cashflow
4) Cost-benefit analysis
5) Others.

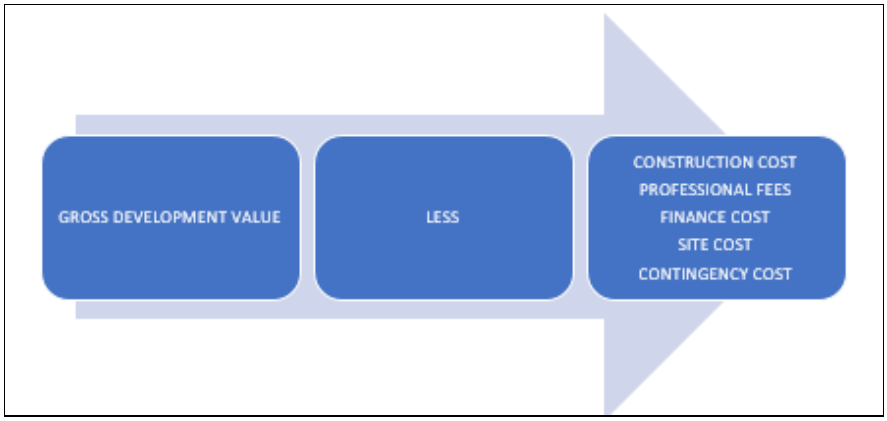

Figure 2: Shows gross development value less with overhead for the development project.

The equations used for the calculation are presented below;

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+i)^t}$$

Here;
CFt = Expected return from the investment in the t period, the probability-weighted average
PV = Present Value of all expected returns over the n-year life of the investment
i = the appropriate rate of discount for future returns

Several detailed discounted cashflow approaches can be adopted in the construction industry. Yet, all are based upon a much more extensive pre-assessment of the cost estimate that is prepared by the quantity surveyor. Therefore, the Tornado simulation analysis will be based on the project itself as a case study. The discounted cash flow approach has several general advantages:

1) Finance costs can be accurately computed.
2) The timing of inflow and outflow can be accurately represented, and they can be adjusted periodically by period to test the sensitivity of overall returns to such changes.
3) Variations in costs and prices can be built into the model.
4) The time structure of the problem, elements such as phasing, rental and selling can be included in the model.
5) More information becomes available to the decision-maker, improving the decision.

Equally, modelling based on these methods requires careful consideration of the actual structure of many variables, their values at the start of the development, their incidence throughout the development, and any changes that are thought possible. Risk assessment analysis was conducted using tornado analysis. The process of identifying risk for development cost is illustrated diagrammatically at the pre-contract stage in Figure 3.

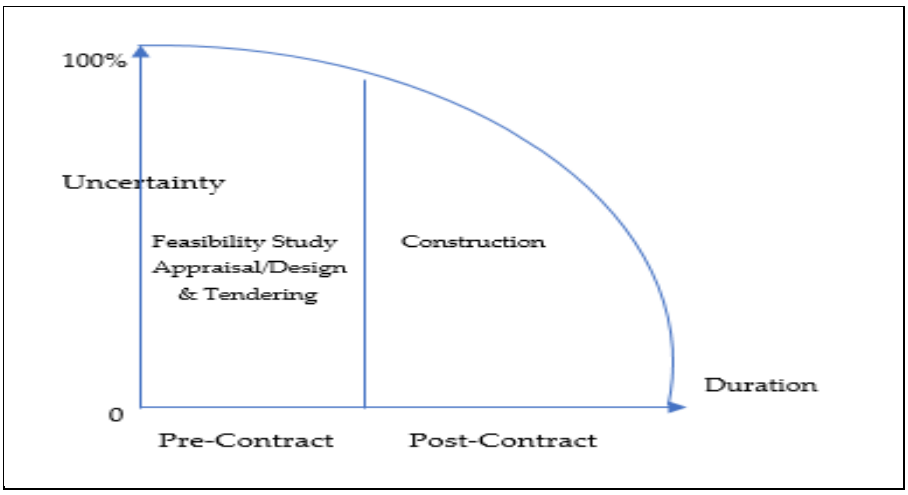

Figure 3: process of identifying risk for development cost is illustrated diagrammatically at the pre-contract stage

The financial risk assessment for green development costs was evaluated at the pre-contract stage. Using simulation, tornado analysis, the decision-maker has the experience to test data accurately before making a decision. A tornado analysis provides a graphical view of how the result is sensitive to the specified independent variables. The Tornado risk analysis function evaluates the impacts of risk prioritised during the qualitative risk analysis process and quantifies project risk exposure such as construction financial risks. This method shows the effects of the probability of occurrence and impact on the project objectives.

RESEARCH METHODOLOGY

The research employed a qualitative method. Piaw (2012) has described qualitative research use, where numerical data produced cannot explain many types of phenomena in the real world. For case studies, the essential benefit of documents is to corroborate and augment evidence from other sources (Yin, 1994). There are exceptional cases that require more careful observation. Therefore, a selected case study of a green development project was analysed. The chosen project information is as follows:

Propose a Green Development for a 7-Storey Hotel, 135 rooms, at Pulau Langkawi, Kedah, Malaysia.

Some of the standard features of green buildings elements adopted for the 7-Storey Hotel are:

1) Energy Efficiency
2) Renewable Energy Generation
3) Water Efficiency
4) Stormwater Management
5) Natural Ventilation
6) Sustainable Material
7) Effective Waste Management
8) Site Sustainability

The researcher analysed the document analysis with information content on development cost and discounted cash flow. The analysis was carried out using a risk simulator software to perform the Tornado Analysis. Figure 4 shows the analysis process for Tornado.

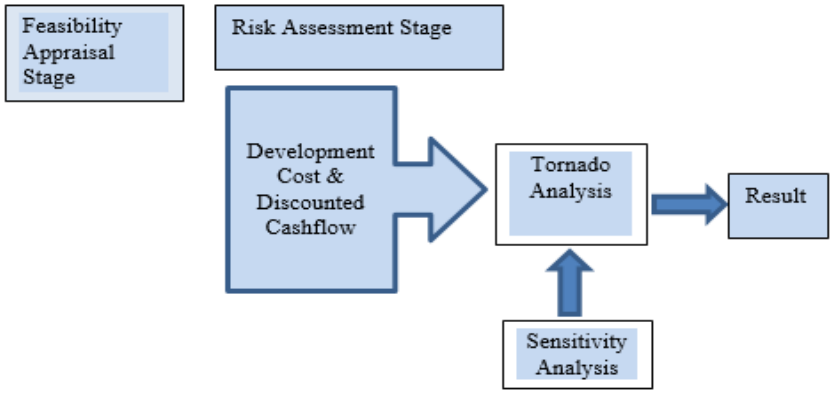

Figure 4: Shows the analysis process of simulation techniques using Tornado

RESULTS AND DISCUSSION

A sensitivity analysis was performed to identify the nature of the response to the development cost for a seven-storey hotel for green development. The analysis was performed for a development cost using a tornado application. The simulation was run for all exogenous variables across a reasonable range from the base conditions. A 10% increase and a 10% decrease were detected in Figure 4, the spider chart. The variable with a steeper line has more influence on the development cost.

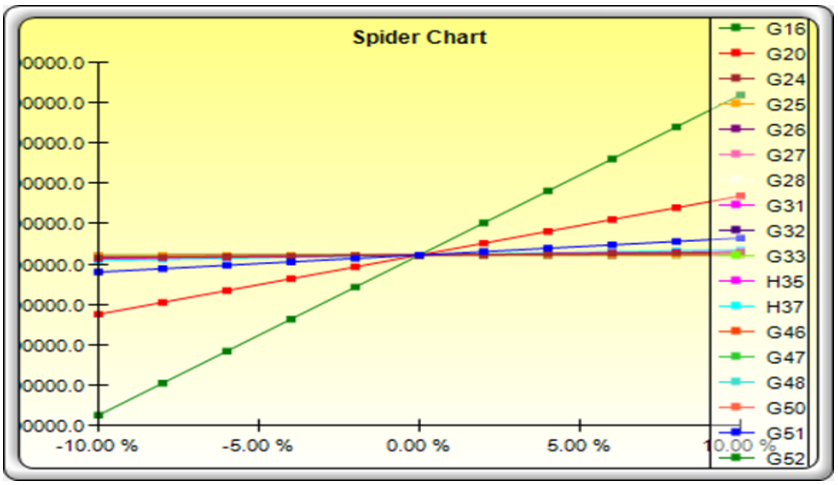

Figure 5: shows Spider Chart

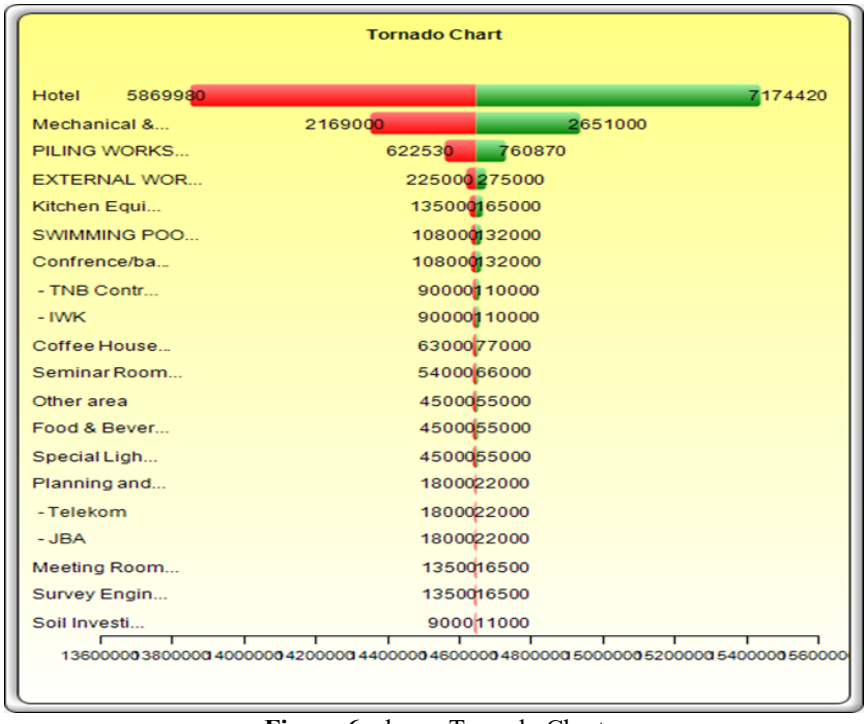

Figure 6: shows Tornado Chart

The resulting Figure 6 indicates the construction of green development for a 7-storey hotel. The tornado shows that a significant risk has appeared at the top of the graph. The top bar displayed the highest risk tabulated for a hotel which

is for the building cost. The bar colours indicate the direction of the relationship between the variable and the forecast. Forecast data will help the developer understand the most affected variable on the budget for the development cost (Atherton, French, & Gabrielli, 2008). The building cost to construct a 7-storey hotel is detected as the most sensitive element, followed by mechanical and electrical work and sub-structure work for piling. Also, the building cost is the most sensitive issue in green development because the material selected has to consider sustainability. The price of the material differs compared with conventional development. The increased cost of 10% of the material in the green building is due to low or non-toxic and minimal chemical use (Halil et al., 2020). The material selected is longer lasting and used in natural products. As confirmed by (Isaac, O'Leary, & Daley, 2010), the construction cost depends on the interplay between several related factors, including development size, site servicing and layout, quality of materials, type and design of a building, and the additional costs that attract higher capital costs. The second major element contributes to the higher cost of financial risk for the mechanical and electrical equipment. Materials and components for mechanical and electrical works meet the energy efficiency, and the cost to install in green buildings is very high. (Touny, Ibrahim, & Mohamad, 2021) were identified as critical success factors (CSFs); material and financial costs contribute to the successful implementation of sustainable development. Therefore, the client should provide a sufficient budget for green development. The developer themselves may play a substantial part in determining these estimates, particularly when they specialise in a particular type of development. Tornado analysis helps the client identify the risk for the cost of the elements that affect the construction of a hotel. Other piling works contribute to the third major risk for the construction of green hotel development. Piling construction is driven by using materials and heavy plants. Typically, concrete and steel piling is used as the primary materials in construction in Malaysia. The environmental impacts of piling construction can be broadly classified in terms of CO2 emission (due to volume of material and energy consumption), soil contamination, noise, air quality and waste generation.

CONCLUSIONS

Tornado analysis is a fundamental part of the development decision-making process. Essentially development will only proceed when the client has evaluated the financial risk. Profit motivation and sustainability are critical considerations for the developer. Sensitivity analysis is essential to assess how the input variables of a tornado model affect the output. Data can be acquired from the information that is received through sensitivity analysis; thus, more effective management decisions can be made. The research outcomes and tornado analysis provide a guideline for the quantity surveyor and client, namely,

on the crucial costs that impact the construction of a hotel in green development. The client knows which risks have the most extensive project impact and evaluates the risks before the project starts. The building cost (hotel), mechanical and electrical, and piling works are the most critical and pose the highest risk for the client in green development for the hotel. Design and materials that are used play a pivotal role in green development, and material selection has noticeable and significant implications for energy and greenhouse gas emissions (Huo et al., 2020).

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READINESS OF TRANSIT ORIENTED DEVELOPMENT (TOD) CONCEPT IMPLEMENTATION IN PERAK'S SUBURBAN AREAS

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Abstract

The transit-oriented development (TOD) concept is a planning strategy in metropolitan areas that involves mixed use of land for transportation systems, especially railway stations, as the basis for planning the TOD concept. The question raised is whether suburban areas are suitable and ready to implement the TOD concept which is included in the suburban districts' local plan. The aim of this paper is to evaluate the readiness of implementing the TOD concept model for 14 suburban railway station areas in seven of Perak's local government administrations. The methodology used is a mixed quantitative and qualitative approach, applying the Fuzzy Delphi Method (FDM) and case study method to develop the readiness model and evaluate the readiness level of the TOD concept in suburban areas. Twenty indicators from 4 key elements in the TOD readiness model were identified, such as population density, transit system, economic development, and land development potential. The findings indicated that all 14 railway stations involved have not yet achieved a 100 per cent level of readiness in implementing the TOD concept model.

***Keywords**:* Transit Oriented Development, Readiness Model, Railway Station, Suburban, Design and Development Research

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INTRODUCTION

Transit-oriented development (TOD) is a development concept which focuses on human residential areas and activities that are located around transportation nodes such as railway stations, motorized stations, and air and water transport. Transportation network is a main pillar in the development of TOD, where it eases the movement of people to travel to other places. Based on several research conducted in big cities such as Doha, Copenhagen, and Perth, TOD can help to solve many problems caused by rapid development such as traffic congestion, land usage, population density, and usage of motorized vehicles (Al-Harami and Raffaello, 2019; Furlan and Saeed, 2019).

In Malaysia, the concept of TOD has been applied in several areas, especially by the Majlis Bandaraya Petaling Jaya (MBPJ) and Iskandar Regional Development Authority (IRDA) using the Local Plan and Master Plan (Abdullah et al., 2020). However, in suburban areas, the concept of TOD was not the main vision for their future development (Azmi et al., 2021). This situation can change completely according to Gomez et al (2019) if the local authority plans for future development based on four elements of TOD, which are density, potential of land use development, economic development, and transit system. The Perak State Structured Plan highlighted a proposal for TOD around the railway stations in Ipoh, Taiping, Tapah, Tanjong Malim, Batu Gajah, and Kampar (PLANMalaysia@Perak, 2020). However, only Ipoh is considered to be ready for TOD implementation due to its status as a City Council and as the capital of the state of Perak. The big question therefore is: when is it suitable for the TOD concept to be applied in a specific area, especially in suburban areas? Hence, the main objective for this paper is to assess the readiness of TOD concept implementation for future development in Perak's suburban areas.

LITERATURE REVIEW

TOD in Suburban Areas

Urbanization has produced many new townships or residential areas to accommodate the needs and demands of urban workers. These new developments are usually located at the end of the city boundary known as a suburb. These types of developments are usually in high demand among urban workers because they are suitable with their income. However, this situation results in a waste of productive time for travelling and also causes air pollution. Besides that, the optimum usage of transportation facilities only occurs at a certain time, usually in the morning, which can be viewed as a waste because building these facilities cost extremely large sums of money (Ahmad and Suratman, 2020). Hence, many countries have taken steps to implement the concept of TOD in their development planning, which can connect many areas using their transportation network and public transport as their medium for travelling.

TOD is also related to the Sustainable Development Goals (SDGs) by the United Nations, where this concept emphasizes the transportation sector as the basis for a given area's development, especially in the context of infrastructure, public transport system, service delivery system, capability, and efficiency of transportation (MacDonald et al., 2018). Sustainable transportation can also help to achieve good economic integration, preservation and conservation of the natural environment, increase social equity, health, urban resilience, urban and rural connection, and rural productivity (Ramlan et al., 2021). To achieve better TOD, there are four main principles for planning and development which can be used in suburban areas, which are:

1. Emphasis on centralized areas and types of densities and mixed land use activities.
2. Relationship between the central area and the rapid transit site such as train stations.
3. Development based on density and design requirements in each central area which are managed by a specialized development agency.
4. Financial mechanism which can allow transit and TOD to be built between the transit and central area.

Criteria for TOD's Model: Malaysia's Policy

In Malaysia, the development concept of TOD has been discussed at the highest level in the Third National Physical Plan (NPP3) which was introduced in 2016 (PLANMalaysia, 2016). In that plan, two detailed guidelines were introduced by PLANMalaysia and *Agensi Pengangkutan Awam Darat* (APAD): the Transit Oriented Development Policy Guidelines in 2016 (APAD, 2016) and the Transit Oriented Development Guidelines in 2018 (PLANMalaysia, 2018) respectively.

The planning for TOD was highlighted in NPP3 via the First Core: Dynamic Growth of Urban and Rural Areas. To succeed in this core, public transport services in urban areas need to be upgraded to form a new stable and sustainable public transportation network. Also highlighted in this core was the Malaysian Government's aim to increase the percentage of public transportation usage in Peninsular Malaysia to 40% in 2030 and 60% in 2050, while for non-primary cities, the target is 30% in 2030 and 50% in 2050 (PLANMalaysia, 2016). To achieve this target, TOD has been proposed in several strategic locations. On the other hand, High-Speed Rail and Electric Train Service (ETS) have already been integrated together with Light Railway Transit (LRT), Mass Rapid Transit (MRT), and Bus Rapid Transit (BRT) to improve public transportation services in urban areas.

Readiness criteria in TOD

The TOD concept has been researched by many researchers to explore the best design to maintain a sustainable quality of life in surrounding areas. In general, TOD is a concept to enable a dense population area to enjoy a perfect lifestyle by using a systematic infrastructure (Rosni et al., 2018) based on four main elements in TOD, which are:

i. **Population Density:** always reflected in local economic development (Wang et al., 2019; Hassan et al., 2018). The TOD concept has been introduced to ease the movement of people and at the same time help to manage and maintain the surrounding environment (Ab Majid et al., 2021).
ii. **Transit System:** can be defined as a system which includes public transportation and private ownership vehicles for movement purposes (Renne, 2016; Hassan et al., 2018). To make the railway system more efficient, another public transport mode is used as a support such as public bus service (Iseki and Eom, 2019).
iii. A dynamic **Economic Development** is essential for every country. One of the focus points of TOD is to establish a dynamic economic development, which can help to increase job and business opportunities for the people (Wang *et al.*, 2019; Samat et al., 2019), tax collection (Kaneko et al., 2019; Hendrastuti, 2021), and to increase the usage of resources (Economic theory) (Samat et al., 2019; Tahir and Malek, 2016).
iv. **Potential for Land Development -** TOD focuses on the potential for land development in the transit infrastructure radius, which can benefit from transit investment such as the construction of pedestrian walkways, better access to job location, and reducing traffic congestion, air pollution, and greenhouse gases (GHG) (Cervero, 2020; Ma et al., 2018; Malaysian Industrial Development Finance, 2017).

A considerable amount of research listed out different TOD indicators that can be used to ensure uniformity of TOD in every area of each country. All these indicators are based on four main principles of TOD, which are, transit system, density, potential of land development, and economic development.

METHODOLOGY

In order to develop a TOD readiness model, a design and development research (DDR) approach was chosen which focuses on 4 main elements and 20 indicators of TOD (Mohd Ridhuan et al., 2014). DDR is a systematic process which is made up of three main phases, which are phase of research, phase of design and development, and phase of model implementation.

Phase 1: Phase of research
Phase 1 is important in order to ensure there is a need for the TOD readiness model to be developed. This phase also explains the extent to which TOD is needed in suburban areas and whether the areas are ready or not for TOD implementation. A questionnaire form was used in this phase. 35 respondents took part in this phase from different positions in 7 local authorities in Perak state. Each of these local authorities was chosen based on their homogenous population density around the existing train station in their jurisdiction area. The final findings in this phase are shown in the indicator list, which can be chosen to develop a readiness model in the next phase.

Phase 2: Phase of design and development
In this phase, the respondents were made up of 20 experts in different fields such as urban planning, transportation planning, land use, and land management. An interview session was conducted among these 20 experts to design and develop the model using the Nominal Group Technique (NGT) method. These 20 experts gave their expert opinions related to the 20 indicators, which are found from the literature reviews and questionnaires from Phase 1. The final findings in this phase will be used for the Fuzzy Delphi Method in Phase 3.

Phase 3: Phase of model implementation
Fuzzy Delphi is a method used in Phase 3, which can be used to assess the usability of the model in suburban areas and to determine the ranking order for each indicator based on importance to TOD. All 20 experts in Phase 2 were chosen to be part of Phase 3. The final findings from this phase is a complete model of TOD readiness based on 20 indicators, which were properly aligned based on importance ranking and complete with a measurement for each indicator.

Case Study of Perak using TOD Readiness Model
The TOD readiness model was used for an in-depth analysis by implementing an assessment of the readiness of railway stations with the local authorities involved in suburban areas through a case study approach (qualitative analysis). This approach was implemented in the study area in 14 railway stations involving 7 local authorities in Perak. These 7 local authorities were categorised as suburban areas due to their status as a Municipal Council. All of the railway stations existing land use within a radius of 800 meters from the station (Figure 1) were considered to determine development of TOD. Several methods of data collection were involved based on 20 indicators (Table 1) along with measurement recommendations for those indicators such as primary data, survey, physical observation, and secondary data from government agencies. After the evaluation of each train station in each local authority, the analysis of the level of readiness

of TOD in the affected areas was explained to find out the current position of the level of readiness of railway stations and local authorities in developing the concept of TOD.

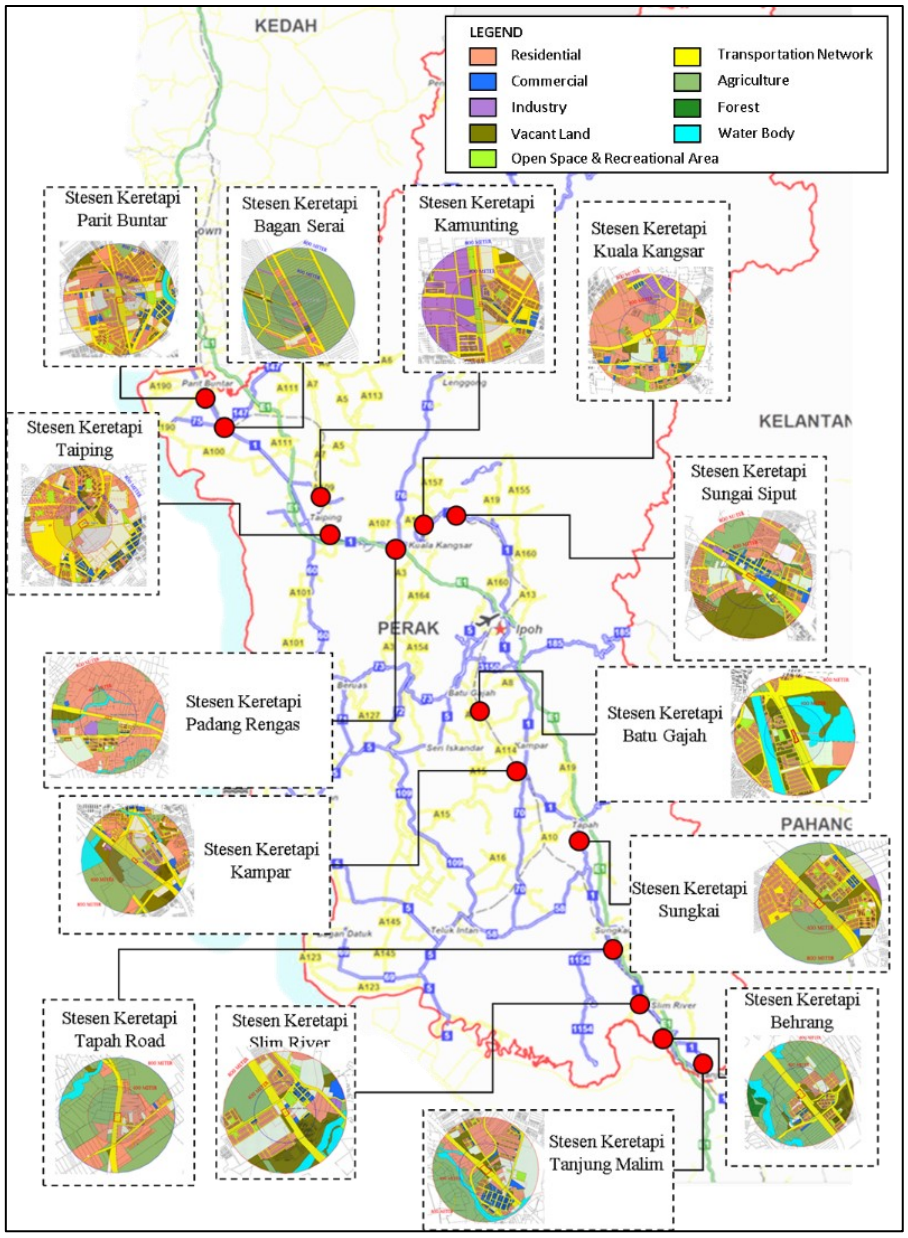

Figure 1: Existing Land Use within 800 Meter Radius from Railway Station

RESULTS AND FINDINGS

The findings of this study can be divided into two sections, which are the proposed indicators and measurements which can be used to assess TOD readiness, and the application of this model in selected areas in Perak's suburban areas.

Indicators and Measurements for TOD Readiness

At the end of DDR, a complete model for TOD readiness was produced complete with suggested measurements from the experts' opinions. This model can be used in a suburban area to determine whether it is ready for TOD implementation or not. The complete model for TOD readiness is as in Table 1.

Table 1: Complete Model of TOD Readiness

Rank	TOD Element	TOD Indicator	Measurement
1	Population Density	Population Density	Minimum 1500 persons/km^2/LA
2	Potential of Land Development	Mixed Land Use	Minimum 100% from TOD zone can be developed.
3	Economic Development	Level of Mixed Land Use	Minimum 50% from TOD area is mixed land use.
4	Transit System	Number of Interchange with Different Mode	Minimum 1 mode of public transportation connected with station.
5	Transit System	Accessibility to Station	Minimum distance is 400 / 800 m from station.
6	Transit System	Connectivity with Other Routes	Minimum 1 route is connected to the station.
7	Transit System	Parking- Car	Existing parking for cars
8	Transit System	Frequency of Transit System Service	Minimum 78 trips/ day
9	Economic Development	Taxes Received by Local Authority	Minimum RM 100 million/ year (*Majlis Perbandaran*) Minimum RM 50 million/ year (*Majlis Daerah*)
10	Transit System	Parking- Bicycle	Existing parking for bicycles
11	Transit System	Parking- Specific Group	Existing parking for specific group of people such as disabled persons
12	Economic Development	Amount of Existing Businesses	Minimum 20% from Local Authority jurisdiction
13	Population Density	Commercial Density	Minimum 20% from TOD zone
14	Transit System	Security	Existing security aspects at station such as CCTV and security guard
15	Population Density	Employment Density	Minimum 20% from TOD zone
16	Economic Development	Private Investment in Local Authority Jurisdiction	Minimum 30% of land use are industry and commercial
17	Transit System	Peak-hour Passengers	300 passengers (2 trips)
18	Transit System	Facilities	Existing proper facilities for train station such as seating, toilets, cafeteria, and good ventilation system
19	Transit System	Non-Peak Hour Passengers	100 persons (1 trip)
20	Transit System	Information Display	Existing information display aspects such as information board, LED and direction board

Application TOD Readiness in Perak's Suburban

There are 14 train stations from 7 different local authorities in Perak's suburban areas that were identified to test the completed TOD readiness model (Table 2). As a result, all 14 train stations are still not ready to implement TOD at present. 4 stations, namely Sungkai Railway Station, Kuala Kangsar Railway Station, Taiping Railway Station, and Kamunting Railway Station are 45% ready for TOD implementation, while another 10 stations are only about 40% ready. This percentage is seen to be an obstacle to successful TOD when all these railway stations do not meet the definition of the TOD concept, which consists of four main elements, namely population density, potential of land development, economic development, and transit system. From 4 main elements of TOD, only one element of the transit system was achieved in all 14 train stations, while only 3 train stations had completed the element of potential for land development. In terms of density, none of the stations achieved the minimum population for TOD; despite that it is the most important factor for consideration to apply the concept of TOD in an area. Since all these stations did not achieve the target of 100%, it will make it difficult for the local authorities to implement TOD in the near future.

Table 2: Complete Model of TOD Readiness

Element	Indicator	MDTM			MDT		MDKpr	MDBG	MPKK			MPT		MDK	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Population Density	Population Density	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Potential of Land Development	Mixed Land Use	X	X	X	X	√	X	X	X	√	X	√	√	X	X
Economic Development	Level of Mixed Land Use	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transit System	Number of Interchanges with Different Modes	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Transit System	Accessibility to Station	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Transit System	Connectivity with Other Routes	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Transit System	Parking- Car	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Transit System	Frequency of Transit System Service	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Economic Development	Taxes Received by Local Authority	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transit System	Parking- Bicycle	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transit System	Parking- Specific Group	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Economic Development	Amount of Existing Businesses	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Population Density	Commercial Density	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transit System	Security	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Population Density	Employment Density	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Economic Development	Private Investment in Local Authority Jurisdiction	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transit System	Peak-hour Passengers	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Transit System	Facilities	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Transit System	Non-Peak Hour Passengers	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Transit System	Information Display	√	√	√	√	√	√	√	√	√	√	√	√	√	√
TOD READINESS (PERCENTAGE)		**40**	**40**	**40**	**40**	**45**	**40**	**40**	**40**	**45**	**40**	**45**	**45**	**40**	**40**

Railways Legend:
1=Tanjung Malim Railway Station; 2=Behrang Railway Station; 3=Slim River Railway Station; 4=Tapah Road Railway Station; 5=Sungkai Railway Station; 6=Kampar Railway Station; 7=Batu Gajah Railway Station; 8=Sungai Siput Railway Station; 9=Kuala Kangsar Railway Station; 10=Padang Rengas Railway Station; 11=Taiping Railway Station; 12=Kamunting Railway Station; 13=Bagan Serai Railway Station; 14=Parit Buntar Railway Station.

CONCLUSION

In conclusion, the developed model of TOD readiness was successfully developed, which involves 20 indicators in four elements, where previous studies had not considered implementing a study of the level of readiness of TOD, especially in suburban areas. This model can serve as a tool to evaluate and measure the level of readiness of a railway station and also local authorities in the planning and development of the TOD concept, where it was proven to be successful. This model may also be used as a proposed study in the development of guidelines for TOD in the suburbs, especially for the Local Authorities which have a TOD concept in their Local Development Plan.

In the context of Perak, all railway stations in Perak's suburbs are not ready to accept, implement, and adopt the concept of TOD in their areas. In order to implement TOD in suburban areas in Perak, all the proposed indicators must be prepared such as population density, potential of land development, economic development, and transit system in these areas. However, the aspect of population density is the most important element in implementing TOD because with high demand, the TOD development will appear more effective.

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NOTES TO CONTRIBUTORS AND GUIDELINES FOR MANUSCRIPT SUBMISSION

INTRODUCTION

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